FLOOD CONTROL DISTRICT

Project Development & Scoping Guidelines

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1.3. Introduction

The Flood Control District of Maricopa County (District) is involved with many different facets of flood control. As the District develops Projects to mitigate flood damage and losses, many of these Projects are planned and designed by Consultants through the contract process.

The District developed the first edition of the Consultant Guidelines, October 1, 1998 to provide Consultants with an understanding of the District's requirements to standardize planning and

design deliverables. The Consultant Guidelines were revised on August 1, 2000 and again on December 1, 2003.

Although the Consultant Guidelines is a document used by Consultants, it is also a tool used by District Project Managers to develop the Scope of Work (SOW) for Projects as part of the contract between the District and Consultants; therefore the name of the document has changed. The process in which projects develop from idea to construction and operation and maintenance was not highlighted within the original document. This revised document focuses not only on information for the Consultant but provides the necessary guidance for any Project Manager that requires an understanding of the project development process and needs to develop a SOW to complete the Project. Disciplines that support Projects, such as hydrology, surveying, or landscape aesthetics, are integrated within the project process to create a clearer understanding of what is needed at various phases and to what level of detail.

This document, the Project Development and Scoping Guidelines is organized into five chapters: Introduction and Project Overview, Contract Process, Scope of Work, Disciplines, and Exhibits.

1.4. General

For planning and design Projects, the purpose of the Project is to identify and quantify flood related hazards and, when possible or appropriate identify possible solutions. This may include development of context sensitive multi-purpose flood hazard mitigation solutions to the extent feasible. The District developed and often utilizes the Context Sensitive Flood Hazard Mitigation (CSFHM) approach which identifies solutions that are acceptable to the local communities, compatible with the environment and effective in reducing the risks of flooding damage. An important component is meeting Acceptable, Compatible, and Effective (ACE) components to deliver flood hazard mitigation solutions. This ACE application is a balance between meeting the need for protection of public health, safety, and welfare with the protection of the valued characteristics of the natural and human built environments.

1.4.1. Purpose of Project Development and Scoping Guidelines

The purpose of this document is to provide an understanding of the project development process, the contracts process, and the scoping process for both District Project Managers and staff and Consultants. This document will provide guidance for the development of the SOW and contract documents for many different types of Projects including floodplain delineations, planning, project design, dam evaluation and rehabilitation, construction, and operation and maintenance.

1.4.2. Scope and Limitation

This document is intended to cover most typical Project types and the disciplines that support the Projects. Each Project has certain unique features that may not be covered in this document. There may be some unique Projects that include special disciplines. It is the responsibility of the Project Manager to adjust the SOW appropriately to fit the uniqueness of the Project.

1.4.3. Using these Guidelines

A Project specific SOW will be developed for each Project. The Scope of Work Chapter(s) in these guidelines can be used in one of two ways.

The first option is to use the Scope of Work Chapter(s) like a menu, revising the applicable Project section(s) such that it becomes a Project specific SOW as an exhibit to the contract. The tasks specifically needed for the Project are selected and will be directly incorporated in the SOW and as an exhibit to the contract.

The second option is to use the Scope of Work Chapter(s) as a reference document. The Project specific SOW would reference this guidance document and add or delete sections as needed.

1.4.4. References & Other District Guidance Documents:

a) The Context Sensitive Flood Hazard Mitigation Planning and Design Approach, FCDMC, April 19, 2010.

b) Data Delivery Specifications: Computer Aided Drafting & Design Rev. 1.0, latest edition, FCDMC.

c) Data Delivery Specifications: The Hydrologic Information System (HIS), latest edition, FCDMC.

d) Desert Spaces, An Open Space Plan for the Maricopa County, Maricopa Association of Governments, undated.

e) Drainage Design Management System for Windows, latest edition, FCDMC.

f) Drainage Design Manual, Vol. 1: Hydrology, latest edition, FCDMC.

g) Drainage Design Manual, Vol. 11: Hydraulics, latest edition, FCDMC.

h) Drainage Design Manual, Vol. III: Erosion Control, latest edition, FCDMC.

i) Drainage Policy and Standards Manual, latest edition, FCDMC.

j) Flood Protection Structure Types Handbook - Descriptions, Photo Examples and Land & Resource Compatibility ratings for Scenery, Recreation and Open Space Resources in Maricopa County, FCDMC, June 2010.

k) Flood Protection Methods Handbook - Descriptions, Photo Examples and Land & Resource Compatibility ratings for Scenery, Recreation and Open Space Resources in Maricopa County, FCDMC, June 2010.

l) GIS Landscape Inventory and Analysis for Maricopa County (LIA), FCDMC, 2009.

m) Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003 or latest edition, FEMA.

n) Landscape Design Themes Handbook - Descriptions, Photo Examples and Land & Resource Compatibility ratings for Scenery, Recreation and Open Space Resources in Maricopa County, FCDMC, June, 2010.

o) Piedmont Flood Hazard Assessment for Floodplain Management for Maricopa County, Arizona, (PFHAM), April 2003, FCDMC.

p) Public Involvement Office Handbook, latest edition, FCDMC.

q) Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects, FCDMC, December 16, 1996, with Cost Ceiling Tables 1 & 2, March 3, 2009.

r) SAVE International Value Standard, latest edition,.

s) Maricopa County Procurement Code

t) Article 5 Procedures Manual

u) A.R.S., Titles 34 and 48

v) Maricopa Association of Governments, Uniform Standards and Specifications for Public Works Construction.

1.4.5. Definitions:

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

ADWR – Arizona Department of Water Resources

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

Certified Value Specialist (CVS) – An individual who has obtained specified training requirements and demonstrated competency in the application of the Job Plan for Value Analysis Studies, and shall have an active certification from SAVE International.

CIP – Capital Improvement Project or Capital Improvement Program

CLOMR – Conditional Letter of Map Revision issued by FEMA.

Construction Manager – Consultant's representative and the primary contact with the District and/or the District's representative and the primary contact with the Consultant during construction. The Construction Manager shall be knowledgeable and responsible for all aspects and phases of the Construction Project.

Consultant – The individual, partnership, firm, corporation, joint venture, or other business entity with which 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.

Context Sensitive – The structure fits in with its surrounds in regards to size and aesthetics.

Cost Estimate – The Consultant's best professional opinion of probable construction costs and other costs of the Project and/or associated services based on current costs. The cost information for construction Projects in the cost estimate shall be adjusted to reflect costs effective the date that the 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 A.R.S., having all the powers, privileges and immunities granted generally to municipal corporations.

FEMA – Federal Emergency Management Agency.

LOMR – Letter of Map Revision issued by FEMA.

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.

Progress Payments – Monetary payment made to the Consultant as contract work progresses and determined in accordance with the contract terms..

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

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

SAVE International - SAVE International® is the international society devoted to the advancement and promotion of the value methodology and certifies its members.

Schedule – A timeline of the scope of work that, at a minimum, contains those elements of the District scheduling template (**Exhibit 1 - Project Schedule**) which are applicable to the Project, i.e., contract start and completion dates, coordination meetings, dates of required submittals, and significant Project milestones.

Scope of Work (SOW) – Contract document detailing the specific tasks, deliverables, and work requirements in addition to the Consultant Guidelines.

Seal – The placement of a permanently legible imprint of the registrant's seal and signature in accordance with Arizona Board of Technical Registration R4-30-304. The seal shall bear the name of the registrant and shall state the profession in which the registrant is permitted to practice; whom shall be qualified and regularly and customarily engage in the technical discipline of the scoped items of work.

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.

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

1.5. Project Process Overview

The District performs many different types of Projects. The main types include surveying and mapping, floodplain delineation, planning, design, structure assessment, construction, and operation and maintenance. These Projects are managed within different branches within the Planning and Project Management Division, the Operations and Maintenance Division (O&M Division), and the Engineering Division. This document is intended to include flexibility for the Project Manager depending on the needs of the Project.

All Projects need inter-discipline support to help produce the final product. The various disciplines include but are not limited to: environmental and cultural resources, geomorphology, geotechnical investigation, hydraulics, hydrology, landscape planning and design, public and stakeholder involvement, real estate, river mechanics, structural engineering, general civil engineering, surveying & mapping, and value engineering.

The organization of the SOW should include the tasks for the Project type (WHAT needs to be done) and the specific disciplines to support the task (HOW does it need to be done).

1.5.1. Project Selection and Authorization

District management determines the priority for annual Project funding on the basis of Project readiness and merit, and total available funding. CIP Projects are authorized through Board resolutions.

1.5.2. Project Types

1.5.2.1. Land Survey and Mapping

Land survey and mapping can be considered Project types when they produce separate, stand-alone work products, such as boundary surveys, control surveys, topographic surveys, or topographic mapping. Land survey and mapping can also be considered as disciplines when they support a larger Project, such as floodplain delineation, master planning, design, or construction, including construction staking and as-built surveys. Unless otherwise specified within the SOW and/or these Consultant Guidelines, all survey work performed for topographic mapping shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in Guidelines and Specifications for Flood Hazard Mapping Partners, February 2002, (FEMA Guidelines).

(a) Land Survey

All land survey work shall be performed by or under the direct supervision of an Arizona Registered Land Surveyor (RLS). The RLS in responsible charge of the work shall seal and sign the work product .

Land survey data submitted to the District shall be tied to a uniform control system, as required by the particular Project. In general, horizontal survey data shall conform to Arizona Coordinate System, 1983, Central Zone (International Feet); vertical data shall conform to the North American Vertical Datum of 1988 (NAVD 88) and compared with the National Geodetic Vertical Datum of 1929 (NGVD 29) where required by the SOW. Horizontal control surveys shall be tied to the North American Datum of 1983 (NAD 83), Arizona Coordinate System 1983, central zone (international feet). The District utilizes the Maricopa County Department of Transportation (MCDOT) Geodetic Densification and Cadastral Survey (GDACS) network for control points for most survey work.

(b) Mapping

Maricopa County has obtained 10-foot contour interval mapping for most of the county, which is suitable for general planning efforts or large area hydrology. For specific Projects, the District obtains more precise topographic maps to meet individual Project needs. Except for very small areas (e.g., one or two acre sites), aerial mapping techniques are used to prepare digital topography. Conventional photogrammetry is the most common aerial mapping method used on District Projects. Aerial Light Detection and Ranging (LiDAR) may also be employed using a hybrid approach in combination with conventional photogrammetry to establish reliable vector (breakline) data and to aid in feature identification. Aerial mapping techniques are supported by field surveys to establish the Project control network, determine more precisely the location and elevation of hard structures, such as existing roadways, canal banks, culverts and bridges, and as part of the QA/QC

process. On occasion, ground-based stationary or mobile LiDAR may be used to supplement aerial mapping methods.

Mapping for studies and floodplain delineations is generally prepared at a scale of 1" = 200' with a two-foot contour interval. Mapping for design Projects is generally prepared at larger scales with a one-foot contour interval. Special circumstances may require even more precise mapping. In areas of steep slope (>15%) the contour interval may be reduced to 4'. Digital rectification of aerial photography into orthophotographs may or may not be included in the Project depending on the specific needs of the Project.

All digital data shall be delivered to the District in a format that meets the Data Delivery Specifications: The Hydrologic Information System (HIS) REV. 3.1 June 1, 1998 Flood Control District of Maricopa County, or the latest edition. All CAD deliverables shall meet the Data Delivery Specifications: Computer Aided Drafting & Design REV 1.0 January 2000 Flood Control District of Maricopa County, or the latest edition. The Project SOW shall indicate the requirement of digital information in "grid" coordinate system (for GIS and FEMA mapping purposes) and/or "ground" coordinate system for design, rights-of-way acquisition, and construction purposes.

1.5.2.2. Flood Hazard Delineation

Part of the District's mission is to identify flood hazards within Maricopa County. Delineating the aerial extent and magnitude (generally depth) of flooding that will occur during the 1% flood event (one chance in 100 that the flood will be equaled or exceeded in a given year) is the primary means to accomplish that mission. Other probabilities of flooding (i.e., the 50%, 10%, 2%, and 0.2%, or 2-year, 10-year, 50-year, and 500-year, respectively) may also be determined. Once a floodplain has been delineated, development can be regulated to reduce the risk of injury, death, and property damage due to flooding.

Within Maricopa County flood hazards come in various types, including riverine (rivers, creeks, and washes), overland flow or sheet flow, and alluvial fan flooding. In general, riverine flooding is more stable and predictable, while the other types can be distributary in nature, meaning the path of the flood can shift from event to event or even during a single event.

Flood hazards can be identified by either approximate or detailed methods. The primary difference between approximate and detailed delineations is approximate delineations are generally depict only a coarse estimate of the aerial extent of likely flood hazards while detailed delineations provide flood elevations or depths and are more precise in the aerial extent of flooding.

All floodplain delineations conducted by the District are conducted according to FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003, or as

identified in the specific scope of work. Alluvial fan type flood hazards are identified using the Draft Piedmont Flood Hazard Assessment for Floodplain Management for Maricopa County, Arizona, (PFHAM), April 2003 or most current version.

The documentation for the floodplain delineation is included in a Technical Data Notebook (TDN) which is prepared in accordance with Arizona Department of Water Resources (ADWR) State Standards 1-97 (SS1-97). The TDN is the document submitted to the Federal Emergency Management Agency for review and acceptance of a particular floodplain delineation. Once accepted by FEMA, the floodplain becomes "effective" and becomes the official standard for floodplain regulation in Maricopa County.

1.5.2.3. Planning

The District's planning program seeks to avoid individual and cumulative impacts of private development and public infrastructure on the natural drainage characteristics and the beneficial functions of watersheds and watercourses. However, it is often necessary to shift planning efforts toward mitigation where existing flood hazards were unrecognized at the time development occurred. In some cases, this resulted from a lack of coordinated and comprehensive regional planning. In others, it is simply the result of greater awareness and understanding of the nature of flood hazards over time.

To achieve effective flood hazard prevention and mitigation, while minimizing the overall public cost of protecting citizens from flooding, the District's planning program emphasizes a regional, uniform, and coordinated strategy of watershed management.

The District has developed the CFSHM which often is used to help guide planning efforts. Determination of the extent of the CSFHM is usually accomplished early in the pre-development of the Project with consultation with Management, Stakeholders, and the Project Team. The CSFHM approach can help to efficiently determine a range of flood hazard mitigation solutions that are acceptable, compatible, and effective. However, budget, schedule and stakeholder expectation must be evaluated to determine if the CSFHM approach is warranted or could be incorporated into the in the study or Project at a later date.

In planning Projects it is important to initially determine an overall vision along with Project goals and objectives in cooperation with partner municipalities, other agencies, and various stakeholders. This helps assure cooperation among the interested parties, guide project development, and assess progress toward the overall vision. It is helpful to revisit the goals and objectives at various milestones throughout the Project. Periodically checking these against the initial vision allows timely adjustments to be made in the goals and objectives, or the vision itself, furthering cooperation and improving the prospects of a successful outcome.

(a) Master Studies/Master Plans - General

The District identifies and selects regional areas or watercourses for study based on either the presence of existing flooding problems or the potential for future flooding problems as development occurs. The planning process recognizes differences in geographic scale of flooding hazards and varies its approach accordingly. In general, master studies/plans fall into the Area Drainage Master Study/Plan (ADMS/P) process or the similar Watercourse Master Study/Plan (WCMP) process. Watershed areas studied and planned under the ADMS/ADMP process are characterized by flooding hazards caused by precipitation falling on the local study area itself. In contrast, major watercourses are characterized by very large watersheds, extending beyond county and even state boundaries, and infrequent but extreme flooding hazards generally caused by precipitation falling well outside the study area. These areas follow a similar but distinct Watercourse Master Plan (WMP) process.

(b) Area Drainage Master Study

Maricopa County is divided among eight major watersheds, all of which eventually flow into the Salt or Gila Rivers. These watersheds are further divided into smaller areas to address regional and local drainage and flooding concerns. The planning process is typically conducted into two phases: the ADMS and the ADMP. They are sometimes combined into a single effort.

The ADMS identifies the nature and extent of flooding hazards and may include collecting other pertinent data, such as existing and proposed development, environmental and cultural features, and plans for major infrastructure Projects such as highways and bridges. Hydrologic analysis of existing conditions is a key component of any ADMS. For undeveloped areas or areas not yet fully developed, hydrologic analysis of future conditions is also performed to understand the potential cumulative impact of development. Often, existing floodplains are delineated as part of the ADMS. Known and potential flooding problems are documented and summarized as part of the flooding hazard context. On occasion, general strategies for flood hazard mitigation are identified in the ADMS in preparation for the ADMP. Figure 1.1 outlines the ADMS process in detail.

(c) Area Drainage Master Plan

When the ADMS identifies the need for mitigation measures on a regional basis the ADMP is performed. The ADMP uses an alternative(s) analysis approach incorporating ideas and evaluations from stakeholders and the general public to develop recommended alternatives and conceptual plans for mitigating flooding hazards. This process may incorporate the District's CSFHM Approach. Determination of the based on the study specific characteristics level or intensity of CSFHM will be generally identified during the early Project inception phase prior to

pre-scoping or more developed Project planning. Figure 1.2 outlines the ADMP process in detail.

(d) Watercourse Master Plan

Maricopa County has six major watercourses – the Gila River and its five principal tributaries: the Salt, Verde, Agua Fria and Hassayampa Rivers and Centennial Wash. In addition, the three major tributaries to the major watercourses – Cave Creek, Skunk Creek, and New River – are considered significant enough for a Watercourse Master Plan (WMP).

Historic diversions for agricultural, municipal, and industrial water supplies have rendered once perennial rivers ephemeral. This has often led to development and sand & gravel mining encroaching on historic floodplains, both of which can alter the natural and beneficial functions of the watercourses. While similar to the ADMP/ADMS process shown in Figure 1.1and Figure 1.2, the differences in flooding source and the extreme hazards require the WMP process to focus more on the watercourse than on the watershed.

Figure 1.1 - ADMS Planning Process

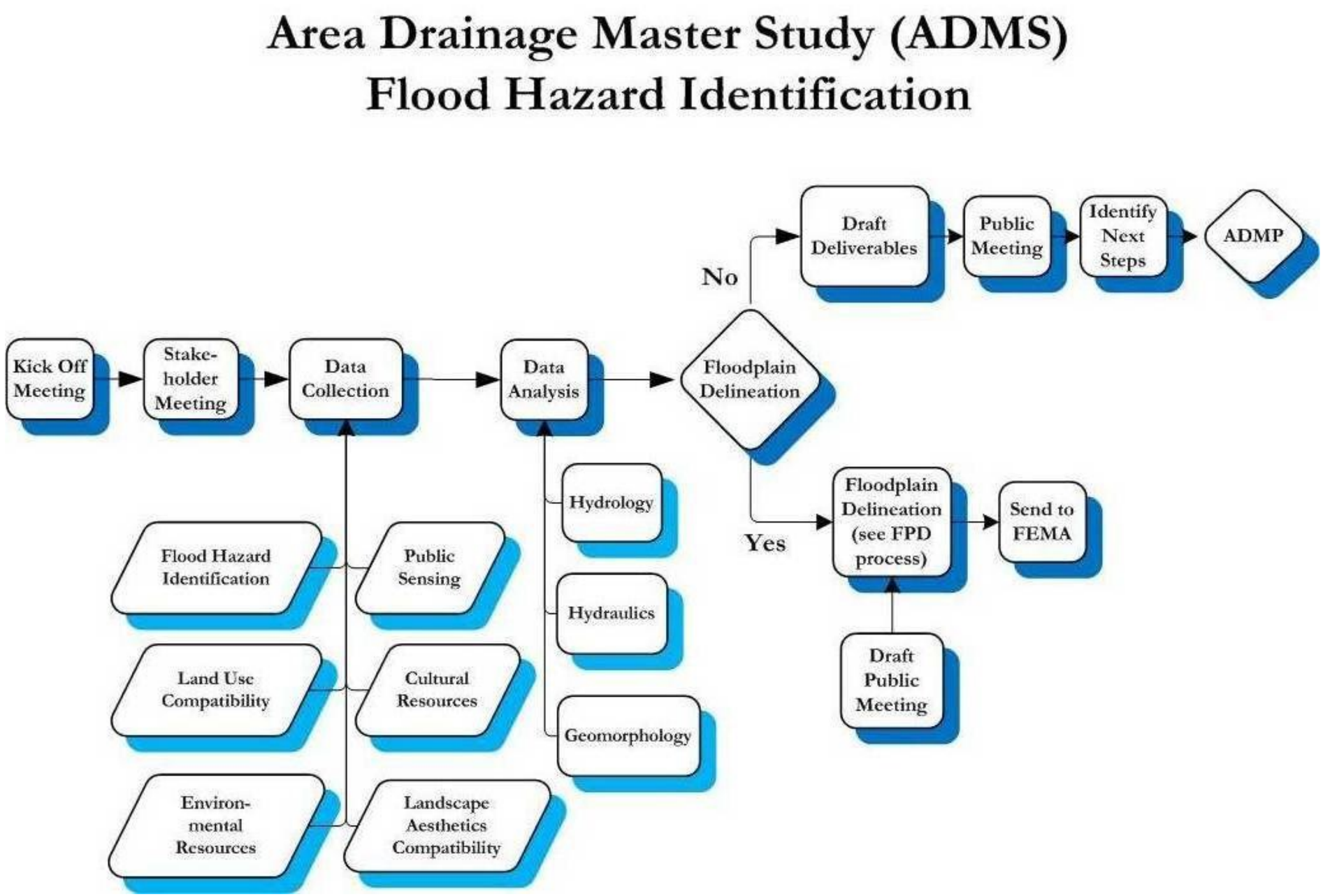
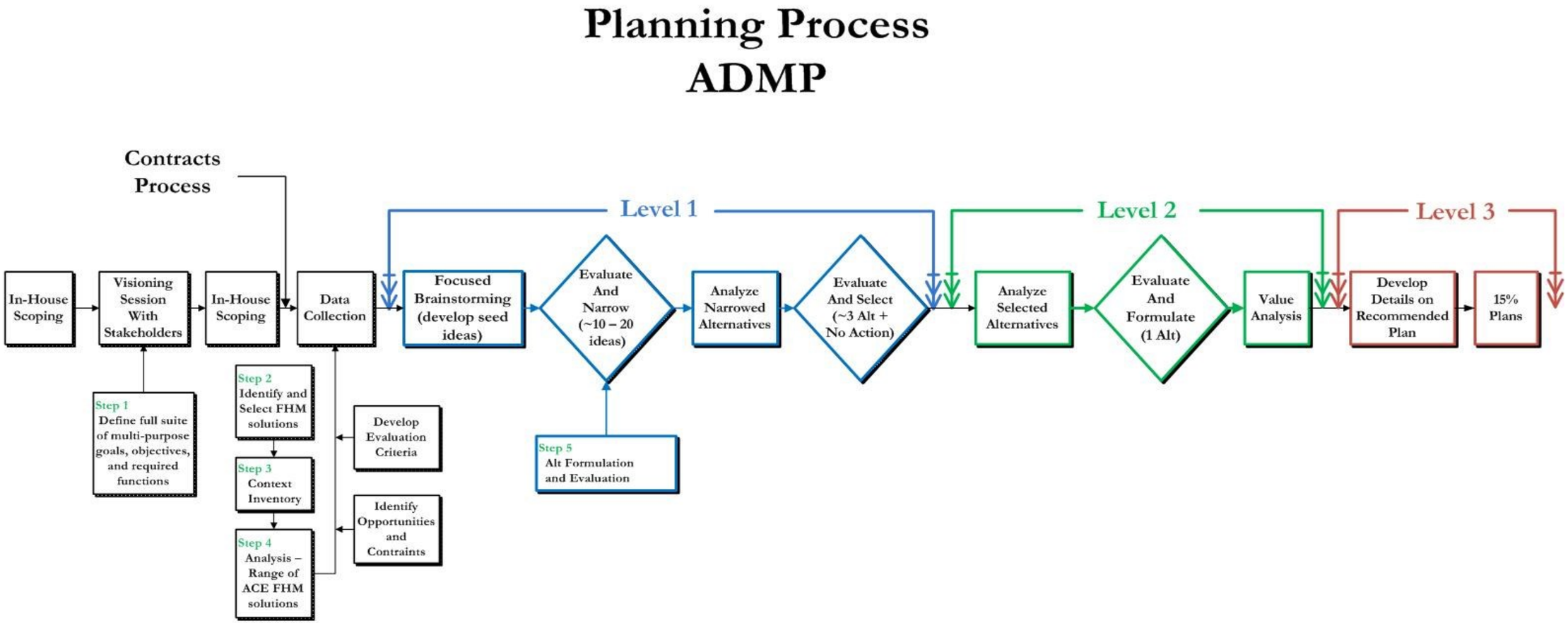


Figure 1.2 – ADMP Planning Process



(a) Design Concept Report

Once an individual Project identified in an ADMP, WMP or CIP request is chosen for implementation, a Design Concept Report (DCR) process may be used to efficiently refine the Project concept. Under the DCR process, the planning level concept (generally, what and where) is analyzed and refined to form the basis for scoping and preparing the final design. Existing ADMPs and CIP requests generally

1.5.2.4. Design

Projects in the District's CIP are identified by the District's planning process, operations staff, or partners, and are evaluated through an annual prioritization procedure to select and recommend their inclusion into the CIP.

The District attempts to support and recommend flood control Projects that, whenever possible, will provide a regional flood control benefit, and that will also contribute to community development, maintain the benefits of existing watercourses, help protect natural habitat and landscapes, and provide multiple-use opportunities for flood control facilities.

(a) Pre-Design

Individual Projects included in the CIP may need to be refined before moving into final design to better define the Project and/or avoid delays and re-work caused by unforeseen conflicts between such things as pre-existing infrastructure or utilities and right-of-way constraints. The Project may go through a pre-design phase to work out the Project features in greater detail than in the conceptual design stage and to identify and resolve conflicts that may not have been readily apparent at that level of analysis. Generally a pre-design effort results in plans approaching the 30% level and is more detailed than most DCRs. This phase is similar to a DCR but is usually focused on an identified stand-alone Project and may not go through a formal Planning Phase 1/Phase 2 alternative analyses. (See Figure 1.3 for the Pre-Design Process flow chart.)

(b) Design

The goal of Project design is to produce the final construction documents (plans and specifications) and determine reliable Project cost estimates for bidding and construction. Review milestones are included in this process, typically at the 30%, 60%, 90% and 100% of final design, and submitted for detailed review and acceptance at each stage of the final design. The purpose of these milestones is to verify at the earliest possible stages that the plans are meeting the intended Project purpose, the design is constructible, and to minimize wasted effort by preventing major revisions late in the design process and after much work has gone into the details of the design documents. At each stage the details of the Project become more refined as the design and documents progresses. (See Figure 1.4, Figure 1.5, Figure 1.6, Figure 1.7, and Figure 1.8 for the Design Process flow chart.)

Figure 1.3 – Pre-Design Process

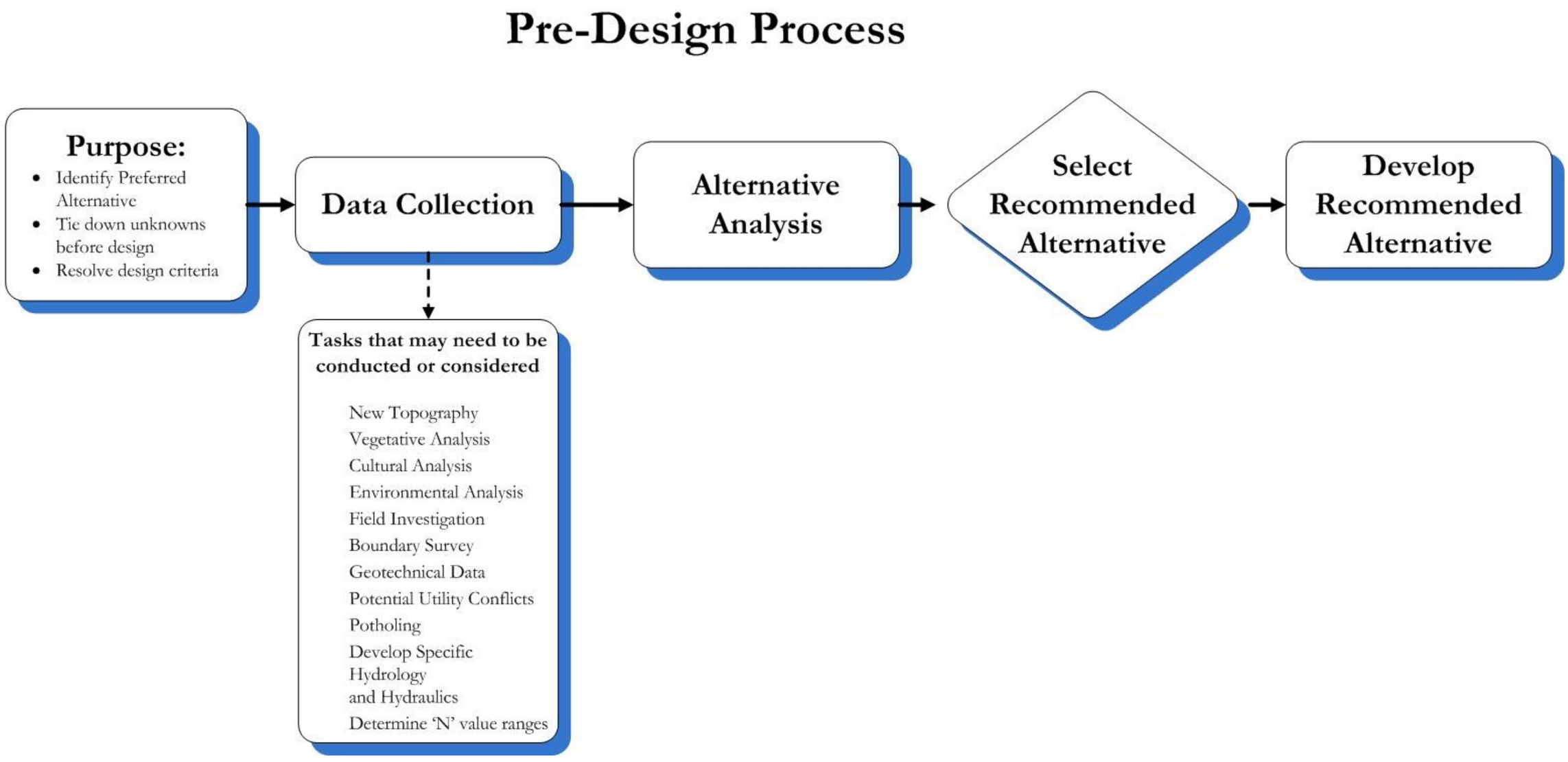


Figure 1.4 – Project Design Process

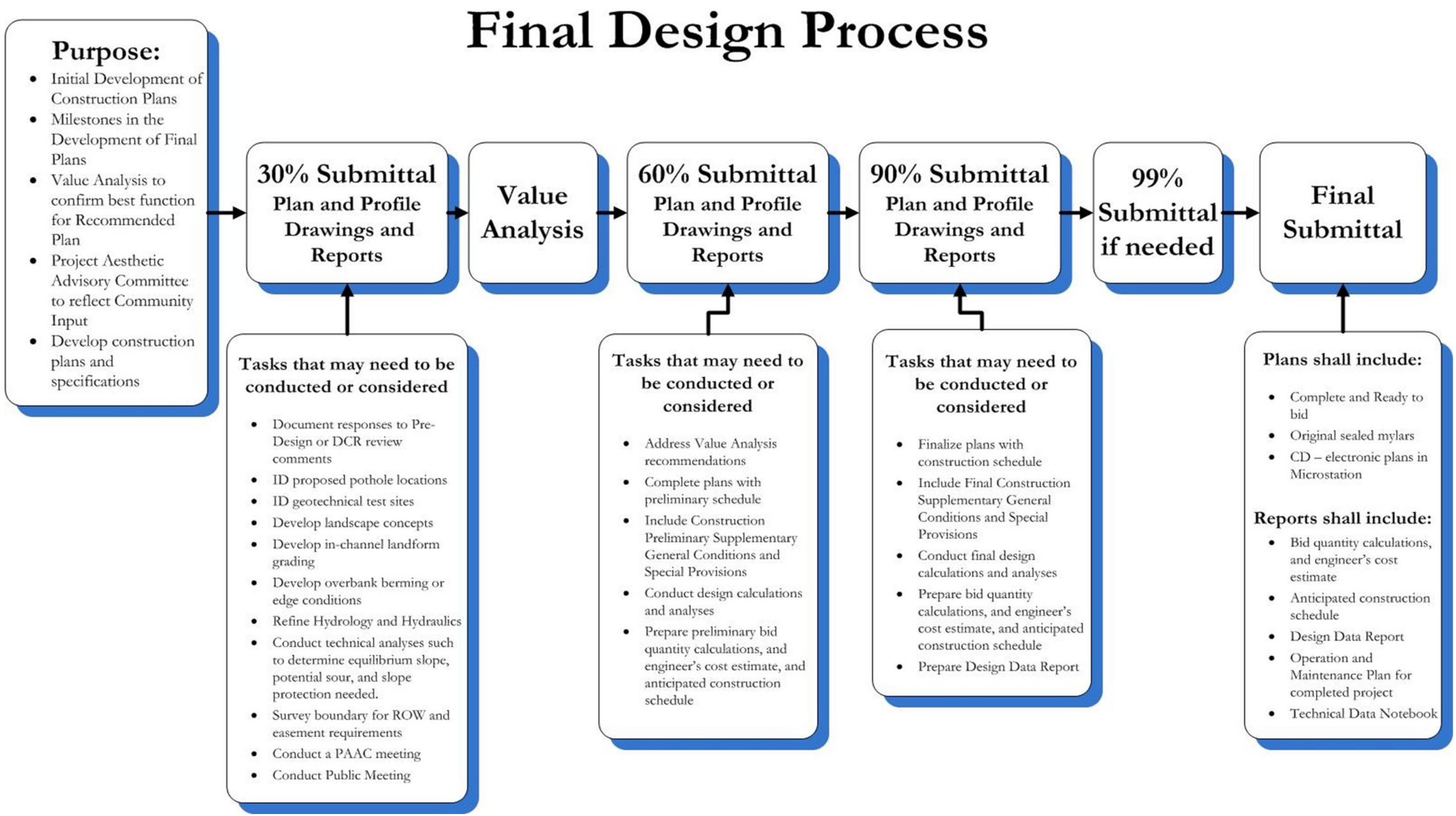


Figure 1.5 – Project Design Process – Detailed 30% Submittal

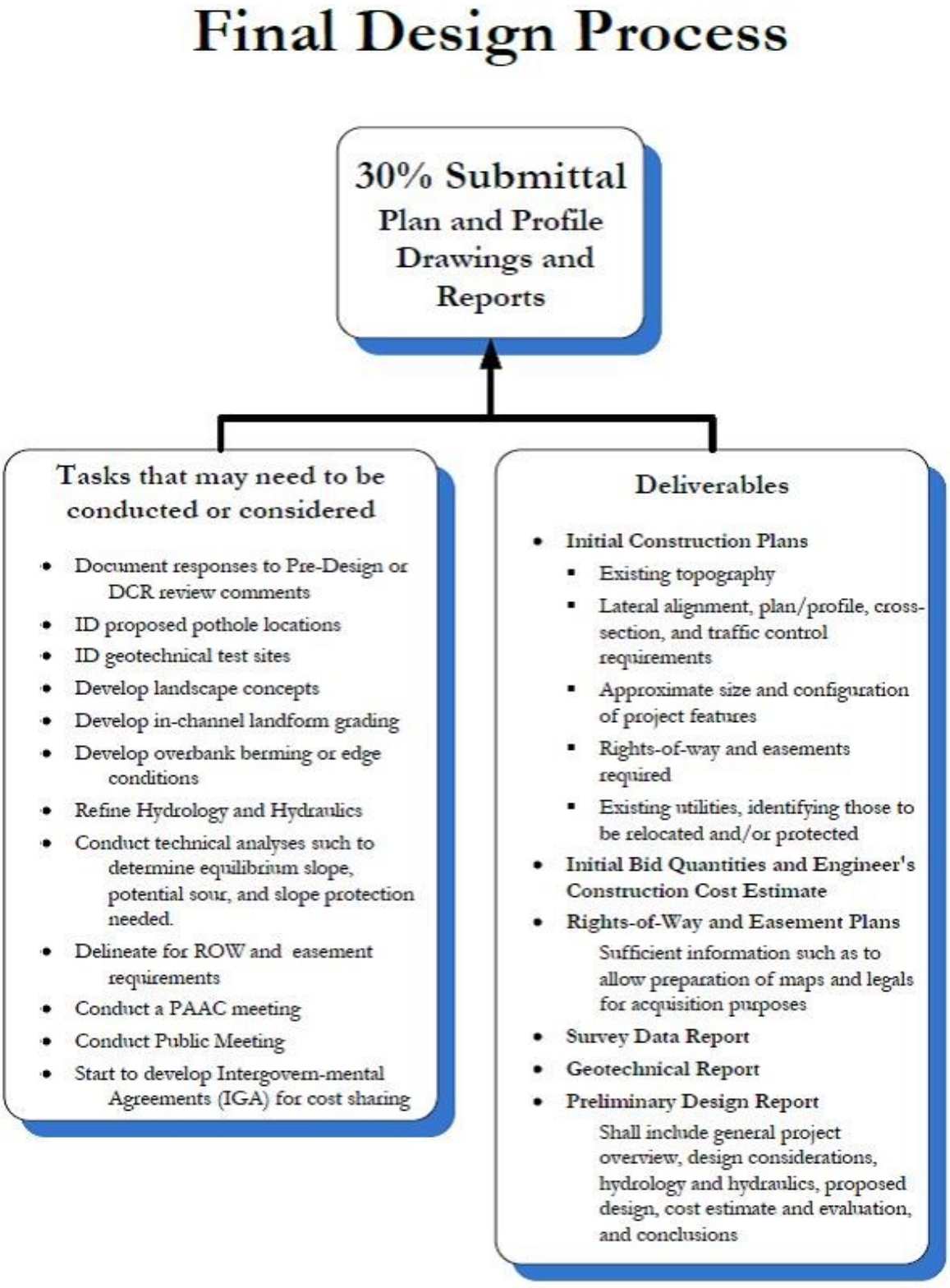


Figure 1.6 – Project Design Process – Detailed 60% Submittal

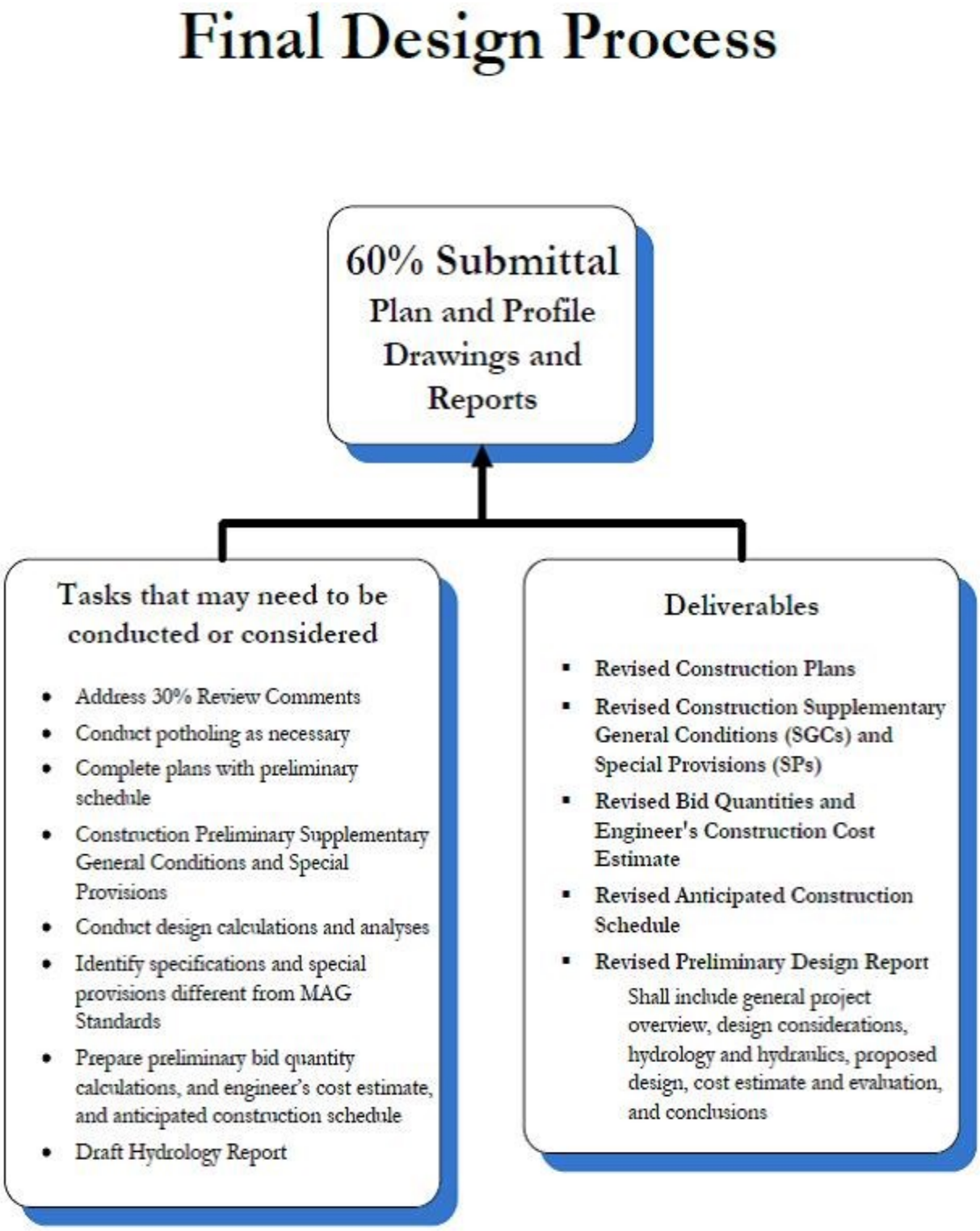


Figure 1.7 – Project Design Process – Detailed 90% Submittal

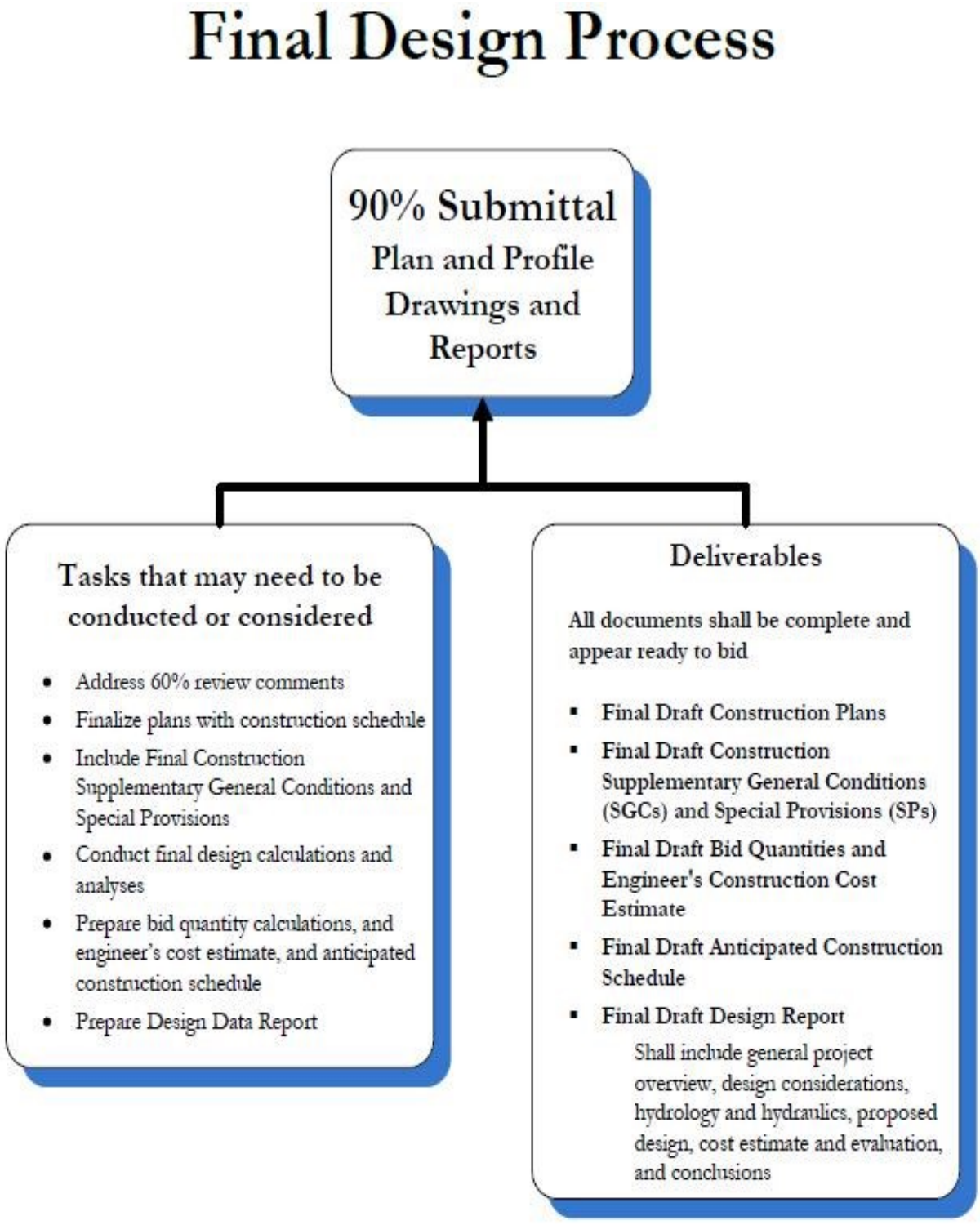
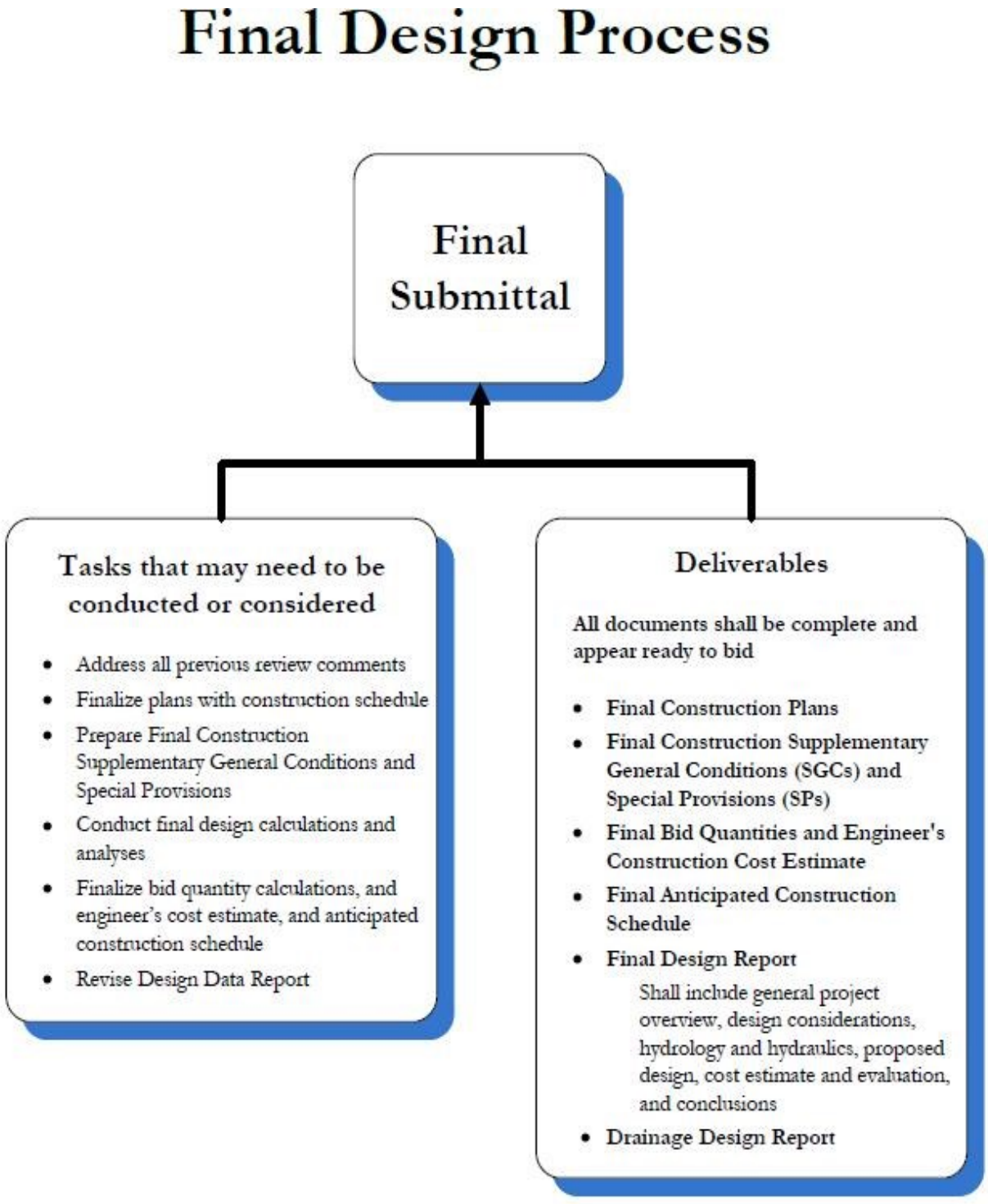


Figure 1.8 – Project Design Process – Detail Final Submittal



1.5.2.5. Structures Assessment

The District assesses and evaluates the condition of the 22 dams and flood retarding structures operated and maintained by the District for continued compliance with current regulations, standards and guidelines. This information is used to plan and manage remediation and rehabilitation Projects for these structures. These Projects include a detailed analysis of the structural integrity of the structure and the hydrologic and hydraulic adequacy of spillways and other outfall structures. Most of these structures were designed and constructed with assistance and funding by the Federal Government and thus requires their involvement in any changes to the structure.

1.5.2.6. Construction Management

The District typically provides construction management of District's contracted construction Project(s) either using District staff or construction management services. The Construction Manager observes and inspects the work of the contractor. The Construction Manager also follows the day-to-day operations of the construction Project in order to monitor progress according to the construction schedule, and help resolve conflicts. Lastly, The Construction Manager documents the work by providing monthly status reports of work completed and approves and process monthly invoices for progress payments.

1.5.2.7. Operation and Maintenance

In addition to dams, the District owns, operates and maintains many other Projects, such as channels, levees, basins and storm drains. The District's O&M Division is responsible for ensuring that each flood control structure is maintained to function as designed and that all dams comply with the licensing standards set by the Arizona Department of Water Resources (ADWR) as outlined in A.R.S. This includes periodic inspections of the facilities, trash and graffiti removal, vegetation management in compliance with Section 404 of the Clean Water Act, sediment removal, repairing damage due to flooding and vandalism, maintaining access control (fencing and gates), and addressing trespass issues, particularly with regard to dust control and compliance with air quality regulations.

Many of the facilities, such as basins, levees and channels, are developed as multi-purpose facilities like ballparks and trails. Many flood control Projects are constructed with multi-purpose uses are turned over to the local municipality to own, operate, and maintain. The O&M Division also may participate in inspection of those facilities maintained by partners (e.g., cities and other county agencies such as Parks & Recreation) per the applicable IGAs. In the event the project partner is not adequately maintaining the facility, certain IGAs authorize the District to conduct necessary maintenance and document the work to obtain reimbursement from the project partner.

Since operation and maintenance is perpetual for the life of the Project, the design and construction of the Project can have long-lasting impacts on operation and maintenance costs as well as the function and reliability of the facility. Therefore, operation and maintenance should be considered in all aspects of the design phase of every Project.

1.6. Contract Overview

District engineering and construction service contracts are procured in accordance with A.R.S. Title 34 and Article 5 of the Maricopa County Procurement Code.

Methods of consultant service procurement include direct selection, register-based selection, and public competition, dependent upon contract award amount (as established by the A.R.S. Title 34 and the Maricopa County Procurement Code) and the District's needs. Contract work may be authorized by the contract itself, or by "on-call" work assignments subsidiary to the contract. Work under a given contract may be negotiated on a lump sum basis, or on a not-to-exceed, time-and-materials basis governed by a fee schedule. The methodology will be specified by the contract/work assignment terms and scope of work.

Methods of construction procurement, as defined by the A.R.S. Title 34 and the Maricopa County Procurement Code, include Limited Scope, Simplified, Design-Bid-Build, Design-Build, Job Order, and Construction Manager at Risk. The District most commonly utilizes Design-Bid-Build and Construction Manager at Risk methods.

Vendors seeking to perform engineering and construction services for the District are advised to post their information to the Maricopa County Article 5 Register:

http://www.mcdot.maricopa.gov/procurement/article5/RSIA5_apphome.asp

1.7. Contract Types

The District contracts work to private companies in accordance with federal, state, and county procurement laws, regulations, and procedures. Article 5 of the Maricopa County Procurement Code defines the requirements and authorities for procurement and contract activities typically associated with planning design, construction, and associated professional services. Article 3 of the Maricopa County Procurement Code establishes procurement procedures for procurements that are not subject to Article 5.

2. Contracting Process

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2.2. Project Selection and Authorization

2.2.1. Identification of Projects

Resources are directed to District Projects under the strategic guidance relayed in the District's Comprehensive Floodplain Management Plan and Report, which can be found on the District's website.

2.2.1.1. Planning Projects

The District's planning program emphasizes a regional, uniform, and coordinated approach to watershed management. This approach works to minimize the public cost of protecting citizens from flooding resulting from private and public development's cumulative effects on drainage characteristics.

The District's Planning Branch prepares comprehensive studies and analyses; identifies locations and property at risk from potential flooding; and identifies regional flood control facilities that will be required in growth areas. Following an analysis of existing and future flooding problems, alternative solutions are developed to determine the most cost effective and publicly acceptable Projects. Recommended Projects are then prioritized for inclusion in the District's CIP. Non-structural alternatives are also evaluated and recommended.

Smaller planning Projects such as components of ADMPs or from the CIP prioritization that need more refinement before entering the design stage are identified by the District's planning program.

Each year the Planning Branch Manager with input from other District managers identifies the Projects that will be analyzed for the following year. The recommendations are presented to the Flood Control Advisory Board (FCAB) for endorsement.

2.2.1.2. Floodplain Delineations

It is important for the District to have accurate up-to-date information that identifies flood hazards throughout Maricopa County. The District accomplishes this goal by doing Floodplain Delineation Studies that identify land areas (floodplains) subject to inundation by a flood that has a one-percent probability of being equaled or exceeded in any given year, also known as a 100-year flood. The results of a Floodplain Delineation Study are submitted to the Federal Emergency Management Agency (FEMA) in order for the study to be incorporated onto the Flood Insurance Rate Maps (FIRM). Any development in an area that is determined to be a floodplain must meet the requirements of local, state and federal regulations.

Floodplain Delineation Studies provide the community with more accurate and up-to-date information on flood hazards and allow residents to prepare for the flood risks they may face. These studies maximize public safety, and minimize the later need to remediate flooding problems.

Each year the Hydrology and Hydraulics Branch Manager with input from the Floodplain Management Division and other District managers identifies the Projects that will be analyzed for the following year.

The recommendations are presented to the FCAB for endorsement.

2.2.1.3. Design

For those flood hazards identified for structural mitigation the District's CIP prioritization procedure evaluates regional Projects identified by the District's planning process, operations and maintenance staff, or Project partners. All Projects are evaluated through an evaluation procedure prior to their initial inclusion in the CIP.

The District's CIP Prioritization Procedure evaluates regional Projects. The District attempts to support and recommend flood control Projects that, whenever possible, will provide a regional flood control benefit, and that will also contribute to community development, maintain the benefits of existing watercourses, help protect natural habitat and landscapes, and provide multiple-use opportunities for flood control facilities.

Each year the District's Prioritization Evaluation Committee (PEC) evaluates and recommends Projects for inclusion in future CIP program. The PEC is comprised of senior representatives from the District's Planning and Project Management, Operations and Maintenance, Engineering, Floodplain Management and Services and Real Estate Divisions. The prioritization procedures and evaluation criteria can be found in the CIP Prioritization Procedure Manual and is located on the District's website. The recommendations are presented to the FCAB for endorsement.

Prioritized regional CIP Projects are "approved" through Resolutions by the District's Board, when appropriate, and approved Projects are implemented subject to the successful negotiation of IGAs with project partners.

The District's Small Project Assistance Program evaluates local drainage Projects. In all cases, these Projects must be proposed by municipalities, with municipalities being responsible for all project and construction management aspects and retaining operation and maintenance responsibilities. For these Projects, the District acts solely as a funding partner. Project recommendations under this program are subject to the implementation of an IGA, where IGA terms are strictly limited by program guidelines.

Each year, by early October, municipalities of Maricopa County may submit no more than five Project requests for construction in the following year. The Small Project Assistance Program manual and application is located on the District's website. Proposals are objectively scored in accordance with a scoring matrix approved by the District's FCAB and then ranked.

The IGAs for the recommended Projects are prepared and sent to the District's BOD and the City's Council for approval.

2.2.1.4. Structures Assessment

The District operates and maintains 22 flood control dams which provide highly beneficial flood protection for significant portions of Maricopa County. Most of these dams are the main flood control features of federal flood control Projects of which the District was the local sponsor.

The District's Dam Safety Program is made up of three major components over and above normal operation and maintenance activities.

(a) Recurrent Dam Safety Activities

Recurrent Dam Safety Activities primarily include: dam safety inspections, outlet pipe inspections, field surveys, land subsidence monitoring, earth fissure monitoring, and development and updating of Emergency Action Plans. Dam safety inspections are performed on an annual basis by District staff. Inspections of outlet pipes by video camera are performed every five years. Field surveys of the dams are required to monitor physical changes to the dams due primarily to embankment and foundation settlement and land subsidence. Most dam surveys are performed under professional consultant service contracts. Land subsidence occurring at and in the vicinity of dams is monitored through use of an engineering tool developed from satellite imagery known as interferograms, which can detect small-scale vertical ground movements over very large areas. Monitoring for the development of new earth fissures is performed through instrumentation installed at identified earth fissure risk zones at dams. Emergency Action Plans are required for all dams and are updated periodically under consultant contracts.

(b) Structures Assessment and Repairs

The Structures Assessment component of the Dam Safety Program assesses and evaluates the physical condition of the District's 22 dams and related features to assure continued compliance with current regulations, and to implement short-term and interim-term measures for the safe operation and proper functioning of the dams required beyond normal operations and maintenance requirements. Phase I Assessments are completed and provide an overall evaluation of the dams pertaining to dam safety and flood protection. Under Phase II of Structures Assessment, site-specific dam safety issues and potential dam safety issues are investigated and repaired or corrected as needed. More extensive interim dam safety repairs are performed as required under CIP construction contracts.

(c) Dam Rehabilitation

Thirteen District dams are currently identified for overall rehabilitation or replacement due to issues of dam safety, urbanization and/or flood protection.

The Structures Assessment Branch Manager along with input from other District managers identifies the priority of dam safety components. The Structures Assessment Branch Manager also identifies opportunities for cost share funding with the Federal Government.

The recommendations are presented to the FCAB for endorsement.

2.2.1.5. Construction

The Construction Management branch of the District facilitates the construction of all District Projects. District construction Projects may last several months or span multiple years and range in costs. For District Projects, the District oversees and inspects the quality of work with its own Construction Manager.

(a) Three Phases of Construction process:

(i) Pre-Construction Phase

Involves processes through award of the contract and issuance of the notice-to-proceed.

(ii) Construction Phase

This phase involves several ongoing processes:

- Partnering Meetings: At the start of the construction phase and at monthly intervals thereafter, all the primary partners in the Project meet to discuss the details of the Project. This shall include the District Project Manager and Construction Manager, Contractor and Subcontractors, Design Consultant, county and city/town representatives.
- Progress Meetings: Each week the contractor provides the District and other partners with Project updates and future work schedules.
- Contract Administration: Documents are generated throughout the construction phase, including payments to the contractor, Project updates, change orders and RFI (Request for Information) forms from the contractor.
- Pay Estimates: Contractors and Consultants working on the Project are paid on a monthly basis until the Project is completed.
- Project Status Updates: The District provides internal tracking of each step of construction progress.
- Inspection: This important quality assurance inspection occurs periodically during the construction phase until the Project is completed.

(iii) Post-Construction Phase

Once construction is completed and the final inspection has occurred, the District ends its management of the Project with the following closeout actions:

- Project Document Close Out: The as-built document, which is the blueprint of the Project in its completed form, is printed and a copy archived at the District administrative office. All financial records are balanced and finalized. The District receives a Certificate of Performance (COP) from the contractor which certifies that the Contractor has completed its responsibilities.
- Hand Over of the Project to Owner: Often the District manages a construction Project that will ultimately be owned and operated by a city or municipality. In these instances, the District provides the owner with all of the necessary documentation, as-builts, manuals, and training to operate and manage the Project after completion.
- One-Year Warranty Enforcement: At the time the Project is completed and the COP received, the District performs a walk-through to inspect for defects or other problems per the one-year warranty on the Project. The contractor is responsible to make any necessary repairs. A second walk-through is performed at the end of the one-year warranty period and repairs are made by the contractor if necessary.
- Final Partnering and Lessons Learned Meeting: In this meeting, all the partners and stakeholders in the Project gather to review the good and bad aspects of the construction process. The discussion and analysis among the parties results in lessons learned, or ways to do things better, that can be applied to future Projects.

2.2.1.6. Operations and Maintenance

In 2011 the Flood Control District's Operations & Maintenance Division is responsible for ensuring the reliability, safety and structural efficiency of more than 80 flood control structures throughout the 9,226 square miles of Maricopa County. These structures include 22 dams, 45 acres of basins, 35 acres of mitigation, 41 miles of lined channels and 81 miles of unlined channels.

The approximately 50 operations & maintenance personnel are in charge of:

- structure maintenance
- illegal dumping and vandalism prevention/remediation
- vector control (mosquito abatement, bee removal and rodent treatment)
- special Projects (major maintenance such as structure rehabilitation)

District-maintained structures have regularly scheduled annual and quarterly inspections by both District personnel and state authorities.

2.3. Procurement Process

District engineering and construction service contracts are procured in accordance with A.R.S. Title 34, and Article 3 and 5 of the Maricopa County Procurement Code.

Methods of consultant service procurement include direct selection, register-based selection, and public competition, dependent upon contract award amount (as established by the A.R.S. Title 34 and the Maricopa County Procurement Code) and the District's needs. Contract work may be authorized by the contract itself, or by "on-call" work assignments subsidiary to the contract. Work under a given contract may be negotiated on a lump sum basis, or on a not-to-exceed, time-and-materials basis governed by a fee schedule. The methodology will be specified by the contract/work assignment terms and scope of work.

Methods of construction procurement, as defined by the A.R.S. Title 34 and the Maricopa County Procurement Code, include Limited Scope, Simplified, Design-Bid-Build, Design-Build, Job Order, and Construction Manager at Risk. The District most commonly utilizes Design-Bid-Build and Construction Manager at Risk methods.

Vendors seeking to perform engineering and construction services for the District are advised to post their information to the Maricopa County Article 5 Register:

http://www.mcdot.maricopa.gov/procurement/article5/RSIA5_apphome.asp

Article 5 of the Maricopa County Procurement Code defines the requirements and authorities for procurement and contract activities typically associated with planning design, construction, and associated professional services. Article 3 of the Maricopa County Procurement Code establishes procurement procedures for procurements that are not subject to Article 5.

2.3.1. Procurement Service

Typically, the District uses procurement services to contract with companies for the following two categories of services.

- **Professional Services** - These contracts are awarded as provided for in Article 5, and include, but are not limited to, architect, assayer, engineer, geologist, land architect, and landscape surveyor.

  These contracts are awarded based on merit qualifications including experience, qualification, number of personnel, specific approaches to difficult tasks, and capability of taking on the work. The qualifications and experience of new Consultants who do not have experience with District work will be reviewed equally with those having prior District and County experience.

- **Construction and nonprofessional services** – These contracts are awarded as provided for in Article 3 and Article 5.

2.4. Professional Services Procurement

The following is the general process for Professional Services, which is followed for the implementation of the Project:

2.4.1. Initial Scope of Work Development

First, the District's Project Manager coordinates within the District to identify the project needs. Then the District will coordinate and Project partners to discuss the project goals and objectives along with specific tasks to be completed under the project. Once the initial goals and objectives have been developed, the District's Project Manager will develop the initial draft SOW. This draft SOW is forwarded for reviewed and comment to the various District personal and project partners.

After the draft SOW has been revised to incorporate appropriate comments, the District develops a preliminary budget estimate for the Project.

2.4.2. Procurement Schedule

The District's Project Manager will coordinate with the Contracts Branch to develop a Procurement Schedule for the Project.

2.4.3. Evaluation Committee

The committee typically represents disciplines across the District with one member, if possible, from Maricopa County Department of Transportation.

2.4.4. Evaluation Process

2.4.4.1. Evaluation Criteria

The District's Project Manager will determine the criteria for the evaluation process within the parameters of Maricopa County Procurement Code. These evaluation criteria and the relative importance or weights of those criteria are within a broad discretion of the District's Project Manager.

2.4.4.2. Initial Evaluation Process

Upon receipt of the Consultant's submittals as required under the solicitation for the Project, the Selection Committee members will independently review and score the respondents' statements of qualifications and experience based on the published evaluation criteria.

Subsequently in a meeting, the Selection Committee will the rate all of the respondents. The Consultants receiving the highest rankings are chosen as the best qualified for the Project and continue to the interview phase.

2.4.4.3. Interviews

The short listed firms will be invited to participate in an evaluation interview. This interview will generally consist of 30 minutes for their presentation and 30 minutes for a question and answer period. The same basic questions will be used for each firm interviewed.

Upon completion of the interviews, the Consultant Selection Committee will meet and re-rate the Consultants. Then the Committee will forward a recommendation to the Chief Engineer and General Manager a ranking list of firms in order of their desirability for each contract. Based on the recommendation and information provided, the Chief Engineer and General Manager may approve the final selection of the firms who will proceed with scoping and negotiations.

2.4.5. Scoping Session

A scoping session will be arranged between the selected Consultant, key sub Consultants, District personnel, and appropriate municipalities. The purpose of the scoping session is to refine the draft SOW, the expected final product, and to discuss and resolve levels of effort.

2.4.6. Fee Negotiations

During the scoping process, the District's Project Manager will request fees based upon the refined SOW. This fee proposal will then be reviewed by the Project Manager and the Contracts Branch.

If fee negotiations cannot be successfully completed because agreement cannot be reached on the fee proposal, negotiations with that firm may be terminated upon written approval of the Chief Engineer and General Manager. The firm will be notified in writing that negotiations are terminated. Negotiations will then be opened with the next ranked firm, or the selection process will be repeated.

Upon completion of successful negotiations, the Contracts Specialist will proceed with finalizing the contract documents for the required approval authority.

2.4.7. Contract Award

Typically, contracts are awarded by the BOD and signed by the Chairman of the Board unless that authority has been clearly delegated and authorized to others by the Board. The Contracts Branch tracks and expedites the award process.

A letter explaining the District's intent to enter into a contractual agreement is issued to the successful firm with multiple sets of the contract for signature by an Officer of the firm.

Upon return of the executed (signed) contract by the Consultant, the contract will be routed for appropriate review and signature. This takes an average of 14 calendar days from start of routing from Contracts Branch to the Clerk of the Board (COB).

In unusual cases, where justifiable, routing as quickly as 7 calendar days may be possible. If expedited routing is required, contracts branch should be notified, and the Project Manager will be responsible for monitoring progress.

2.4.8. Notice to Proceed

After the BOD approves the contract, it takes approximately 5 – 10 days for the COB to return the signed documents. This executed Contract agreement is then sent to the Consultant or Contractor with the notice of award or notice to proceed. The Notice to Proceed/Award begins the performance period of the contract.

2.4.9. Work Assignments – On-Call Contracts

A professional services contract using multiple work assignments is called an on-call contract. The on-call contract identifies the general scope of work, the negotiated fee schedule, and an unauthorized lump sum amount. The District will authorize a portion of the unauthorized lump sum amount with the implementation of each work assignment. Thus, the work assignment is a critical process of the on-call contract.

Each work assignment is issued as a not-to-exceed amount with a written Notice to Proceed (NTP), scope of work, completion date and Project cost. The Project hours are negotiated during for each work assignment.

2.5. Steps for General Construction Procurement Services

Unless otherwise provided, typical District construction contracts are awarded by competitive sealed bidding as provided in Article 3.

2.5.1. Cost Estimate

The District's Project Manager provides an Engineer's Estimate of the proposed Project cost to the Contracts Branch. The Engineer's Estimate is considered a confidential document and may only be made public at the bid opening and thereafter filed in the official District procurement file.

2.5.2. Public Notice

The District will provide public notice if required and in accordance with A.R.S. and Article 3 of the Maricopa County Procurement Code.

2.5.3. Contract Review

The Contracts Branch reviews design packages to ensure construction/bid package bid-ability prior to issue of any solicitation.

2.5.4. Solicitation Package

The solicitation typically includes the following documents:

- Statement of Requirements of A.R.S. § 34-201
- Invitation For Bid

- Bid Proposal Form
- Bid Schedule
- Signature Page
- Subcontractor Listing
- Surety Bond Form
- No Collusion Affidavit
- Certification of License
- Contract Agreement
- Payment and Performance Bond Forms
- Indemnification Clause
- Certificate of Insurance Requirements
- Certificate of Performance
- Supplemental General Conditions
- Special Provisions
- Drawings

2.5.5. Pre-Bid Meeting and Site Tour

The pre-bid meeting will be scheduled and the agenda coordinated between the Contracts Branch and the Project Manager. Information at the pre-bid meeting will include technical requirements and procurement/contractual requirements.

The Contracts Branch routes an attendance roster during the meeting for all attendees to sign. The attendance roster will be posted on the Project Advertisement Web Page. The attendance roster would also be used in identifying the attendees of a mandatory pre-bid in relation to the bid opening.

Any presentation or documentation presented at the pre-bid meeting will be available for review on the Project Advertisement Web page of the Flood Control District web site. Additionally, any answers or information provided which clarifies or modifies the bid documents will be issued as an addendum.

2.5.6. Addenda

Clarifications or changes to the solicitation made in response to bidder question(s) will be transmitted to all plan holders by an addendum. The addendum will document all changes or revisions to the solicitation and will include the following information:

- Number of addendum, title and solicitation number of the Project,
- Indication of a revised or unchanged bid opening date, and
- Reminder that acknowledgment of receipt of the addendum on bids is required for a responsive bid.

An addendum will be issued within a reasonable time before bid opening to allow prospective bidders time in which to prepare their bids. If the Procurement Officer determines that the time and date set for bid opening does not permit sufficient time for bid preparation, the time and date for the bid opening will be extended in the addendum.

2.5.7. Bid Opening

Each bid shall be time-stamped upon receipt and stored unopened in a secure place until the time and date set for the bid opening. The bids will be publicly opened at the time, date, and location designated in the solicitation.

The official bid opening time is determined by the District Support Services Branch calibrated time clock.

2.5.8. Mistakes in Bids

A bidder may modify or withdraw its bid at any time before bid opening if the modification or withdrawal is received before the time and date set for bid opening and in the location designated in the solicitation.

After bid opening, a bid mistake based on an error in judgment may not be corrected. A bidder may be permitted to withdraw a bid without a penalty if a mistake is clearly evident on the face of the bid, but the intended correct bid is not similarly evident; or the bidder establishes by clear and convincing evidence that a mistake was made.

2.5.9. Single Bid

If only one bid is received in response to a solicitation, it shall not be publicly opened. It will be received sealed from the bidder, and they will be informed that the bid will be taken under advisement. The District may make a determination of whether to open and accept the bid. If it is determined to be in the best interest of the District to accept the bid, it will be opened. If it is determined that the bid will not be accepted, it will be returned unopened to the bidder with a letter indicating that the solicitation has been canceled.

If multiple bids are received, but only one bid is determined to be responsive, an award may be made if the price is determined to be fair and reasonable in comparison to the Engineer's Estimate.

2.5.10. Other Construction Procurement Types

There are other construction procurement methods which the District may use and include the following:

Design –Bid-Build Services

Sealed competitive bids will be used for construction contracts in the design-bid-build process. This method involves the solicitation of bids and the award of a contract to the responsible bidder submitting the lowest responsive bid.

Design-build service is a Project delivery method in which there is a single contract for design and construction services. Design and construction may be in sequential phase or concurrent phases. Finance services, maintenance services, operations service, design services, pre-construction services and other related service may be included.

Design-build construction services will be procured in accordance with the Article 5 Procedures Manual.

Limited Scope Construction

This procurement is limited to a yearly-adjusted value as per A.R.S..

The Maricopa County Procurement Code and the Article 5 Procedures Manual contain detailed procedures for completion of this type of procurement.

Simplified Construction

Procurement shall not exceed one hundred thousand dollars ($100,000.00).

The Maricopa County Procurement Code and the Article 5 Procedures Manual contain detailed procedures for completion of this type of procurement.

Job Order Contracting

This procurement is a qualification-based process that may include design services and is for "on-call" construction capability – Unknown quantities.

The Maricopa County Procurement Code and the Article 5 Procedures Manual contain detailed procedures for completion of this type of procurement.

Construction Manager at Risk

This procurement is a qualification-based selection method that will result in multiple contracts.

The Maricopa County Procurement Code and the Article 5 Procedures Manual contain detailed procedures for completion of this type of procurement.

2.6. Contract Change Orders

During the length of the contract, situations may change or unforeseen things develop where the contract needs to be changed in regards to tasks and/or time. If it is deemed necessary to change the contract, the Project Manager will prepare the Change Order and the justification review and approval.

Depending on the monetary change for the Change Order, various levels of signatures are required.

2.6.1. Contract Payment

The Consultant shall submit a copy of monthly invoices to the Finance Department and the District's Project Manager.

The District's Project Manager should review the invoice for completeness and amount of progress completed for the month using an earned value method.

The Finance Branch will prepare and route the warrant for approval. The Project Manager will be the first approval. The Project Manager will complete the stamped information on the warrant paperwork. This includes Project Control Number (PCN), Object Code, Low Org, Activity, Project Manager's approval initials, and date. The invoice then gets routed to the Project Manager's Branch Manager, CIP Branch Manager, Division Manager, Finance, and then the Contracts Branch.

The Contracts Branch will verify the following information prior to approval of any contract payment:

- Contract completion date or insurance expiration date has not passed
- Contract value has not been exceeded
- All changes have been authorized and issued according to District requirements
- SBE Participation Report included with payment request
- Calculation of quantities and unit prices is correct
- Retention and/or security-in-lieu of retention is correct

2.6.2. Retention

Retention is conducted only on construction Projects. Unless arrangements have been made for substitute security in lieu of retention, the District will retain 10% of each progress payment made to Contractors until the work is 50% complete. At that point, if work is satisfactory, retention is reduced to 5%. Retention is released upon final acceptance of the work and receipt of a Certificate of Performance.

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3.9. Scope of Work - Operations and Maintenance..... 3-99

3.2. Scope of Work - Project Administration

This section provides a general overview of the Project and contract terms, specifies the tasks required to coordinate, monitor, and maintain progress toward successful completion, and defines the delivery standards of Project work products.

3.2.1. General Information

District's Project Manager to provide this information & it will broadly describe the Project and its location.

3.2.2. Project Purpose and Description

District's Project Manager to Modify. This scope of work is for professional (specify discipline, e.g., engineering, architecture, surveying, etc., services as needed) services necessary for (put in main Project name and purpose in one sentence).

3.2.3. Project Goals and Objective

The District's Project Manager to Identify the goals and objectives of the Project and any details of the Project and include in this section.

3.2.4. Context Sensitive Flood Hazard Mitigation

For Planning, Design, Structures Assessment, and Construction Projects, the CSFHM approach shall be used as a framework for development of solutions that integrate the three basic functions of being acceptable to local communities, compatible with the environment and effective in reducing the risks of flooding. The level of effort associates with CSFHM will be Project dependent, and may not be applied to all Projects or Project types.

3.2.5. District Landscaping Policy

In accordance with District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects, the Consultant shall integrate, as appropriate, landscape architectural aspects throughout all phases of Project planning, design and implementation utilizing an interdisciplinary approach.

3.2.6. Location

The (Project - i.e. ADMP, design concept report, design) is located in the (general direction i.e. central, northwest,) portion of Maricopa County. See Figure 3.1 – Vicinity Map. The study area is generally bounded by (name road or feature) on the north, (name road or feature) on the east, (name road or feature) on the south, and (name road or feature) on the west. See Figure 3.2 – Project Area Map. The study area is approximately (number of square miles), which includes Unincorporated Maricopa County and portions of (local municipalities and/or neighboring counties if applicable). Portions of the study area are under federal and state ownership. (keep or delete sentence as needed).

3.2.6.1. General Area Description

(Provide a general description of the area including terrain, vegetation, communities, development, and major features such as rivers, roadways, and canals).

Figure 3.1 – Vicinity Map

Vicinity Map on this Page.

(Vicinity Map should be very basic including at a minimum: county boundary, north arrow, scale, major highways/freeways, and pointer to Project location.)

Figure 3.2 – Project Area Map

(Insert Project Area Map on this Page. Project Area Map should be more detailed depending on extent of the Project area and include at a minimum: Project boundary, north arrow, scale, major highways/freeways, jurisdiction boundaries, major roads, and watercourses.)

3.2.7. General Provisions

This section includes definitions, District and Project partner points-of-contact, time frame, District-provided data, Project evaluations, and optional tasks.

3.2.7.1. Points-of-Contact

The Consultant shall address all correspondence and coordinate directly with the following District and partner agency representatives who are to receive copies of Project reports and submittals and act as the primary point-of-contact:

District Project Manager:

Name
Flood Control District of Maricopa County
Email
Phone number

Other Project partners:

Name
Agency
Email
Phone number

3.2.7.2. Contract Period of Service

The Consultant shall complete the tasks defined in the Scope of Work within a Period of Service of (identify the number of days) calendar days from the Notice to Proceed, typically the date the contract is approved by the District's Board. The Period of Service includes review time for the District and other Agencies involved in the Project. A calendar date for Project completion date shall be determined from the date of the Notice to Proceed Period through the Period of Service in order to establish a clear deadline for completing the Project.

3.2.7.3. Project References

At the beginning of the Project, generally at the Project Kick Off Meeting, the District will provide the Consultant with the following data needed to initiate the Project:

List the references:

1. (Insert Reference)

3.2.7.4. Project Evaluation

The performance of the Project and its participants will be formally evaluated by the District and the Consultant at Project completion and may similarly be evaluated at interim Project milestones prior to completion.

(a) Evaluation Forms

The District shall complete one evaluation form Exhibit 4a - Evaluation form of Consultant by FCD and the Consultant shall complete one evaluation form Exhibit 4b - Evaluation Form of FCD by Consultant. Both parties sign these forms. The originals are given to the Contracts Branch and copies are given to the Consultant and the District's Project Manager.

(b) Use of Evaluations

Project evaluations may be used in guiding the selection of consultants for future Projects.

3.2.7.5. Authorized Contract Amount

The total authorized contract amount includes the lump sum fee for base tasks plus a not-to-exceed fee for the proposed cost of all optional tasks.

3.2.7.6. Optional Tasks

During negotiation and development of the final SOW for the Project between the Consultant and the District's Project Manager, work tasks are often added, deleted, or modified from the draft SOW. Some tasks may be identified as potentially necessary; however the actual need may remain uncertain until later on in the course of the Project. In such cases, an effective Project management tool is to specify a task as optional. This enables the contract to account for the cost of the optional task in the overall Project budget without obligating the District to execute a task that is later deemed unnecessary. This avoids the need for a change order to the Project scope and corresponding fee to later add or delete a task. Authorizing an optional task is accomplished by a letter from the District's Project manager to the Consultant's principal or signatory to the contract.

(a) Separation of Optional Tasks

Each optional task shall be clearly identified as such in the Scope-of-Work and listed separately as an optional task in the Consultant's fee proposal.

(b) Optional Tasks are not authorized by the Notice-to-Proceed

The description of each optional task shall be accompanied by statements to the effect that the contract Notice-to-Proceed does not authorize the Consultant to perform an optional task unless expressly authorized in writing by the District based upon specific need as determined by the District during the contract period; that the Consultant's Project schedule shall not include time for performance of optional tasks; and that all invoices shall separately identify costs for work performed under each authorized optional task.

(c) Request for Authorization of Optional Task

Once the District's Project manager, in due consideration of any recommendations by the Consultant, determines that performing an optional task is necessary to achieve the goals of the Project the Consultant shall prepare and submit a written request for

authorization to perform the optional task. The Consultant's written request shall include an explanation of the need for the task, the proposed level of effort and time required to accomplish the work, the proposed fee, and supportive cost information.

(d) Consistency with Scope-of-Work

The proposed work must be consistent with the nature of the task described in the original Scope-of-Work (e.g., land surveys, hydrology, floodplain delineation, alternatives analysis, etc.). Otherwise, a scope clarification (minor variation to the task description) must be part of the written authorization or a change order (significant variance from the original task) must be issued. If an optional task will not be used and a different scope-related item is substituted, a change order issued by the District must be completed to delete the optional task and add the alternate.

(e) Written Authorization

The District's written authorization shall specify the level of effort to be expended and the fee authorized for the particular optional task. The level of effort and fee may be less but not more that the amount quoted in the original fee proposal for the particular task. The written authorization shall include a summary of optional tasks and fees authorized and the total amount authorized to date under the contract, including the base lump-sum fee.

(f) Additional Time for Optional Tasks

The authorization may include an allowance for additional contract time if performance of the optional task does not allow the Consultant to complete all Project tasks within the period of service specified in the original contract or any subsequent change orders. In such a case, a change order must also be approved and issued to extend the period of service.

(g) Prior Authorization Required

Written authorization from the Project Manager will be required prior to initiating any optional task. Exhibit 5 - Optional Authorization Letter(s) show examples of the District's authorization letter for optional tasks.

(h) Encumbrance of Contract Budget

The total authorized contract amount, including all the optional tasks, is encumbered in the contract budget and cannot be transferred to any other contract or budget item. If an optional task will not be used in the course of the Project, a deduct change order must be issued by the District to remove those costs from the contract budget.

3.2.8. Schedule and Project Coordination

Effective Project management recognizes the importance of establishing a Project work plan. The Project work plan typically includes a schedule for executing phases of the Project and accomplishing individual tasks within the Project phases, coordinating between tasks and disciplines, tracking progress and comparing progress to the schedule, and adjusting the schedule and work plan as necessary to maintain progress toward completion within the contract period of service. Schedule and Project coordination are further recognized as legitimate Consultant budget items. This recognition serves to emphasize the critical role of Project management in overall Project success and avoids considering Project management as strictly part of the Consultant's overhead.

3.2.8.1. Schedule

As part of the Project Work Plan, the Consultant shall submit a schedule for the Project to the District's Project manager at the Kick Off Meeting, 3.2.10.1. 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 to the Schedule Template Exhibit 1 - Project Schedule.

(a) Schedule Tracking Format

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 program is preferred. The Consultant shall update this Project schedule when appropriate or when requested by the District's Project Manager.

(b) Cost Projections

A Projection of estimated Project costs expenditures consistent with the Project man-hours 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 3c - Invoice, Forecast. The cost Projection must be updated by the Consultant quarterly at minimum and following any significant schedule revision.

(c) Review Times

The Consultant shall allow for a minimum 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.

(d) Project Work Plan

The Consultant shall prepare a Work Plan that will include a process flow chart, Exhibit 2 - Project Flow Chart, and schedule that coordinate the timing of all work tasks and deliverables, Project requirements such as permits, and indicates responsibilities for preparation, review, and approval. The work plan will also include

dates of all proposed coordination meetings, dates of all required submittals for each of the scope tasks, significant Project milestones, and District review periods. The Work Plan will be submitted at the Project Kick Off Meeting.

3.2.8.2. Project Coordination

Accountability for Project coordination is achieved through the Consultant's delegation of responsibility for accomplishing all aspects of the Project to a single Project Manager. Responsibility for successful completion of the Project requires the Consultant's Project Manager have sufficient authority to direct and manage the work of the Consultant's Project team, to adjust staffing and scheduling of the Consultant's resources and to ensure Subconsultant's compliance with the terms of the overall contract. Tracking of Project progress is integral to documenting requests for payment for services rendered and to ensure a balance between actual progress and the amounts invoiced to the District. This also serves to identify variances between the level of effort expended by the Consultant and actual progress and to make the proper adjustments to the work flow as needed to maintain the Project schedule. Tracking and communicating progress is accomplished through preparing and maintaining progress reports, agendas, and minutes.

(a) Appointment of Project Manager

The Consultant shall appoint a Project Manager who shall be familiar with the various disciplines and level-of-effort required to accomplish the Project work, be knowledgeable of the progress and has 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.

(b) Point of Contact

The Consultant's Project Manager shall be the primary point of contact for the District.

(c) Replacement of Project Manager

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 Consultant may submit a request for a replacement Project Manager to the District for approval. If the Consultant is unable to provide an acceptable replacement Project Manager, the District reserves the right to terminate the contract.

(d) Coordination with Outside Agencies

The Consultant's Project Manager shall keep the District informed of all coordination with outside agencies and other affected parties.

(e) Invoice Projections

The Consultant will submit an estimate of the Projected monthly billings at the Kick-Off Meeting. The estimate shall include the amount of retention (if any) to be withheld quarterly. Thereafter, this estimate will be updated and submitted to the

District's Project Manager at least ten (10) days prior to the end of each quarter. This estimate will be based upon the percentage of work to be completed each month expressed as a percentage of the total contract amount and in dollars to be earned each month (earned value method).

(f) Progress Payments

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 Project name, contract number, and the District's Project Control Number (PCN). The basis for calculating progress payments varies with the type of contract or as specified in the contract, and is described in the following subsection:

Basis of Payments (Identify the type of contract and include only the appropriate paragraph(s).)

Lump Sum Contracts - Payments shall be based upon the amount of work accomplished per task to date. Payments due shall be computed as specified in the contract. Progress payments may be based on percent complete for each work task and subcontracted service identified in the contract fee proposal. The invoice shall show the percent completed for of each task multiplied by the budget amount for the task per the fee proposal. The invoice shall show the amount for all tasks included in the current invoice; the amounts previously billed; the amount due for the period; the amount remaining for each task; and the contract total. All direct expenses shall be itemized per the fee schedule and the total included as a separate line item. Alternatively, payments may be based on completion of contract milestones, typically delivery of a specified work product. In that case, a schedule of payments tied to specific deliverables shall be incorporated into the contract. Other components of the invoice, such as amounts previously billed, amount due for the period, the amount remaining, and the contract total shall be included as previously described. Optional tasks shall be broken out separately, as described below. (Exhibit 3 - Sample Invoice)

On-Call Contracts or Optional Tasks for Lump Sum Contracts – Payments shall be based upon the actual cost of the work completed to date. Costs for work under each work assignment or optional task shall be summarized separately. Invoices shall identify the contract number and the PCN for each work assignment. The billing format should follow the fee schedule format.

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.

(g) Submittal of Invoices

Invoices shall be submitted to the District's Financing Division, Attn: Accounts Payable for processing and payment. The invoice may be transmitted by mail or electronically as previously arranged. At the same time a (choose electronic and/or hard) copy of the invoice will be provided to the District's Project Manager, who will review and approve the payment request.

(h) Progress Reports

The Consultant shall submit a progress report with each invoice. The report shall summarize Project activities for the time period covered by the corresponding invoice. The report shall be brief, generally no more than two (2) typed pages. At a minimum, the monthly report shall contain the following:

A description of the significant work accomplished during the reporting month by task as identified in the contract fee proposal.

For contracts or work assignments greater than $200,000: The Consultant shall submit a table showing the actual monthly invoice amounts to date and original Project estimate cumulative monthly totals for the duration of the contract (Exhibit 3c - Invoice, Forecast). A graph showing the original monthly billing Projection and the actual monthly invoiced amounts to date will be included.

A brief description of the work to be accomplished in the following month by task.

A description of any problems encountered and actions to resolve the problems.

(i) Weekly Progress Report

The Consultant shall call the District's Project Manager weekly to provide a verbal progress report, unless directed otherwise by the District's Project Manager.

(j) Agendas

The Consultant shall prepare an agenda and provide the agenda to the District's Project manager in advance of all meetings.

(k) Minutes

The Consultant shall prepare meeting minutes and summaries of significant telephone conversations and provide copies of the minutes, summaries of significant telephone conversations, and copies of correspondence to the District's Project manager on a monthly basis. At the end of the Project copies of all minutes, conversation notes, and correspondence, shall be submitted in the Project Data Notebook.

(l) Monthly Budget Summary

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.

3.2.9. Deliverable Standards

The Scope-of-Work shall specify the interim and final work products to be formally delivered to the District. These include, but are not limited to: Reports, Documents, Figures, Exhibits, Tables, and Plans. The specified deliverables shall be submitted in a standard format and professional responsibility for the deliverables shall be acknowledged as specified in this sub-section. Deliverables produced for display at Public Meeting must meet the FCD PIO graphic standards.

3.2.9.1. Interim Deliverables

All interim items shall be sealed by a professional registered in the appropriate discipline with the State of Arizona. A signature is not necessary. Upon receipt of an interim submittal, the District will review the document and provide written comments to the Consultant. The Consultant shall address the comments and re-submit the interim deliverable to the District to verify the accurate incorporation or otherwise satisfactory resolution of all comments. If incomplete and/or incorrect incorporation of those comments is found, the original documents will be returned to the Consultant for correction and re-submittal. A comment resolution meeting may be held to achieve consensus.

3.2.9.2. Final Deliverables

All draft final and final deliverables shall be sealed, signed, and dated by the same professional registered in the appropriate discipline with the State of Arizona as submitted the interim deliverable. Upon receipt of draft final, the District will review the documents and provide written comments to the Consultant. The Consultant shall address the comments and submit a final deliverable to the District to verify accurate incorporation or otherwise satisfactory resolution of all comments. If the District's Project manager is satisfied with the results of the review and resolution of any comments on the interim deliverables, a draft final deliverables may not be necessary. If incomplete and/or incorrect incorporation of comments on the draft final deliverable is found, the original documents will be returned to the Consultant for correction and re-submittal. A comment resolution meeting may be held to achieve consensus on issues in question. Separately bound reports and appendices should be individually sealed, signed, and dated even if only required on the cover, title page, and table of contents of the main report that includes a listing of appendices.

(a) Electronic Copies

Electronic copies of reports, documents, figures, exhibits, and tables shall be submitted in both a pdf format and a version of Microstation, ARCInfo, Microsoft

Project, Microsoft Word and/or Microsoft Excel that is later than or equal to 2003 or other acceptable software format as determined by the District's Project Manager.

(b) Plans

Plans should be developed in a format as approved by the District's Project Manager and in accordance with the "CADD Drafting Standards".

(c) Electronic Data

The Project will be developed in either Geographical Information System (GIS), Hydrologic Information System (HIS), or Computer Aided Drafting & Design (CADD) format as specified in the Scope of Work or otherwise approved by the District. Topographical data may be required in both formats/coordinate systems.

(d) GIS/HIS Format

Electronic data delivered in GIS format shall use ARC/Info version 9.0 or greater. HIS data shall comply with the District's Data Delivery Specifications: The Hydrologic Information System (HIS) REV. 3.1, June 1, 1998 - Flood Control District of Maricopa County or more current edition.

(i) Hydrologic Information System (HIS) Quality Control (QC)

HIS data submittals will be subject to a quality control (QC) check by 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 will be delivered to the Consultant at the Kick-off 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.

(ii) Automated HIS QC Tool

A 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 submittal of HIS.

(iii) Review and Acceptance of HIS Submittals

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

(iv) CADD Format

Consultants shall follow the CADD standards and should deliver digital data in ASCII DXF format from either AutoCAD Version 13 or newer or MicroStation Version 7.01 or newer per the following specs book: "Data Delivery Specifications: Computer Aided Drafting & Design REV 1.0 January 2000" Flood Control District of Maricopa County, latest edition. The District's CADD drafting standards can be found at:

http://www.fcd.maricopa.gov/GIS/specs.aspx.

3.2.10. Meetings

Meetings will be held from time to time during the course of the Project to maintain adequate communication among the Project team, local officials, other agencies, and at particular milestones during the Project. There should be sufficient meetings to ensure continuity and progress toward successful Project completion. Planning of meetings should strive to include the appropriate individuals while avoiding unnecessary attendance when no valuable purpose is served. When appropriate, meetings such as monthly coordination meetings and milestone meetings can be combined.

3.2.10.1. Kick Off Meeting

The Consultant shall meet with the District within fourteen (14) days of the Notice to Proceed. The Consultant shall bring the key Project team members including the Project quality controller to the meeting to introduce them to the District staff who will be working on the Project.

At the Kick Off meeting the Consultant shall submit:

- Initial Project Schedule
- Monthly Estimation of the Projected Billings
- Project Work Plan

At the Kick Off meeting the District will provide available District data that may include hydrology reports and models, aerial topographic mapping, utility record drawings, GIS files, and other information and data as outlined in the Scope of Work.

3.2.10.2. Coordination Meetings

There shall be regular (monthly or more frequently as identified in the scope of work) coordination meetings. The Consultant's and District's Project Manager along with pertinent team members will attend. The Consultant is responsible for preparing agendas and taking and distributing minutes of all meetings. Whenever possible, coordination and milestone/deliverable review meetings will be combined. Coordination Meeting locations shall generally be at the District's Office, unless otherwise identified in the Project tasks.

3.2.10.3. Meetings with Officials

The Consultant and the District Project Manager shall meet with officials from the towns, cities, agencies, utility representatives, Project partners, and other interested parties as may be appropriate and as identified in the Project tasks. The purpose of such meetings is identified in the description of Project tasks in the scope of work. Project partner expectations and requirements for the Project will be identified and incorporated into the Project whenever possible. Meetings with the officials shall typically be held at their offices.

3.2.10.4. Meeting with Other Agencies

Meetings with other agencies and utilities will be held as required the Project tasks and shall generally be held at the agency's office. The District shall be invited to all such meetings. The District shall be copied on all meeting minutes.

3.2.10.5. Other Meetings

All other meetings are specified in the Project tasks and shall be held at locations convenient for the various attendees.

3.2.11. Site Visits

3.2.11.1. Kickoff Site Visits

The Consultant shall conduct a kick off site visit including all the Project team to provide the Project team members with an overview of the Project/watershed.

3.2.11.2. Other Site Visits

The Consultant shall conduct site visits as required by the specific work tasks included in the Scope of Work. These site visits shale be included and specifically identified in the Project schedule. These site visits are listed as follow:

List the Required Site visits.

3.3. Scope of Work - Survey, Photogrammetry, and Mapping

3.3.1. Project Description

District's Project Manager to develop and replace this section with…. - This subsection summarizes the essence of the Project in a few concise sentences. The following paragraphs identify the types of survey and mapping Projects or services, followed by example descriptions to be included in the scope of work for each type of Project or service (in developing a scope of work, delete explanatory paragraphs and irrelevant Project descriptions).

3.3.2. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in 3.2, Scope of Work - Project Administration.

3.3.3. Types of Required Surveys

3.3.3.1. Boundary surveys

Boundary surveys (add or Delete as necessary) The Consultant shall research and conduct a boundary survey of (name or location of area to surveyed) in order to establish the (legal boundary or right-of-way limits) for the (name of structure, property, or Project) in accordance with accepted standards of the practice of land surveying.

The Consultant shall set permanent monuments, as appropriate. (A description of the type of monument may be inserted here.)

The survey shall be documented on an exhibit drawing at a scale of (specify) utilizing the drafting standards described in (specify appropriate standard).

The boundary coordinates shall be referenced and tied to (GDACS, cadastral, township, range, and section; State Plan Coordinate System, ground or other coordinate system as required).

Following acceptance of the survey and exhibit by the District, the Consultant shall file a record-of-survey with the Maricopa County Recorder (or adjacent county, if the land is located in another county, e.g., Pinal County).

3.3.3.2. Control surveys

(add or delete as necessary)

The Consultant shall research, survey and establish control monuments for (name of Project or purpose, such as benchmarks) of a precision conforming to (class, order, or standard) for the purpose of (supporting the named mapping Project; construction Project; establishing long-term survey control).

The Consultant shall research and conduct precise leveling surveys of the (crest of dam or flood retarding structure; spillway, channel bottom, etc.) to identify changes in the land

surface (or identified structure) caused by subsidence or settlement (or erosion or deposition of sediment). The Consultant shall survey and establish monuments of a precision conforming to (class, order, or standard) and consisting of (describe the nature of the monument, such as steel bar with brass cap set in concrete or contained in a monument well).

3.3.3.3. Design surveys
(add or delete as necessary)

The Consultant shall research and survey existing constructed features for the purpose of matching the design of (name of Project) to the existing features at the following locations: (describe, list, and/or reference a drawing or table).

The Consultant shall establish control monuments and benchmarks and provide construction staking services for the (name of Project), located (briefly describe location, such as along and/or in between named street, existing drainage features, etc.) within (unincorporated Maricopa County, name of city or town, as appropriate).

3.3.3.4. As-built surveys
(add or delete as necessary)

The Consultant shall provide as-built or record drawing survey services for (name of Project), located (specify vicinity, name of city or town, as appropriate).

3.3.3.5. Mapping Projects
(add or delete as necessary)

The Project Area shall be mapped to a scale of 1" = 200' (or as identified) with a contour interval of two (2) feet (or as identified). The mapping shall be divided into individual tiles consisting of 6,000 feet x 6,000 feet (international feet) (or as identified) grid elements, referenced to the State Plane Coordinate System.

3.3.4. Project Requirements
(District's Project Manager to add or delete as necessary)

The Consultant shall perform all survey, photogrammetry, and mapping tasks needed to complete the Project, unless otherwise directed by specific tasks identified in this SOW, all to more stringent requirements of either this SOW or the Federal Emergency Management Agency (FEMA) document, Flood Insurance Study: Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003, or most recent revised document, hereinafter referenced as the FEMA Document.

3.3.5. Control and Geodetic Reference
Mapping or other type of survey Projects need to be referenced to the appropriate coordinate system. Most survey work for the District is tied to the Arizona State Plane Coordinate System.

However, some surveys, such as design and construction surveys, may be tied to "ground," i.e., local monuments such as section corners where direct measurements are made on an assumed plane coordinate system without conversion to a regional, state, or geodetic coordinate system. The description of the appropriate coordinate system is included in Section 3.3.3, Project Description.

Final design Projects require preparation of photogrammetric and survey deliverables in both "grid" (GIS coordinate) and "ground" coordinates. "Ground" coordinates are used for rights-of-way acquisition and construction plans. "Grid" coordinates are needed for preparation of Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) documentation when the final design Project results in modification of FEMA floodplains.

3.3.6. Mapping Methods

The Consultant shall perform Surveying, Photogrammetry, and Mapping (select all sections that apply) to obtain the data required to develop the topographic mapping and Digital Terrain Model (DTM). The Consultant may also use a hybrid approach combining LiDAR and photogrammetry to achieve the goals of the Project. A hybrid approach requires that the Consultant perform the additional tasks described in 4.12.3, Photogrammetry/LiDAR.

3.3.7. Supervisory Qualification Requirements

The Consultant shall have personnel meeting the requirements of 4.12.1.4, Supervisory Qualification Requirements.

3.3.8. Quality Control and Quality Assurance

Quality control and quality assurance shall be in conformance of 4.12.1.5, Quality Control and Quality Assurance.

3.3.9. Public Notification

The Consultant shall identify all property owners within the Project Area on whose lands entry may be required and notify them by mail and obtain any necessary Rights-of-Entry (ROE) for the Project Area. [Note: To reduce the number of notifications, the Consultant may be asked to identify where entry is needed, such as common areas within a subdivision, existing public rights-of-way, state lands or public lands. This avoids sending letters to potentially thousands of homeowners within subdivisions when entry on individual properties is not necessary.]

- **Right-of Entry Letter**: The District will furnish the Consultant with a draft notification letter and ROE form for the Consultant to finalize for prior approval by the District's Project Manager.
- **Assessor's Data:** The District will provide the Consultant with Maricopa County Assessor's data to develop the list of property owners. The Consultant shall review and modify the list to ensure that the current property owners are notified prior to entering the property.

- **Public Involvement Plan:** A Public Involvement Plan will not be required for mapping Projects.

- **Property Owners List:** The Consultant will develop a list of property owners within the Project Area. The District and Consultant may edit the mailing list to target specific properties where entry will be required and avoid sending notices to landowners upon whose property no entry will be required (e.g., individual residents of platted subdivisions).

- **Transmittal of Notice:** The Consultant shall notify by first-class mail property owners within the Project Area on whose property entry is potentially needed and request ROE for the Consultant and survey Subconsultant. The District will furnish the Consultant with twenty-four (24) laminated copies of the finalized notification letter. The Consultant shall furnish the District's Project Manager with a list of all property owners notified.

3.3.10. Project Survey Report

The Consultant shall submit a survey report in conformance of 4.12.2.11, Project Survey Report, unless specified otherwise within this SOW

3.3.11. OPTIONAL TASK: Edge Matching – Additional Effort

This Optional Task is not authorized with the Notice-to-Proceed and must be authorized in writing by the District based on specific need as determined by the District during the contract period. All invoices shall separately identify costs for work performed under this optional task. Performance of the additional effort for edge matching may include an extension of the contract time period. The Consultant's original schedule for the contract shall, therefore, not include a scheduled activity for the optional task.

3.3.11.1. OPTIONAL TASK – Monumentation of property corners modified by Project rights-of-way acquisition and subsequent filing of a Record of Survey.

3.4. Scope of Work - Floodplain Delineation Studies

3.4.1. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in 3.2, Scope of Work - Project Administration.

3.4.2. Advertising

- **Legal Advertising** - The District is responsible for placing the legal advertising at the beginning of the study, as well as notifying the public of the study as directed by the District. After the ad is published the District will supply the Consultant with the original affidavit of publication from each of the newspapers for each day that the ad ran.

- **Display Advertising** - The District is responsible for placing display advertising at the start of the study and at the study results stage. The advertisement should run in a local area newspaper twice with approximately two (2) weeks between runs.

- **Property Owner Notification** - The District shall notify by mail all property owners along the watercourses being studied at 1)the start of the study and 2) prior to the study results public meeting. If right-of-entry is required, the Consultant / District will obtain any necessary rights-of-entry for the study area. The list of all the property owners notified of the study and a sample letter shall be included as an appendix in the report. If right-of-entry is required, the list of property owners contacted and a sample right-of-entry letter shall be included as an appendix in the report.

3.4.3. Public Meetings

- **Local Community Officials Meeting** - The Consultant / District shall meet with officials from the local communities. 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.

- **Public Meetings** - Two (2) public meetings shall be planned and conducted in conjunction with a 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 and mailer notice for these meetings. Consultant / District shall respond to the public's comments and make revisions to the study if necessary.

3.4.4. Data Collection

3.4.4.1. Collect and Review Pertinent Data

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.

3.4.4.2. Results

The results of the data collection efforts will be included in the Technical Data Notebook (TDN). A preliminary draft of this section of the TDN is due within (specify, typically 90) days of the Notice to Proceed.

3.4.5. Photogrammetric Mapping and Control Surveying

3.4.5.1. Standards

All mapping shall follow the specifications as identified in 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

3.4.5.2. Location

Insert a map and description of areas that need to be mapped.

3.4.5.3. Surveying

(a) Standards

All surveying shall follow the specifications as identified in 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

(b) Field Survey of Structures

The Consultant shall provide field survey data for cross sections and additional hydraulic structures, including but not limited to bridges, culverts, and hydraulic structures, when As-Built plans are not available or where the District's 10-foot contour mapping or the USGS DEM data are not adequate. GDACS control will be the basis of field survey, unless otherwise approved by the District. There will be approximately (specify number) structures.

3.4.5.4. Survey Field Book

The Consultant shall include copies of the survey field books and office calculations in the TDN. An Arizona Registered Land Surveyor (RLS) must seal the survey notes. This information can be submitted separately if approval is obtained from the District's Project Manager.

3.4.5.5. Digital Data

The Consultant shall prepare digital data in either a CADD or GIS format in conformance with the District's Hydrologic Information System Data Delivery Specifications, Revision 3.1 (or CADD Data Delivery Specifications Rev. 1.0, January 2000 or latest version). The following themes are generally used for the data developed for Field Survey. However, for this study there may not be data for every theme identified here, or the Consultant might develop data for themes not listed here. Therefore, only those themes for which there are data need to be completed. If the Consultant has data that doesn't fit one of the themes listed here, the District's Project Manager shall be contacted to determine the appropriate theme for that data.

- CORNERS (if any)
- CTRL (Misc. Control Survey Pts.)
- FPCTLFCD (ERMs)
- STRCT (Structure)
- PRJ (Project Boundary)

3.4.5.6. Data Presentation

This information should be reduced and compiled into an 11"x 17" (maximum size) drawing format approved by the District, for inclusion in the TDN. The information presented in the drawing should be in a format appropriate for use in future HEC RAS models. It may be necessary to field survey some structures since the as-built plans may not be on the same datum as the study.

3.4.6. Hydrology

The Consultant shall perform complete and detailed hydrologic analysis and geologic analysis of the Project area in order to fulfill the specific requirements identified below.

The Consultant shall follow the procedures outlined in 4.6, Hydrology and the Drainage Design Manual for Maricopa County, Volume I Hydrology, latest revision, for all hydrologic modeling and calculations and General Requirements and Procedures.

3.4.6.1. Methodology

(a) Approximate Floodplain

There will be approximately (specify number) miles of Zone A as determined. An approximate methodology, appropriate for the delineation of the Zone A floodplains, shall be used for developing the hydrology. The methodology shall be proposed by the Consultant. Upon written approval of an acceptable methodology for the hydrology by the District, the development of the hydrology will begin.

(b) Detailed Floodplain

There will be approximately (specify number) miles of detailed floodplains determined. The Consultant shall use a detailed computer-based model, approved by the District, to develop the flows at significant inflow locations.

If the U.S. Army Corps of Engineers computer program HEC-1, Version 4.1 is used to develop the flows, the Consultant shall use the District's Drainage Design Management System for Windows (DDMSW), (latest version) to develop the hydrologic model for the area.

3.4.6.2. Frequency and Duration

The Consultant shall develop hydrology for the 100-year, 6-hour and 100-year, 24 hours frequency and durations.

After completing the initial hydrologic modeling a selection will be made between the 6-hour or 24-hour HEC-1 model which generates the higher peak flow for each storm event.

3.4.7. Hydrologic Tasks

The details of these tasks can be found in 4.5, Hydraulics.

3.4.7.1. Hydrology and Field Reconnaissance

The Consultant shall research and give consideration to all existing hydrologic studies of the area and shall become familiar with the general hydrology of the area. The Consultant shall conduct a field reconnaissance with pertinent District team member. The field reconnaissance shall be done to determine the following:

- Verify sub-basin delineation boundaries
- Verify flow patterns
- Determine the actual current land use for parcels

- Identify flow diversion locations caused by natural obstructions, drainage structures, etc.
- Obtain field cross sections at hydrologic flow split locations [may not be needed for 2-D modeling]

3.4.7.2. Base Map

The Consultant shall develop the Hydrologic base maps using the topographic mapping prepared by the Consultant or supplied by the District. For those areas not covered by the 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 an appropriate scale as approved by the District's Project Manager.

3.4.7.3. Review and Approval

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

- Watershed boundary maps, soil maps, and land use maps
- HEC-1 parameter estimation
- HEC-1 flow diagram and input parameters
- Regression equations and HEC-1 results
- All hydrology models and digital supporting data including GIS shape files shall be submitted to the District in digital and paper format for review and approval.
- Hydrology Report (This may not be necessary if a small area where the information can be included in the TDN.)
- The CONSULTANT shall prepare a separate bound Hydrology Report. Details for the report are found in 4.5, Hydraulics.

3.4.7.4. Technical Data Notebook

The findings of the hydrologic study will be presented in Section 4 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. Deviation from this hydrologic scope shall not be undertaken without the express written authorization from the District's Project Manager.

3.4.7.5. Digital Deliverables

The Consultant shall submit the digital data in either a CADD or GIS format that is prepared in conformance with the District's Hydrologic Information System Data Delivery Specifications, Revision 3.1 (or CADD Data Delivery Specification, Rev. 1.0, January 2000).

3.4.8. Hazard Identification and Floodplain Delineations

3.4.8.1. General Requirements

The Consultant will prepare the floodplain delineations using the guidelines established in FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, December 1993, and FEMA 265, Managing Floodplain Development in Approximate Zone A Areas, April 1995 (if doing Zone As.) and Arizona Department of Water Resources' State Standard for Floodplain Hydraulic Modeling (SS9-02).

Floodplain delineations must be accomplished using the U.S. Army Corps of Engineers' most recent version of the HEC-RAS computer model. Other modeling methodologies acceptable to FEMA shall be considered on a case by case basis, and will be specified in the Scope of Work.

The hydraulic models for each study area will need to include textual descriptions regarding the name of the study contractor and their location, District FCD contract number, District Project manager, study-related topographic mapping, and other items determined pertinent to obtain full study documentation.

The hydraulic modeling and delineation work maps shall be in the North American Vertical Datum of 1988 (NAVD 88). The delineations shall be based upon the final results of the hydrologic study as directed by the District.

The delineation work will also require review and acceptance by(….. Name the other jurisdictions.)

3.4.8.2. Hydraulics Field Reconnaissance

The Consultant shall conduct a field reconnaissance of the study area. This will include observation of channel and floodplain conditions for estimating Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank characteristics; observation of possible overflow areas; observation of levees or other flood control structures; and measurement of bridge dimensions.

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.

The field reconnaissance results will be incorporated in the TDN as Appendix E, and a draft copy will be submitted to the District for review and approval prior to beginning the HEC-RAS modeling. The field reconnaissance section will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The section 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.

Manning's 'n' evaluations shall be performed for all study watercourses to determine if the water surface elevations are sensitive to minor changes to "n" values. Results shall be documented in the Field Reconnaissance Report. Following completion of the initial HEC-RAS modeling, a sensitivity analysis will be conducted for all watercourses. If significant changes are noted, the Consultant and the District will determine the most appropriate "n" values to use in the delineation study.

3.4.8.3. Cross-Sections

The location and alignment of modeling cross-sections and channel centerlines will be submitted for the District's review and approval prior to digitizing the cross-section data. FEMA mapped cross-section locations and those digitized from work maps will be presented initially, where available. Where possible, the cross-section locations (cross-section digital file) from the effective floodplain delineation study will be used.

Identification of cross-sections will be in river miles, increasing upstream. 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 floodwaters. Cross-section IDs may change from the current FEMA IDs if the thalweg or river baseline has changed.

Cross-section stationing will be from left to right looking downstream with the thalweg as station 10,000.

Cross-section orientation may need to be altered after running the HEC-RAS model to ensure that they are perpendicular to the flow, per FEMA criteria.

Textual descriptions regarding cross-section locations with respect to physical features within each study area will be required within the Hydraulic model. These descriptions should also reference flow-splits and other hydrologically pertinent study results, including results from previous related studies.

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.

3.4.8.4. Hydraulic Computer Model

Floodplain delineations shall be accomplished using the U.S. Army Corps of Engineers' HEC-RAS, latest version computer model.

Evaluations will be made with the assumption that all embankments do not meet FEMA certification standards. Therefore delineation downstream of culverts will be made using the downstream concentration point discharge below any culvert. For situations where an

embankment may be found parallel to the flow direction there may be the need to evaluate the embankment "in place" and "not in place" for determining the worst case water surface elevation.

The Consultant is to make refinements to the HEC-RAS model based on review of the model results by the District, ADWR, FEMA, and the FEMA Flood Map Production Coordination Contractor. The Consultant shall also review the HEC-RAS model results for reasonableness. The use of FEMA's Check-RAS computer program will be part of the review process. Work normal to the scope shall include all adjustments to the input parameters required for obtaining the most realistic results.

Bridges and culverts must be modeled in compliance with HEC-RAS modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-RAS modeling results for bridges, culverts, and other hydraulic structures may need to be checked using an independent method as determined by the District to analyze these structures.

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 4.6, Hydrology), 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 area extent of the ponding, versus the creation of two independent ponds.

3.4.8.5. Delineation

The delineation study shall be based on the results of the hydrologic study as summarized in 3.4.6, Hydrology of this document, or existing hydrology data supplied by the District at the beginning of the Project.

The Consultant shall develop FEMA flood zones.

The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by the FEMA and the ADWR. The delineation work may also require review and acceptance by other cities, towns, or local agencies as identified in the contract Scope of Work.

3.4.8.6. Work Maps

The Consultant shall provide permanent work-study drawings.

Unless specified otherwise, 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.

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 contours, spot elevations, 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 Central Zone 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). The District will supply a template of map and drawing formats.

The final drawings shall be sealed by each qualified registrant according to the work performed. The work of each Subconsultant and/or Subcontractor shall be performed in accordance with this Scope of Work. The Consultant shall check all work prior to each submittal to the District. All drawings shall be initialed and dated by the person who performed the work and the checker.

3.4.8.7. Review and Approval

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

- Draft field reconnaissance section of the TDN and estimation of Manning's "n" values.
- Proposed location and alignment of the cross sections.
- Methodology used for the floodplain delineations.
- Floodplain (natural) delineation.
- Floodway delineation.
- Final hydraulics section of the TDN.

3.4.8.8. Technical Data Notebook

The Consultant shall prepare a Technical Data Notebook(s) (TDN) in accordance with the ADWR State Standards Attachment 1-97 (SSA1-97) to present the findings of the floodplain/floodway delineations.

TDN(s) will be separated into geographic or watershed based documents.

The format of the TDN(s) 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(s) for a FEMA submittal and review.

The TDN(s) shall include profile plots and complete printouts of the HEC-RAS and HEC-1 models.

The District will submit the TDN to FEMA and coordinate any comments.

3.4.8.9. FEMA Comments

The Consultant shall review FEMA comments. After review of FEMA comments with District staff, the Consultant shall prepare a response and revised submittal or addendum to TDN(s).

The Consultant shall provide response to District for re-submittal to FEMA.

3.5. Scope of Work – Planning Studies

3.5.1. Planning: Area Drainage Master Study

The Area Drainage Master Study (ADMS) shall identify where and what are the flooding hazards and the magnitude of the flooding hazard. The ADMS consists mainly of data collection including analyses of existing facilities, identification of past drainage and flooding problems, collection of existing flood photos, completion of existing conditions analyses, and identification of flood hazard limits.

The Consultant will identify drainage problems using the Flooding Inventory and Analysis (FIA) as specified in 3.5.1.5, Flooding Inventory and Analysis by evaluating the impacts in the watershed due to development, review the existing and future conditions hydrologic models, revising as necessary, perform hydraulic analyses, evaluate existing floodplain delineations and delineate additional floodplains, conduct sedimentation and geomorphic evaluations, and conduct survey work.

3.5.1.1. Project-Specific Tasks

The Consultant shall complete the following Project-specific tasks. (Choose all that apply and delete the rest). Detailed guidelines regarding methods for completing each of these tasks can be found in the Project SOW or elsewhere in these Consultant Guidelines.

- Project Administration
- Data Collection
- Hydrologic Analysis
- Hydraulic Analysis
- FEMA Floodplain and Floodway Delineation
- Field Survey(s)
- Sedimentation Engineering and Geomorphic Evaluation
- Public Involvement
- Flooding Inventory and Analysis
- Land and Resource Inventory and Analysis
- Community Inventory and Analysis
- Flood Warning/Flood Response Plan

3.5.1.2. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in 3.2, Scope of Work - Project Administration.

3.5.1.3. Data Collection, Inventory and Analysis

All data collection, inventory and analysis tasks shall be complete prior to subsequent tasks and the initiation of preliminary alternatives formulation.

3.5.1.4. Base Map

The Consultant shall prepare a base map of the study area with a maximum finished size of 36”x48” unless otherwise approved by the District. The Base Map shall be used as a basis for all analysis, including hydrology, and exhibits. The base map shall include a map

display area (data frame) containing the study area boundary and an area of land extending a about 1 mile beyond the perimeter of the study area boundary, a one (1) inch border, legend area, map title, study title, north arrow, map scale and other information and graphics specified in the District's Standardized Guidelines for Graphics and Printed Material unless otherwise approved by the District's Project Manager.

3.5.1.5. Flooding Inventory and Analysis

The Flooding Context Inventory includes an identification of flooding risk and exposure based upon inventory and interpretation of geomorphology and land use. In this assessment, the geomorphology is inventoried and analyzed to identity the presence of different flooding types within the Project area. The Consultant shall develop flooding risk ratings that shall be assigned to various areas of the Project based upon their identified flooding type(s). The Consultant shall obtain existing and future land use data and utilize it to assess and assign flood exposure ratings to various parts of the Project area. The relationship between the assessments of risk and exposure is then evaluated to derive an overall flood hazard rating for various parts of the study area. The flood hazard assessment is utilized to identify geographic areas of highest priority for flood hazard mitigation. Additionally, the flooding risk assessment serves as a tool for identifying the effectiveness of different possible solutions.

The Consultant shall collect and review pertinent data from the District, MCDOT, partner Towns and Cities, and other sources. Data to be collected and reviewed for the flooding inventory will include, but is not limited to, existing topographic mapping, utility quarter sections, as-built plans for existing structures, FEMA Flood Hazard Boundary Maps, FEMA-approved floodplain delineation studies, any Letters of Map Amendment and/or Revisions, drainage reports, site plans, future drainage improvement plans, land-use plans, development plans, and landfill closure plans.

The Consultant shall interview appropriate agencies or associations for information on drainage problems in the area. The Consultant shall also develop a comprehensive list of possible existing and proposed developments impacting the Project area.

The Consultant shall develop a comprehensive list of flooding and drainage problems impacting the Project area. This is an essential part of the Phase I task to document the need and necessity for the Project. The Consultant shall research and obtain historic flood data such as precipitation data, newspaper articles, and historic flooding photos, to help establish past flooding within the Project area. The Consultant shall provide a map, which indicates the location of flooding or problem areas identified by the flood data obtained.

The Consultant shall prepare an Existing Facilities Exhibit containing an inventory of all man-made or relevant drainage facilities within the Project area, including stock ponds. The inventory shall note the condition, size and/or capacity, level of protection, and ownership of these structures. These facilities shall become part of the base map for the

alternatives analysis. The Consultant shall make maximum use of these facilities, where feasible, as part of the alternative plans.

The Consultant shall research and become familiar with all existing hydrologic and hydraulic studies and models impacting the Project area.

Utilizing the assessment of flooding types, flood risk, land use, flood exposure and flood hazards developed, the Consultant shall document the FIA in the Data Collection Report.

3.5.1.6. Hydrologic Analysis

The Consultant shall perform a complete and detailed hydrologic analysis of the Project area as detailed in 4.6, Hydrology.

3.5.1.7. Data Collection Report

The Consultant shall compile the data in a Data Collection Report. The Data Collection Report will contain a description of information collected for this Project. Existing major natural washes and existing and planned man-made drainage facilities in the watershed should be shown on the Existing Facilities Exhibit to be submitted with the Data Collection Report. The Existing Facilities Exhibit will be prepared in AutoCAD format. The Consultant shall submit a draft of this report followed by a final report once all data collection tasks are complete.

The Data Collection Report should include the following as applicable:

- Executive Summary
- Project Description
- Scope of Project
- Data Collection Results
    - Current Conditions
    - Areas of Past and Potential Flooding
    - Existing and Future Development Plans
    - Current and Future Transportation Plans
    - Existing and Future Drainage Facilities
- Land
    - Parcel Ownership
    - Rights-of-Entry Requirements
- Existing Hydrology/Hydraulics/FLO-2D Models
    - Summary of Models/Conditions
    - Concerns
- Flooding Inventory and Analysis
- Major Utilities
- Existing Facilities Exhibit
- References/Figures

3.5.1.8. Floodplain Delineation

Consultant shall conduct floodplain delineations in accordance with 3.4, Scope of Work - Floodplain Delineation Studies.

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3.5.1.9. Flood Warning / Response Plan

District's Project Manager to develop details on how to conduct these required analyses.

3.5.1.10. Field Surveys

Consultant shall conduct surveys in accordance with 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

3.5.1.11. River Mechanics – Sedimentation Engineering and Geomorphic Evaluation

Consultant shall conduct River Mechanics in accordance with 4.10, River Mechanics.

3.5.1.12. Public and Stakeholder Involvement

(a) General

Public and Stakeholder involvement is a major key to the success of a Project. It is important to engage the public early in the process and include the stakeholders in the data collection phase and alternative formulation process at the appropriate time.

The District has prepared a separate set of guidelines for Consultants conducting public involvement and public information activities. A copy of these guidelines is available from the Public Information Office and should be used as a reference by the Consultant when preparing public information related materials. These guidelines cover:

- Materials Content Guidelines
- District Turnaround Times
- Design and Printing Guidelines
- Logo Guidelines
- Web Site Guidelines
- Methods of Delivery
- PowerPoint Presentations
- Deliverables
- Quality Control & Review
- District Public Information Office Staff.

The District and the Consultant will plan and conduct public involvement and information as required for a particular task and as identified in this Scope of Work, in accordance with the District Public Involvement and Information Guidelines.

(b) Public and Stakeholder Involvement plan

The Consultant shall provide a Public Involvement Plan in conjunction with the Stakeholder Involvement Plan (See 4.8, Public & Stakeholder Involvement) within (*specify time frame, typically two three weeks*) upon the NTP.

Agencies, private enterprises, or individuals who have an interest in the outcome of the Project will be considered stakeholders. The Plan will include a preliminary list of stakeholders for use in developing a stakeholder database, preliminary agendas for the initial stakeholder working group meeting, a preliminary stakeholder's matrix of opportunities and issues, and a preliminary stakeholder involvement schedule. After review by the District Project Manager, the Consultant will finalize the plan and keep it updated during the ADMS Phase.

(c) Stakeholder Involvement

The Consultant shall coordinate and participate in (insert #) of meetings Stakeholder working group meetings to exchange information, address opportunities and issues and ensure that stakeholder concerns and input are recorded for consideration as part of the alternatives formulation. The Consultant shall work with the District to determine when these meeting will be held in the ADMS schedule.

In addition to the working group meetings, the Consultant shall meet with stakeholders individually, as needed and as approved by the District, to ensure that site and stakeholder specific issues are recorded for consideration in the future preliminary alternatives analysis. The District's Project Manager shall be advised of meetings and given an opportunity to attend. The Consultant shall keep a written summary of all meetings and will include them as part of the Project record.

(d) Public Involvement

The Consultant shall conduct Public Involvement per 4.8, Public & Stakeholder Involvement.

(e) Project Web Site

The Consultant shall compose and provide information to the District and city/town/other jurisdiction for placement on their respective Web sites, including, but not limited to an overall Project description, the Project schedule, the current Project status, future Project activities, a Project area map, and exhibits from public meetings. The Consultant shall review the Web sites and recommend updates to the Web sites on a regular basis.

(f) Additional Public Outreach

At the direction of the District, the Consultant shall create and provide a media fact sheet and a press release regarding the start of the ADMS. The District shall contact local media (e.g. radio, newspaper) and arrange an informal meeting (e.g., brown bag lunch meeting) to present the Project and provide the media fact sheet and press release as approved by the District's Project Manager.

3.5.1.13. Site Visits

Site visits to the Project area are important throughout the Project. As often as possible combine tasks that are required during each field trip.

(a) Kick Off Site Visit

The Consultant shall conduct a kick off site visit including all the Project team to provide the Project team members with an overview of the watershed (see also 3.2.11, Site Visits).

(b) Additional Site Visits

The Consultant shall conduct (insert #) of site visits additional site visits. Below is a list of the identified site visits:

(District's Project Manager to create a list of the specific site visits.)

3.5.1.14. Meetings

(a) Meeting Summary and Minutes

The Consultant is responsible for the minutes of any meetings and shall include copies of minutes of meetings, telephone conversations, and correspondence to the District in the Project Administration Report.

(b) Specific Meetings

The Consultant shall participate in the following specific meetings, generally held at the District's office, during the ADMS:

- **Kick-Off Meeting** – As identified in 3.2.10.1, Kick Off Meeting.
- **Data Collection Report Review Meeting** – The Consultant shall meet with the District staff to review the overall Project status and to discuss the Data Collection Report review comments that will be provided to the Consultant at the meeting. The Consultant should be prepared to explain all information and any assumptions made up to this point. Any problems will be identified and discussed.
- **Lesson's Learned Meeting** – Upon completion of the Project, the Consultant shall facilitate a half (½) day workshop to review any SOW items, task items, Project assumptions, methodologies, Project issues, etc., that can provide insight to the Project Team for future Projects.
- **Monthly Project Review Meetings** – The Consultant shall meet monthly with the District's Project Manager and Project Team to review the overall Project status. The Consultant and Subconsultants shall be prepared to provide status updates and discuss any new or outstanding issues. Any problems shall be identified and discussed. The Consultant shall take notes of all regularly scheduled Project review meetings.

3.5.1.15. DELIVERABLES

All deliverable shall follow the standards as set forth in 3.2.9, Deliverable Standards in this SOW.

(a) Reports

The following documents or reports shall be developed as a result of ADMS work. These may or may not be under the same cover.

- Data Collection Report
- Project Administration Report
- Interim Development Guidelines
- ADMS Hydrology Report (in TDN format)
- ADMS Hydraulics Report (in TDN format)
- FEMA Floodplain Delineation Submittal and HIS Data
- Flood Warning/Flood Response Plan
- Project Survey Report
- Sedimentation Engineering and Geomorphic Evaluation Report
- Landscape Character Analysis Report
- Public and Stakeholder Involvement Plan

The Consultant shall submit four (4) paper copies, one (1) electronic copy in PDF format, and one (1) electronic copy in the original software format of each draft report, estimates, schedules or drawings to the District and one (1) paper copy and (1) electronic copy in PDF format for each final report, estimates, schedules or drawings to each participating agency.

3.5.2. Planning: Area Drainage Master Plan

The ADMP will refine the initial Project specific goals and objectives as developed under the ADMS. However, the primary purpose and goal of the ADMP shall answer the questions: Where/what is the flooding hazard and what is the magnitude of the flooding hazard?

Through the course of performing the preceding ADMS, it is anticipated that flooding hazards have been identified using the Flooding Inventory and Analysis (FIA). This study shall update or develop the FIA as appropriate. As part of the FIA, The Consultant shall analyze the impacts in the watershed due to development; review the existing and future conditions hydrologic models, revising as necessary; perform hydraulic analyses; evaluate existing floodplain delineations and delineate additional floodplains; conduct sedimentation and geomorphic evaluations; conduct survey work; and possibly produce interim development guidelines; and prepare a number of reports, as identified in Section 3.5.2.20, Deliverables.

The FIA data shall include but is not limited to items such as existing facilities, identification of past drainage and flooding problems, collection of existing flood photos, completion of existing conditions analyses, and identification of flood hazard limits. Drainage problems shall be identified by evaluating the impacts in the watershed due to development, review the existing and future conditions hydrologic models, revising as necessary, perform hydraulic analyses, evaluate existing floodplain delineations, delineate additional floodplains, and conduct sedimentation and geomorphic evaluations.

3.5.2.1. Project – Specific Tasks

Based on this Project SOW, the Consultant shall complete the following Project-specific tasks. (Choose all that apply and delete the rest) Detailed guidelines regarding methods for completing each of these tasks can be found in the Project SOW or elsewhere in these Consultant Guidelines.

- Data Collection
- Flooding Inventory and Analysis
- CSFHM
    - Land and Resource Inventory and Analysis
    - Community Inventory and Analysis
- Hydrologic Analysis
- Hydraulic Analysis
- FEMA Floodplain and Floodway Delineation
- Field Survey(s)
- Sedimentation Engineering and Geomorphic Evaluation
- Public Involvement
- Environmental and Cultural Resources
- Alternative Analysis
- Preliminary Alternatives
- Proposed Alternatives
- Preferred Alternative and Recommended Plan
- Flood Warning/Flood Response Plan

3.5.2.2. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in 3.2, Scope of Work - Project Administration.

3.5.2.3. Data Collection, Inventory and Analysis

All data collection, inventory and analysis tasks shall be complete prior to subsequent tasks and the initiation of preliminary alternatives formulation.

3.5.2.4. Base Map

The Consultant shall prepare a base map of the study area with a maximum finished size of 36”x48” unless otherwise approved by the District. The Base Map shall be used as a basis for all analysis, including hydrology, and exhibits. The base map shall include a map display area (data frame) containing the study area boundary and an area of land extending a about 1 mile beyond the perimeter of the study area boundary, a one (1) inch border, legend area, map title, study title, north arrow, map scale and other information and graphics specified in the District’s Standardized Guidelines for Graphics and Printed Material unless otherwise approved by the District’s Project Manager.

3.5.2.5. Flooding Context Inventory and Analysis

The Flooding Context Inventory includes an identification of flooding risk and exposure based upon inventory and interpretation of geomorphology and land use. In this assessment, the geomorphology is inventoried and analyzed to identity the presence of

different flooding types within the Project area. The Consultant shall develop flooding risk ratings that shall be assigned to various areas of the Project based upon their identified flooding type(s). The Consultant shall obtain existing and future land use data and utilize it to assess and assign flood exposure ratings to various parts of the Project area. The relationship between the assessments of risk and exposure is then evaluated to derive an overall flood hazard rating for various parts of the study area. The flood hazard assessment is utilized to identify geographic areas of highest priority for flood hazard mitigation. Additionally, the flooding risk assessment serves as a tool for identifying the effectiveness of different possible solutions.

The Consultant shall collect and review pertinent data from the District, MCDOT, partner Towns and Cities, and other sources. Data to be collected and reviewed for the flooding inventory will include, but is not limited to, existing topographic mapping, utility quarter sections, as-built plans for existing structures, FEMA Flood Hazard Boundary Maps, FEMA-approved floodplain delineation studies, any Letters of Map Amendment and/or Revisions, drainage reports, site plans, future drainage improvement plans, land-use plans, development plans, and landfill closure plans.

The Consultant shall interview appropriate agencies or associations for information on drainage problems in the area. The Consultant shall also develop a comprehensive list of possible existing and proposed developments impacting the Project area.

The Consultant shall develop a comprehensive list of flooding and drainage problems impacting the Project area. This is an essential part of the Phase I task to document the need and necessity of the Project. The Consultant shall research and obtain historic flood data such as precipitation data, newspaper articles, and historic flooding photos, to help establish past flooding within the Project area. The Consultant shall provide a map, which indicates the location of flooding or problem areas identified by the flood data obtained.

The Consultant shall prepare an Existing Facilities Exhibit containing an inventory of all man-made or relevant drainage facilities within the Project area, including stock ponds. The inventory shall note the condition, size and/or capacity, level of protection, and ownership of these structures. These facilities shall become part of the base map for the alternatives analysis. The Consultant shall make maximum use of these facilities, where feasible, as part of the alternative plans.

The Consultant shall research and become familiar with all existing hydrologic and hydraulic studies and models impacting the Project area.

Utilizing the assessment of flooding types, flood risk, land use, flood exposure and flood hazards developed shall document the FIA in the Data Collection Report.

3.5.2.6. Context Sensitive Flood Hazard Mitigation

(Delete the Following section if CSFHM is not part of the Project goal/objective as part of the ADMP).

CSFHM approach may be used as a framework for development of solutions that integrate the three basic functions of being acceptable to local communities, compatible with the environment and effective in reducing the risks of flooding. The level of effort associates with CSFHM will be Project dependent, and may not be applied to all Projects or Project types.

(a) Land and Resource Context Inventory

(Delete the Following section if CSFHM is not part of the Project goal/objective as part of the ADMP).

The Land and Resource Context inventory includes the identification of flood hazard mitigation strategies, structural types, and structural methods for specific areas in the ADMP.

The Consultant shall conduct a Land and Resource Context inventory and analysis following the details of how to conduct this analysis and develop the compatibility maps found in the District's Landscape Architecture Consultant Handbook.

The Land and Resources Inventory and Analysis (LIA) data will include such items as biological and cultural resources, scenery resources, and recreational plans.

(b) Community Context Inventory

(Delete the Following section if CSFHM is not part of the Project goal/objective as part of the ADMP)

The Community Context inventory and analysis provides a predictive analysis of the range of flood hazard mitigation solutions to the local community, utilizing direction contained the local community general plans, plan elements and the land management direction contained in the other agency land management plans situated within the Project study area.

The Consultant shall conduct a Community Context inventory and analysis following the details of how to conduct this analysis and develop the compatibility maps.

3.5.2.7. Environmental and Cultural Resources

The Consultant shall conduct an environmental and Cultural inventory and analysis in accordance with 4.2.3, Biological Resources – Planning Studies.

3.5.2.8. Evaluation Criteria

The Project Team and stakeholders will develop the evaluation criteria that all evaluations during the Project will be based on. Socioeconomic, physical and natural environmental, flood safety, and cultural and visual resource impacts are to be included, as applicable, in the evaluation criteria

3.5.2.9. Data Collection Report

The Consultant shall compile the data in a Data Collection Report. The Data Collection Report will contain a description of information collected for this Project. Existing major natural washes and existing and planned man-made drainage facilities in the watershed should be shown on the Existing Facilities Exhibit to be submitted with the Data Collection Report. The Existing Facilities Exhibit will be prepared in AutoCAD format. The Consultant shall submit a draft of this report (generally within 120 days of the NTP) followed by a final report once all data collection tasks are complete.

The Data Collection Report should include the following as applicable:

- Executive Summary
- Project Description
- Scope of Project
- Data Collection Results
- Current Conditions
- Areas of Past and Potential Flooding
- Existing and Future Development Plans
- Current and Future Transportation Plans
- Existing and Future Drainage Facilities
- Flooding Context Inventory Analysis
- Land and Resource Context Inventory Analysis
- Community Context Inventory Analysis
- Environmental and Cultural Resources Overview
- Evaluation Criteria
- Land
- Parcel Ownership
- Rights-of-Entry Requirements
- Existing Hydrology/Hydraulics/FLO-2D Models
- Summary of Models/Conditions
- Concerns
- Major Utilities
- Existing Facilities Exhibit
- Reference & Figures

3.5.2.10. Hydrology Analysis

The Consultant shall perform a complete and detailed hydrologic analysis, as described in 4.6, Hydrology, of the Project area to the level of detail for each step of the analysis.

All hydrologic analysis will be conducted for the following storms using the NOAA 14 rainfall depths. Include any other storms or delete those not needed.

- 100-yr, 24-hr event
- 100-yr, 6-hr event
- 10-yr, 24-hr event
- 10-yr, 6-hr event

3.5.2.11. Hydraulic Analysis

The Consultant shall perform a complete and detailed hydraulic analysis of the Project area to the level of detail for each step of the analysis as described in 4.5, Hydraulics.

3.5.2.12. Floodplain Delineation

Consultant shall conduct surveys in accordance with 3.4, Scope of Work - Floodplain Delineation Studies.

3.5.2.13. Field Survey

Consultant shall conduct surveys in accordance with 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

3.5.2.14. River Mechanics – Sedimentation Engineering and Geomorphic Evaluation

Consultant shall conduct surveys in accordance with 4.10, River Mechanics.

3.5.2.15. Public and Stakeholder Involvement

(a) General

The Public Information Office of the District has prepared a separate set of guidelines for Consultant conducting public involvement and public information activities for the District. A copy of these guidelines is available from the Public Information Office and should be used as a reference by the Consultant when preparing public information related materials.

It is the intention of the guidelines to increase quality, efficiency, and consistency in public involvement work and products at the District. These guidelines should assist in creating a consistent message for uniform and quality materials.

These guidelines cover:

- Materials Content Guidelines
- District Turnaround Times
- Design and Printing Guidelines
- Logo Guidelines
- Web Site Guidelines
- Methods of Delivery
- PowerPoint Presentations
- Deliverables
- Quality Control & Review
- District Public Information Office Staff

The District and the Consultant will plan and conduct public involvement and information as required for a particular task and as identified in this Scope of Work and in accordance with the District's Public Involvement and Information Guidelines.

(b) Public and Stakeholder Involvement plan

The Consultant shall provide a Public Involvement Plan in conjunction with the Stakeholder Involvement Plan within (specify time typically two three weeks) upon the NTP.

Agencies, private enterprises, or individuals who have an interest in the outcome of the Project will be considered stakeholders. The Plan will include a preliminary list of stakeholders for use in developing a stakeholder database, preliminary agendas for the initial stakeholder working group meeting, a preliminary stakeholder's matrix of opportunities and issues, and a preliminary stakeholder involvement schedule. After review by the District Project Manager, the Consultant will finalize the plan and keep it updated during the ADMP Phase.

(c) Stakeholder Involvement

The Consultant shall coordinate and participate in (insert #) of meetings Stakeholder working group meetings to exchange information, address opportunities and issues and ensure that stakeholder concerns and input are recorded for consideration as part of the alternatives formulation. The Consultant shall work with the District to determine when these meeting will be held in the ADMS schedule.

The Consultant shall prepare a stakeholder working group notebook, which will be distributed at the first meeting for participants use. Meeting summaries shall subsequently be prepared and distributed, as well as a stakeholder opportunities/issues matrix. These will be developed and maintained throughout the Project by the Consultant. The matrix/database will be utilized in the future for the alternatives formulation/evaluation/recommendation.

In addition to the working group meetings, the Consultant shall meet with stakeholders individually, as needed, to ensure that site and stakeholder specific issues are recorded for consideration in the future preliminary alternatives analysis. The District's Project Manager shall be advised of meetings and given an opportunity to attend. The Consultant shall keep a written summary of all meetings and will include them as part of the Project record.

(d) Public Involvement

The Consultant shall conduct Public Involvement per 4.8, Public & Stakeholder Involvement.

3.5.2.16. Meetings

(a) Meeting Summary and Minutes

The Consultant is responsible for the minutes of any meetings and shall include copies of minutes of meetings, telephone conversations, and correspondence to the District in the Project Administration Report.

(b) Specific Meetings

Add specific meetings not identified in 3.2.10, Meetings, such as but not limited to the following:

- **Data Collection Report Review Meeting** – The Consultant shall meet with the District staff to review the overall Project status and to discuss the Data Collection Report review comments that will be provided to the Consultant at the meeting. The Consultant should be prepared to explain all information and any assumptions made up to this point. Any problems will be identified and discussed.
- **Progress Evaluation Meeting** – The District shall facilitate an all-day meeting with the Consultant and other stakeholders to discuss flooding problems, identified alternatives, and to review the impacts of Phase I findings on the anticipated work plan for Phase II.
- **Lesson's Learned Meeting** – Upon completion of the Project, the Consultant shall facilitate a half (½) day workshop to review any SOW items, task items, Project assumptions, methodologies, Project issues, etc., that can provide insight to the Project Team for future Projects.
- **Monthly Project Review Meetings** – The Consultant shall meet monthly with the District's Project Manager and Project Team to review the overall Project status. The Consultant and Subconsultants shall be prepared to provide status updates and discuss any new or outstanding issues. Any problems shall be identified and discussed. The Consultant shall take notes of all regularly scheduled Project review meetings.

3.5.2.17. Alternates Development and Analysis

Once the flooding problem has been identified and quantified, this step in the alternatives process will focus on identifying the best solution based on a set of criteria that was developed by the team and stakeholders.

(a) Preliminary Alternative Formulation and Analysis

The Preliminary Alternatives Formulation and Analysis shall be conducted using information provided by the data collection effort and the Project-specific tasks. This preliminary analysis will be conducted to insure the feasibility of each alternative.

The focus of this feasibility level evaluation is to determine if a suitable Project alternative exists to alleviate or manage flooding.

The Consultant shall prepare an existing constraints and opportunities map for presentation at a Preliminary Alternatives Formulation and Analysis Meeting. The presentation shall identify existing flooding problem areas, other Projects, and the results of the data collection effort and Project-specific tasks to include the environmental, cultural, Scenery Resource and Multi-Use Assessment. This presentation shall ensure all Project Team members are aware of all existing information and issues in the area. The Consultant will then provide five (5) seed ideas for potential solutions and consideration for the entire study area as part of the brainstorming session.

The Team will review the criteria that was developed during the Data Collection and use the criteria to rate all preliminary alternatives.

(b) Preliminary Alternatives Brainstorming meeting

This meeting will use the brainstorming technique to develop alternative plans and evaluate them against the criteria to determine which alternative plans will move on for further development.

The attendees of the Preliminary Alternatives Brainstorming meeting shall include all team members and stakeholders.

The attendees shall develop as many seed ideas as possible.

The attendees shall use the criteria to develop preliminary alternative plans from the seed ideas.

The results of the chosen preliminary alternative plans shall be no more than twenty (20) alternatives to be considered.

Preliminary alternatives shall be developed and shall address both structural and non-structural alternatives. As a minimum, the following alternatives shall be developed:

- "No Action" alternative
- Alternative with least impacts to the environment
- Environmental enhancement alternative
- Cultural enhancement alternative
- Most context sensitive alternative
- Least cost alternative

The Consultant shall document each preliminary alternative with a schematic drawing (if appropriate) and narrative description. The Consultant shall further identify the

strength, weakness, estimated costs, opportunities and constraints of each preliminary alternative.

(c) Preliminary Alternatives Analysis

The Consultant shall develop the preliminary alternatives to a concept level to include location, size, and costs, or any other criteria developed by the team.

(d) Interim Development Guidelines

The Consultant shall produce Interim Development Guidelines. The Consultant shall look at possible construction requirements that could be implemented for structures and roads. These requirements shall include, but not be limited to, finished floor elevations, setbacks from washes, construction of walls and road alignments. The Guidelines should provide details of what can and cannot be constructed, ways to alleviate the impacts of construction on the watershed, and how to protect structures from flooding and erosion.

These Interim Development Guidelines will be used by the Regulatory Division of the District to manage development, which includes subdivisions and individual lots, in the ADMP area. The Consultant shall produce the guidelines in a document format that the District will be able to provide to developers or landowners as a guide to construction on their property. The Consultant shall develop possible methods to implement the Guidelines within the County.

(e) Preliminary Alternatives Evaluation meeting

The team and stakeholders will meet to review the Preliminary Alternatives plans and evaluate the plans that will move forward to the Proposed Alternatives level.

Approximately three (3) alternative plans plus the No Action plan will move forward to the next level.

The Consultant shall document the results and include in the Preliminary Alternatives Report.

(f) Proposed Alternatives Analysis and Evaluation

During this Level the Alternatives will be developed to a level with more detail than the Level 1. The plans shall include size, general grade, any potential utility conflicts, and costs.

(g) Conceptual Designs

The Consultant shall develop conceptual designs for each Proposed Alternative. The Project features shall be limited to typical sizes and dimensions and shall be sufficient to determine the costs of major Project components. Project features will provide a level of protection as described in the Project SOW. For areas where no retention is planned as part of the alternatives, future condition hydrology may be used as a

basis for design. Capital cost estimates shall include design, major construction items, ROW, major utility relocations, and aesthetic improvements

The Consultant shall identify major existing utilities for any proposed structural or engineered alternatives. Utilities shall be identified within the Project construction limits that may impact the Project. The alignment of the utilities shall be shown on the alternative sketches and in the conceptual design plans. 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 utility facilities. Record drawings shall be obtained to ascertain all underground utility locations.

The Consultant shall formulate conceptual designs that are environmentally friendly and blend with the natural landscape of the area. The Consultant shall follow the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects, dated December 16, 1992, and revised 2001.

The Consultant shall develop possible methods of implementing the alternatives. These methods shall be documented and submitted to the District.

The Consultant shall review the Interim Development Guidelines and evaluate them as an alternative. These Guidelines may be revised to reflect any new information that is produced during the Phase II analysis. The Consultant shall develop possible methods to implement the Guidelines within the County.

The Consultant shall prepare a Proposed Alternatives Analysis Summary presenting the Proposed Alternatives and evaluation criteria to be reviewed by the Project Team and used to evaluate the proposed alternatives at a comparative level of detail.

(h) Review Evaluation Criteria

The Team shall review the evaluation criteria with input from the participating agencies as proposed during the Preliminary Alternatives analysis. The Consultant shall prepare a matrix by which the alternatives can be evaluated.

(i) Proposed Alternatives Evaluation Meeting

A Proposed Alternatives Evaluation Meeting will be held to evaluate the proposed alternatives. The results of this meeting will be a Preferred Alternative that will be presented to decision makers and will then be Value Analyzed.

The same attendees to the Preliminary Alternatives Evaluation meeting shall be invited to this meeting.

The Team and stakeholders shall evaluate each proposed alternative based on the criteria previously developed.

The Consultant shall assemble the evaluations and identify the proposed alternatives receiving the highest composite score based on the scores assigned by the reviewers. The Recommended Alternative may be comprised of multiple features, providing a collective solution.

(j) Proposed Alternatives Analysis Report

A Proposed Alternatives Analysis Report shall be prepared containing narrative descriptions of the Proposed Alternatives considered and discarded, the results of the alternatives analysis, cost estimates, and the recommended plan. The advantages and disadvantages of each alternative shall be identified, considering construction cost, logistics, ROW issues, public preferences, environmental impacts, Project objectives, and reliability and life of the Project. The Recommended Alternative shall be identified in the Report. For the alternatives that are not recommended, the Consultant shall document the reasons the Recommended Alternative was preferred or selected in lieu of the other proposed alternatives. The Report shall be submitted in draft form for review by the District and the Project participants. Upon receipt of review comments, the Consultant shall incorporate appropriate revisions and incorporate the Proposed Alternatives Analysis Report into the ADMP Report. The Proposed Alternatives Analysis Report format should include the following as applicable:

- Executive Summary
- Description of Project Area
- Scope of Project
- Environmental Overview
- Ecological Assessment Summary
- Hazardous Materials Overview
- Cultural Resources Assessment
- Landscape Character Analysis
- Multiple-Use Opportunities Assessment
- Alternatives Descriptions (including sketches as necessary)
- Alternatives Eliminated
- Cost Estimates
- Evaluation Criteria/Matrix
- Evaluation of Alternatives
- References/Figures

(k) Technical Data Notebook

A TDN shall be prepared by the Consultant in accordance with ADWR State Standards Attachment 1-97 (SSA1-97) to present the technical findings of the Proposed Alternatives Analysis. Only pertinent sections of SSA1-97 will apply. The TDN contains documentation of any designs, analysis and calculations. The TDN should include the following as applicable:

- Executive Summary

- Description of Project Area
- Scope of Project
- Data Collection Results
- Environmental Overview
    - Ecological Assessment Summary
    - Hazardous Materials Overview
    - Cultural Resources Assessment
- Landscape Character Analysis
- Multiple-Use Opportunities Assessment
- Land
    - Parcel Ownership
    - Rights-of-Entry Requirements
    - Right-of-Way Requirements
- Hydrology/Hydraulics Models
    - Current Conditions
    - Areas of Past and Potential Flooding
    - Existing and Future Development Plans
    - Existing and Future Drainage Facilities
    - Summary of Models/Conditions
    - Concerns
- Major Utilities and Utilities Conflicts
- Existing Facilities Exhibit
- References/Figures

(l) Value Analysis

The Preferred Alternative will be analyzed based on various criteria to produce a Recommended Plan that will move forward in to concept plan development. See 4.13, Value Analysis / Value Engineering for details.

The Consultant shall provide all the necessary planning and design documents, copies of reports and visual displays for use by the Value Analysis Team to evaluate potential cost saving measures and value improvements for the Project. The VA Session may be from three (3) to four (4) days in length depending on the complexity of the Project.

The Consultant shall provide a certified (C.V.S.) professional VA Team Leader and independent expert team members. The Consultant shall submit the proposed VE Team for approval by the District. The VA Team Leader shall prepare a VA Report of the Session for distribution and inclusion in the final ADMP Report.

(m) Recommended Plan

The Consultant shall prepare Conceptual Design Plans and profiles which will identify the approximate sizes, slopes, profiles, alignments, cross-sections and plan and profile for proposed channels, culverts, basins and/or other features. These plans

shall be integrated with the Scenery Resource and Multi-Use Assessment recommendations for the recommended Alternative.

The Consultant shall show major existing utilities impacting the Recommended Alternative on the Conceptual Design Plans. 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 identify permanent and temporary ROW and easement requirements necessary for the Recommended Alternatives. The Consultant shall also identify the land acquisition requirements for implementing the recreation multi-use features of the Project components in the Recommended Plan.

The Consultant shall provide a final cost estimate for Recommended Alternative. Additionally the estimate shall clearly identify the costs for the recreation multi-use and aesthetic features of the Project components in the Recommended Plan, utilizing the Revised Cost Ceiling Tables for Landscaping and Project Aesthetic Features, FCDMC, 4/26/01.

The Consultant shall develop recommendations to minimize the environmental impacts for the Recommended Alternative. The Consultant shall assess the potential effects of the Recommended Alternative in terms of the ecological resources, cultural resources, hazardous materials assessment, and social environment and recommend mitigation measures to reduce the level of impact.

The Consultant shall provide hydrologic and hydraulic models that incorporate the effects of the Recommended Alternative as described in the Project-specific Hydrology and Hydraulics tasks.

The Consultant shall assess the area benefited for each identified Project feature of the Recommended Alternative. The assessment should include the area benefited by the feature, a description of the types of existing and future developments that would benefit from the Recommended Alternative, and/or other information that will typify the benefited area.

3.5.2.18. ADMP Report

The ADMP Report will focus on the Recommended Alternative. The Report will include recommendations to regulators which will detail recommended regulatory methods to circumvent localized flooding. The recommendations and guidelines will be developed using hydrologic, hydraulic, environmental, and landscape analyses and will include consideration for preserving landscape character and habitat and recreation opportunities.

The draft ADMP Report shall be submitted for review by the District and other Project participants. Upon receipt of review comments, the Consultant shall incorporate

appropriate revisions and complete the final ADMP Report. The Report should include the following as applicable:

- Executive Summary
- Description of Project Area
- Scope of Project
- Evaluation Criteria
- Selection of Recommended Alternative
- Recommendations to Regulators
- Environmental Impacts
- Landscape and Multiple-Use Themes
- Landscape and Multiple-Use Planning & Design Guidelines
- Cost Estimates
- Priority of Features
- Implementation Plan
- References/Figures
- Disk Copies of applicable hydrologic and hydraulic models
- Conceptual Design Plans (if applicable):
- Indicate existing topography
- Indicate conveyance criteria; approximate size and configuration, invert,
- Typical cross-section
- Indicate conflicting utilities

The Consultant shall submit one copy of the draft ADMP Report to each of the participating agencies for review and comment.

The Consultant shall prepare a separate, reproducible Executive Summary of the final ADMP Report.

3.5.2.19. Flood Warning / Response Plan

District's Project Manager to develop this section.

3.5.2.20. Deliverables

All deliverable shall follow the standards as set forth in 3.2.9, Deliverable Standards.

(a) Reports

The following documents or reports shall be developed as a result of ADMP. These may or may not be under the same cover.

- Data Collection Report
- Project Administration Report
- Interim Development Guidelines
- ADMP Hydrology Report (in TDN format)
- ADMP Hydraulics Report (in TDN format)
- FEMA Floodplain Delineation Submittal and HIS Data
- Flood Warning/Flood Response Plan
- Project Survey Report
- Sedimentation Engineering and Geomorphic Evaluation Report

- Environmental Overview Report
- Landscape Character Analysis Report
- Multiple-Use Opportunities Assessment Report
- Public and Stakeholder Involvement Plan

The Consultant shall submit four (4) paper copies, one (1) electronic copy in PDF format, and one (1) electronic copy in the original software format of each draft report, estimates, schedules or drawings to the District and one (1) paper copy and (1) electronic copy in PDF format for each final report, estimates, schedules or drawings to each participating agency.

3.5.3. Watercourse Master Plan

The Watercourse Master Plan is similar to a ADMS/ADMP, so the use of the ADMS/ADMP processes should be used as the base and modified accordingly for the Project specifics.

3.5.4. DCR/Pre-Design

3.5.4.1. DCR/ Pre-Design General

The purpose of a Design Concept Report (DCR) / Pre-Design is to refine and firmly establish the Project alignment and features, resolve unknowns, and clearly establish the design criteria. The DCR/Pre-Design plans will refine the design in sufficient detail such that the size, alignment, and profile of major Project features are determined, field data is collected, including identification of potential major utility conflict information, which will be required for completion of the final design, and Project costs are refined.

The selection of a DCR or a Pre-design study is predicated on the specifics of the Project. If the unknowns, Project alignment(s)/locations, constraints/ and opportunities are numerous in nature it would be more conducive to perform a DCR.

Another difference between a DCR and a Pre-design study is the level of effort and the detail of the final plans and profile. 15% design plans (typical at a large scale) is considered adequate for a DCR while the Pre-design should be taken to a 30% level design plans (typically at 1"=40' or less).

3.5.4.2. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in 3.2, Scope of Work - Project Administration.

3.5.4.3. Data Collection

The Consultant shall conduct a data collection effort to obtain the data and references needed to support the study. This effort shall include the following:

(a) Existing Reports & Data

The Consultant shall review all previous studies conducted, including other existing designs, reports, hydrology models, and studies as developed in the Planning Phase of the Project and provided by the District. The Consultant shall also collect any new data, information, and reports that has been discovered and/or developed after the Planning Phase.

The Consultant shall review and include any additional reports and data such as:

- Vegetative Studies
- Cultural Analysis Studies
- Environmental Analysis Studies
- Field Investigations
- Existing Utility Maps
- Existing and Historic Aerial Photographs
- Hydrology and Hydraulics Studies
- Field Surveys
- Boundary Surveys
- Geotechnical Analysis
- Preliminary and/or final Plats and construction plans for existing and/or proposed land developments in the vicinity of the proposed facility
- Existing Topographic mapping and aerial photography

The Consultant shall review existing topographic mapping and aerial photography. The Consultant shall identify and document any additional mapping or surveying needs for the Project, and submit this to the District for consideration for additional work.

(b) Data Collection Memo

The Consultant shall prepare and submit a Data Collection Memo that includes the Project specific goals and objectives, the Project LIA, CIA, and FIA inventories, and the suggested evaluation criteria for the Alternatives

3.5.4.4. DCR/Pre-Design Analysis Activities

The following activities shall be refined and developed throughout the analysis for the study as required. Specific scheduling of the specific task will be identified in the various progress submittals.

3.5.4.5. Environmental and Cultural Resources

The purpose of the Environmental Evaluation for the pre-design phase of proposed flood control Projects is to conduct a more site-specific environmental evaluation of the Project area. The Project area and proposed impacts will be well defined for the Consultant.

The Consultant shall perform the following tasks as identified in 4.2, Environmental and Cultural Resource unless otherwise stated.

- Phase 1 Environmental Site Assessment
- Biological Surveys
- Biological Assessment and Consultation with USFSW
- Cultural Resource Survey
- 404 Jurisdictional Delineation
- Title VI Environmental Justice Assessment
- Survey, Photogrammetry & Mapping
- Requirements for survey, photogrammetry & mapping can be found in 4.12, Survey, Photogrammetry & Mapping.

3.5.4.6. Surveying

- (District's Project Manager shall include the specific types of surveying that needs to be conducted)
    - (Photogrammetry & Mapping)
    - (Traditional Mapping)
    - (Aerial Mapping)
    - (Field Surveys)
    - (Structure Surveys)
    - (Include any other specific surveying needed for the Project.)
    - All of the survey will be on the ground control established for the Project area, and grid conversion factor will be provided by the Consultant.

3.5.4.7. Geotechnical

The Consultant shall conduct, or contract for, geotechnical investigations as required for the design of the Project. The Consultant shall perform the following tasks as identified in 4.4, Geotechnical unless otherwise stated.

3.5.4.8. Geomorphology

The Consultant shall conduct, or contract for, geomorphology investigations as required for the design of the Project. The Consultant shall perform the following tasks as identified in 4.3, Geomorphology of this Scope of Work unless otherwise stated.

3.5.4.9. Hydrology

The Consultant shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume I Hydrology, latest revision, for all hydrologic modeling and calculations and refer to 4.6, Hydrology for specific details.

(a) Return Frequency

Hydrologic modeling shall be completed for the (specify which frequency and duration needed). 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 may require the 50-year 6 and/or 24-hour event.

(b) Existing Hydrology Model(s)

The Consultant shall use the hydrology models that were prepared in previous studies. The Consultant shall review and become familiar with the previous hydrology models. The hydrology models and calculations shall be updated for the alternate(s).

(c) Hydrology Modifications - Establishing Existing Conditions Hydrology Model(s)

The Consultant shall extract the appropriate watershed area from the hydrologic model supplied by the District. The Consultant shall identify any discrepancies in the combined existing conditions model and regional drainage facilities that have been constructed or in the process of being constructed that may affect the basin boundary or the sub-basin boundaries or routing. The Consultant shall provide recommendations to the District on how the model should be modified if discrepancies are found.

The Consultant shall extend and revise the sub-basin boundaries as necessary for the Project area.

The Consultant shall refine the sub-basin boundaries based on concentration points agreed upon by the District.

The Consultant shall revise the hydrologic characteristics (i.e. land use and routing) as needed for the revised Project watershed for the existing condition hydrology model(s).

Proposed Hydrology Model(s) with Project

The Consultant shall use the updated Existing Condition Hydrology Model(s) and update it for each alternative identified in the Alternative Analysis. The Consultant shall note and document any areas of adverse affects and the overall performance of each alternative.

3.5.4.10. Hydraulics

The Consultant shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume II Hydraulics latest revision, for all hydraulics calculations, except as amended or modified herein or in the scope of work.

The Consultant shall perform the following tasks as identified in 4.5, Hydraulics unless otherwise stated. The hydraulic models and calculations shall be updated for each step of the design.

- Open Channel Hydraulics for Major Watercourses

- Channel Stabilization Design
- 100-year Floodplain boundary delineation – pre- and post- Project.

(a) Baseline Hydraulic Modeling

The Consultant shall prepare an existing conditions baseline hydraulic model for the Project alignment within the study area. The model shall extend from ____ and to ____.

(b) Alternative(s) Hydraulic Analysis and Modeling

The Consultant shall evaluate the alternatives using normal depth calculations to size the proposed facilities.

(c) Recommended Alterative Hydraulic Modeling

The Consultant shall prepare a hydraulic model for the recommended alternative within the study area.

3.5.4.11. Aesthetic Treatment and Landscaping

All Aesthetic Treatment and Landscaping activities will be completed using the District's "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects" and the Landscape Planning and Designing manual guidelines. Details of the activities are in 4.7, Landscape Planning & Design.

The Consultant shall gather the information necessary to complete the Inventory and Analysis for all contexts.

3.5.4.12. Project Aesthetics Advisory Committee

The District will form and utilize a Project Aesthetics Advisory Committee (PAAC) 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.

3.5.4.13. PAAC Meetings

The District will conduct (identify the number of meetings) PAAC meetings during the course of the Project. The Consultant including their Consultant's Landscape Architect shall attend the PAAC meetings. The PAAC meetings should be held approximately two weeks before any public meeting. The details for each PAAC meeting can be found in 4.7.4.3, PAAC Meeting Objectives.

3.5.4.14. Public and Stakeholder Involvement

(a) General

Public and Stakeholder involvement is a major key to the success of a Project. It is important to engage the public early in the process and include the stakeholders in the data collection phase and alternative formulation process at the appropriate time.

The Public Information Office of the District has prepared a separate set of guidelines for Consultants conducting public involvement and public information activities for the District. A copy of these guidelines is available from the Public Information Office and should be used as a reference by the Consultant when preparing public information related materials.

It is the intention of the guidelines to increase quality, efficiency, and consistency in public involvement work and products at the District. These guidelines should assist in creating a consistent message for uniform and quality materials.

These guidelines cover:

- Materials Content Guidelines
- District Turnaround Times
- Design and Printing Guidelines
- Logo Guidelines
- Web Site Guidelines
- Methods of Delivery
- PowerPoint Presentations
- Deliverables
- Quality Control & Review
- District Public Information Office Staff.

The District and the Consultant will plan and conduct public involvement and information as required for a particular task and as identified in this Scope of Work, in accordance with the District Public Involvement and Information Guidelines.

(b) Public and Stakeholder Involvement plan

The Consultant shall provide a Public Involvement Plan in conjunction with the Stakeholder Involvement Plan (See 4.8.1. Public and Stakeholder Involvement Plan) within (specify time typically two three weeks) upon the NTP.

Agencies, private enterprises, or individuals who have an interest in the outcome of the Project will be considered stakeholders. The Plan will include a preliminary list of stakeholders for use in developing a stakeholder database, preliminary agendas for the initial stakeholder working group meeting, a preliminary stakeholder's matrix of opportunities and issues, and a preliminary stakeholder involvement schedule. After review by the District Project Manager, the Consultant will finalize the plan and keep it updated.

(c) Public Meetings

There shall be a minimum of two (2) (identify the number of meetings needed) public meeting throughout the design of this Project. The meetings shall be conducted utilizing an Open House format near the Project site so that maximum local residents surrounding the Project site can attend. Public meetings shall be coordinated so as

not to conflict with other District Project public meetings, partner Council meetings, and/or partner Commission meets.

The meetings shall be scheduled as follows: (Identify the point in the schedule where the public meeting should be held i.e. after 30% plans.)

(d) Public Involvement

The Consultant shall conduct Public Involvement per 4.8, Public & Stakeholder Involvement.

3.5.4.15. Rights-of-Entry

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 Project Manager. Occasionally the Scope of Work may identify if the Consultant will notify all property-owners and obtain any necessary rights-of-entry for the study area. In such a case, the Consultant will furnish the District with a list of all the property-owners notified and a sample rights-of-entry letter.

3.5.4.16. Rights-of-Way

The Consultant shall:

Review parcel ownership maps and identify which properties will be affected by the proposed Project.

Identify all existing rights-of-way adjacent to the Project site that may be disturbed by Project construction.

Identify permanent rights-of-way and easements requirements necessary for the Project features and indicate all property impacts and acquisition requirements on the preliminary or 30% plans.

The estimated costs to purchase the rights-of-way shall be based upon unit cost values that are provided by the District. Such costs will include relocation costs if relocation of businesses or residences is required. The required acreage and costs shall be included in the Project cost estimate as a separate line item.

3.5.4.17. River Mechanics

All sediment transport, scour, deposition, lateral migration and other river mechanics will be analyzed following the general procedures based on Chapter 11 Sedimentation from the District's 2010 "Drainage Design Manual Volume II, Hydraulics", "DDMSW River Mechanics Reference Manual" (September, 2009), and those found in 4.10, River Mechanics.

The following tasks shall be performed (select which tasks should be conducted and which ones should be deleted):

- Total Scour
- Sediment Yield and Sediment Transport
- Sediment Sampling and Testing
- Lateral Migration
- Riprap Sizing

3.5.4.18. Structural Engineering

(District's Project Manager to insert specific requirements for the proposed Project that are needed to be followed and adhered to.)

3.5.4.19. Traffic

The Consultant shall identify initial requirements for public and private access within and across the Project limits, both for construction and post-construction.

3.5.4.20. Utilities

Identification of Major Existing Utility Corridors

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 as-built and/or record drawings for the alignment and size of all the utilities both above ground and buried. 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.

(a) Identification of Potholing

The Consultant shall identify potholing and designating requirements. The Consultant / District (choose one), will have potholed and/or designated **ALL** potentially conflicting utilities and shall survey the location and elevation of utilities at locations where potholes and/or designating has been completed. (If the Consultant conducts the potholing), The Consultant shall submit in writing a proposed plan and associated costs to complete the required potholing and designating.

Performance of potholing and designating is not authorized with the Notice to Proceed (NTP) for this scope of work but, upon review of the Consultant's plan, the District may authorize the work under a separate written NTP. The unit base costs for performance of potholing and designating will be included in the fee schedule as a separated item to be negotiated by the District.

(b) Utility Map

The Consultant shall identify and show utilities on the planimetric mapping and Project layout. The Consultant shall include existing utility locations on the 30% plan submittal. All subsequent plan submittals shall include existing, relocated, and abandoned-in-place utility locations.

(c) Establishment of Permanent Survey Ties to Utilities

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.

3.5.4.21. Alternative Analysis

(a) Alternatives Analysis Workshop Meeting

After completion of the Data Collection and the Data Collection Memo, the Project team along with any other pertinent stakeholders will attend an Alternatives Analysis Workshop session to develop capital improvement alternatives. Up to three alternatives and one "do nothing" alternative will be identified for development and analysis. The selected alternatives shall include specific Flood Hazard Mitigation solutions, recreational opportunities, and landscape theming.

The Workshop ideas will be evaluated based on the criteria established in the CSFHM process.

The Consultant shall be responsible for all materials and exhibits necessary for the meeting and shall be responsible for preparing meeting notes.

The meeting will be facilitated by a non-vested District coordinator. A pre-meeting will take place to inform the coordinator about the Project.

The Workshop session will include a presentation about the Project and an overview of the data collected and evaluation criteria.

The meeting attendees will review Data Collection Memo and previously established evaluation criteria to ensure the CSFHM approach and workshop ideas are meeting the goals and intent of the Project.

(b) Development of Alternatives

The Consultant shall develop each of the three alternatives to a conceptual level and prepare exhibits for informal presentation and discussion with the District.

The Consultant shall refine each of the alternatives to a level of detail sufficient for hydrologic and hydraulic modeling, development of ROW requirements, grading/basin contours, structure sizing and conceptual level cost estimating, including landscaping

components. The Consultant shall modify the HEC-1 hydrologic models developed under Phase 1 for each of the alternatives. The alternatives will be presented in plan view format and shall include 1 concept level landscape schematic and cross-section per alternative in order to depict a representation of the Project theming and recreational enhancements.

The Consultant shall develop a budget level cost estimate for ROW acquisition and construction of each of the alternatives. ROW shall be sized to include landscape design features per District policy.

The Consultant shall prepare a draft alternatives report, including exhibits, narrative description, cost estimates and evaluation. The report shall describe baseline conditions, the alternatives evaluation process and results, and the alternatives. The narrative shall include a description of each concept and the rationale for selecting each concept, including a listing of potential cost-share partners, and a description of the tangible benefits to those partners.

The Project Team will meet to evaluate the results of the Alternatives Development and Analyses based on the existing evaluation criteria. The selected alternative will move forward to further refine the details.

(c) Recommended Alternative

The Consultant shall prepare conceptual level plans (15%) for the Recommended Alternative. These plans shall include a cover sheet, plan and profile drawings, typical sections for major channels, basin contouring, major structure locations and concept details, major utility locations, and right-of-way requirements.

The Consultant shall prepare a concept level color rendered site development and landscape grading concept plan for each structural component of the Recommended Alternative utilizing the same map scale chosen to depict the engineering design concepts. The concept plans shall include the entire Project area for non-linear structures such as storage basins and segments extending for a length of 1000 feet linear Projects such as conveyance channels, channel levees or flood retarding structures selected by the District. The concept plans shall illustrate the location, extent and configuration of all flood control and multiple use features of the Project including, but not limited to, the Project right of way, Project setback area, overall grading design, top and toe of slopes, islands, natural features to be preserved, low flow channel, inlets, outlets, grade control structures, weirs, walls, maintenance roads, public entry points, trails, other multiple-purpose features and use areas, and general planting design concept. The Consultant shall identify the structure type, structural method, multiple-use emphasis and landscape design theme for each Project on the concept plan sheet for each structural component. Utilizing the Structural Guidelines contained in the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects and the District's Landscape Design Guidelines

in 4.7.6, Project Pre-Design the Consultant shall develop and include landscape design guidelines on the plan sheets for the Project setback limits, overall form, configuration and scale of the Project and its features, features to be preserved in place and the surficial treatment including materials, colors and textures and plant palette to communicate the design intent for subsequent design implementation of the structural components of the Recommended Alternative. Additionally, the Consultant shall provide a color rendered cross section illustrating the flood control, aesthetic and multiple-use features for each of the above design concept plans.

The Consultant shall identify the need for any additional environmental investigations and those permits that may be required during final design.

The Consultant shall develop a cost estimate for the recommended alternative, including a cost estimate for aesthetics and landscape, at a level of detail consistent with the conceptual plans. Cost items shall be itemized and separated as to drainage improvements, roadway improvements, right-of-way, and aesthetics and landscape. In order for the District to determine the appropriate cost-share for potential Project partners, the Consultant shall identify the proportion of specific benefits and costs assignable to the identified cost-share partners according to guidelines provided by the District.

The Consultant shall prepare display exhibits in PDF format of the recommended plan at 24 by 36 inch size ("Dimensioned Schematic"), adaptable to 11 by 17 inches. Display exhibits shall be suitable for public presentation and be on a single sheet 24 by 36 inch format. The exhibit shall show overall plan view and right of way locations, typical landscaped cross sections with dimensions for channels and basins, plan view landscape concepts for channels and basins, and basic grading information.

(d) Correspondence and minutes

Prepare a memo including correspondence and minutes of conversations and meetings with the District, other affected agencies and utility owners.

Submit one (1) copy for District records.

3.5.4.22. Survey Data and Report

Submit two (2) copies to the District for review.

3.5.4.23. Geotechnical Report

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

3.5.4.24. Preliminary Design Calculations and Analyses

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

3.5.4.25. Value Analysis

The Consultant shall include in the initial schedule for the study when the Value Analysis shall be conducted for review and approval by the District. The Consultant / District (choose one) shall be responsible for scheduling, coordinating, and soliciting third party Value Analysis (VA) facilitator outside expert team members and planning of the VA workshop. The Consultant / District (choose one) will be responsible to notify and coordinate participation by other agencies and stakeholder.

See 4.13, Value Analysis / Value Engineering for the specific requirements and details to perform the Value Analysis study.

3.5.4.26. MEETINGS

(a) Meeting Summary and Minutes

The Consultant is responsible for the minutes of any meetings and shall include copies of minutes of meetings, telephone conversations, and correspondence to the District in the Project Administration Report.

(b) Specific Meetings

Add specific meetings not identified in 3.2.10, Meetings such as but not limited to the following:

- **CSFHM Work Session** -The Project Team will attend a Work Session to develop the alternative formulation and basic function criteria for which all alternatives will be evaluated. The Consultant shall present the findings of the Data Collection Memo and shall note comments or modifications requested by the Project Team. The Consultant shall revise the Data Collection Memo per the input given at the Work Session for presentation at the Alternatives Workshop.
- **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.

3.5.4.27. DOCUMENTS

(a) Design Data Report (DDR)

The Consultant shall maintain a design data 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:

- A recommendation of lateral design, configuration, alignment, and feature

locations. (Include a 1"=100' scale preliminary plan).
- Location of conflicting utility relocations and potholing and designating locations.
- Requirements for public and private access.
- Rights of way and easement information.
- Identification of hazardous materials.
- Hydraulic and hydrologic calculations.
- Quantity calculations.
- Engineering Estimate(s).
- Design review and permitting requirements.
- Construction duration and schedule.
- Special Project features, including unusual construction techniques, special materials, and/or conditions.
- Maps, sketches, calculations, and other supporting documentation as required.
- Results of the Value Engineering Session.

(b) DCR / Pre-Design Final SUBMITTAL

Following the Project Kick-off meeting and the review of appropriate reports and studies, the Consultant shall perform preliminary investigation and calculations necessary to prepare the Submittal. All submitted items shall be dated and marked "Preliminary". The following submittals shall be included:

(c) Plans

- Indicate existing topography.
- Indicate alignment, plan/profile, and typical cross sections.
- Include the approximate size and configuration of Project features.
- Indicate rights-of-way and easements required.
- Indicate all utilities and identify conflicting utilities that are to be relocated and/or protected in relationship to Project control and monument lines.
- Details need not be included.
- Submit four (4) sets to the District for review. These may be half-size or full size as directed in the Scope of Work.
- Submit copies as required to all Project partners, other outside agencies, and to municipalities for review of water and sewer relocations. Submit sufficient number of plan sets to the District for distribution to all other utilities that may have conflicting utilities.

(d) Project Administration Report

The Consultant shall provide and document correspondence and minutes of conversations and meetings with the District, other affected agencies and utility owners.

Submit one (1) copy for District records.

(e) Survey Data and Report

Submit two (2) copies to the District.

(f) Geotechnical Report

Submit two (2) copies to the District for review.

(g) Preliminary Design Calculations and Analyses

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

3.6. Scope of Work – Final Design and Construction Documents

3.6.1. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in the 3.2, Scope of Work - Project Administration.

3.6.2. Data Collection

3.6.2.1. Reports

The Consultant shall review all Design Concept Reports (DCR), if one was conducted, and other existing designs, reports, hydrology models, and studies as developed in the Planning Phase and in Pre-Design of the Project and provided by the District. These reports and studies shall form the basis of the final design concept and construction documents.

3.6.2.2. Existing Topographic mapping and aerial photography

The Consultant shall review any new topographic mapping and aerial photography. The Consultant shall identify any additional mapping or surveying needs for the Project.

3.6.2.3. Other Reports or Analysis

The Consultant shall review any additional reports such as:

- Vegetative Study
- Cultural Analysis
- Environmental Analysis
- Field Investigation
- Hydrology and Hydraulics
- Boundary Survey
- Geotechnical Analysis

3.6.3. Design Activities

These activities are developed throughout the design of the Project. Specific scheduling will be identified in the various progress submittals.

3.6.3.1. Environmental and Cultural Resources

The purpose of the Environmental Evaluation for the design phase of proposed flood control Projects is to conduct a more site-specific environmental evaluation of the Project area. The Project area and proposed impacts will be well defined for the Consultant.

The Consultant shall perform the following tasks as identified in 4.2, Environmental and Cultural Resource unless otherwise stated.

- Phase 1 Environmental Site Assessment
- Biological Surveys

- Biological Assessment and Consultation with United States Fish and Wildlife Service.
- Wetlands Delineation
- Cultural Resource Survey
- 404 Jurisdictional Delineation
- Title VI Environmental Justice Assessment
- Geomorphology

3.6.3.2. Geotechnical Investigations

The Consultant shall conduct, or contract for, geotechnical investigations as required for the design of the Project. The Consultant shall perform the following tasks as identified in 4.4, Geotechnical unless otherwise stated.

- Field Investigation
- Lab Tests
- Analysis
- Report
- Hydraulics

3.6.3.3. Hydraulic Analysis

The Consultant shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume II Hydraulics latest revision, for all hydraulics calculations, except as amended or modified herein or in the scope of work.

The Consultant shall perform the following tasks as identified in 4.5, Hydraulics unless otherwise stated. The hydraulic models and calculations shall be updated for each step of the design.

- Open Channel Hydraulics for Major Watercourses
- Channel Stabilization Design

3.6.3.4. Hydrology

The Consultant shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume I Hydrology, latest revision, for all hydrologic modeling and calculations and refer to 4.6, Hydrology for specific details.

(a) Return Frequency

Hydrologic modeling shall be completed for the (specify which frequency and duration needed). 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.

(b) Existing Hydrology Models

The Consultant shall use the hydrology models that were prepared in previous studies. The Consultant shall review and become familiar with the previous hydrology models. The hydrology models and calculations shall be updated for each

step of the design.

3.6.3.5. Aesthetic Treatment and Landscaping

All Aesthetic Treatment and Landscaping activities will be completed using the District's "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects" and the Landscape Planning and Designing manual guidelines. Detail of how to do these activities can also be found in 4.7, Landscape Planning & Design.

The Consultant Landscape Architect shall prepare a fully integrated detailed site layout and landscape contour grading plan that adapts the flood control, aesthetic and multi-use functional design requirements and to the characteristics, opportunities and constraints identified in the site analysis, utilizing the same base sheets and map scale used for the engineering drawings for the Project.

3.6.3.6. Project Aesthetics Advisory Committee

The District will form and utilize a Project Aesthetics Advisory Committee (PAAC) 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.

(a) PAAC Meetings

The District will conduct (identify the number of meetings) PAAC meetings during the course of the Project. The Consultant including their Consultant's Landscape Architect shall attend the PAAC meetings. The PAAC meetings should be held approximate two weeks before any public meeting. The details for each PAAC meeting can be found in 4.7.4.3, PAAC Meeting Objectives.

3.6.3.7. Public and Stakeholder Involvement

(a) General

Public and Stakeholder involvement is a major key to the success of a Project. It is important to engage the public early in the process and include the stakeholders in the data collection phase and alternative formulation process at the appropriate time.

The Public Information Office of the District has prepared a separate set of guidelines for Consultant conducting public involvement and public information activities for the District. A copy of these guidelines is available from the Public Information Office and should be used as a reference by the Consultant when preparing public information related materials.

It is the intention of the guidelines to increase quality, efficiency, and consistency in public involvement work and products at the District. These guidelines should assist in creating a consistent message for uniform and quality materials.

These guidelines cover:

- Materials Content Guidelines
- District Turnaround Times
- Design and Printing Guidelines
- Logo Guidelines
- Web Site Guidelines
- Methods of Delivery
- PowerPoint Presentations
- Deliverables
- Quality Control & Review
- District Public Information Office Staff

The District and the Consultant will plan and conduct public involvement and information as required for a particular task and as identified in this Scope of Work, in accordance with the District Public Involvement and Information Guidelines.

(b) Public and Stakeholder Involvement plan

The Consultant shall provide a Public Involvement Plan in conjunction with the Stakeholder Involvement Plan (4.8.1, Public and Stakeholder Involvement Plan) within (specify time typically two or three weeks) upon the NTP.

Agencies, private enterprises, or individuals who have an interest in the outcome of the Project will be considered stakeholders. The Plan will include a preliminary list of stakeholders for use in developing a stakeholder database, preliminary agendas for the initial stakeholder working group meeting, a preliminary stakeholder's matrix of opportunities and issues, and a preliminary stakeholder involvement schedule. After review by the District Project Manager, the Consultant will finalize the plan and keep it updated.

(c) Stakeholder Involvement

The Consultant shall coordinate and participate in (insert #) of meetings Stakeholder working group meetings to exchange information, address opportunities and issues and ensure that stakeholder concerns and input are recorded for consideration as part of the alternatives formulation. The Consultant shall work with the District to determine when these meeting will be held in the schedule.

The Consultant shall prepare a stakeholder working group notebook, which will be distributed at the first meeting for participants use. Meeting summaries shall subsequently be prepared and distributed, as well as a stakeholder opportunities/issues matrix. These will be developed and maintained throughout the Project by the Consultant. The matrix/database will be utilized in the future for the alternatives formulation/evaluation/recommendation.

In addition to the working group meetings, the Consultant shall meet with stakeholders individually, as needed, to ensure that site and stakeholder specific

issues are recorded for consideration in the future preliminary alternatives analysis. The District's Project Manager shall be advised of meetings and given an opportunity to attend. The Consultant shall keep a written summary of all meetings and will include them as part of the Project record.

(d) Public Meetings

There shall be a minimum of two (2) *(identify the number of meetings needed)* public meeting throughout the design of this Project. The meetings shall be conducted utilizing an Open House format near the Project site so that maximum local residents surrounding the Project site can attend.

The meetings shall be scheduled as follows: *(Identify the point in the schedule where the public meeting should be held i.e. after 30% plans.)*

(e) Public Involvement

The Consultant shall conduct Public Involvement per 4.8, Public & Stakeholder Involvement.

(f) Public Information Media

The Consultant shall prepare material announcing the beginning of the study, the study schedule, and introducing the public to the District and the study process as follows:

- Create draft brochure (final and printing to be done by the District)
- Create draft cover letter for mailing brochure to residents, businesses and Stakeholders.
- District will mail brochure to affected and identified properties located within the study area boundaries
- Place brochures in key area locations in study area – schools, libraries, etc.

(g) Project Web Site

The Consultant shall create and provide information to the District and partnering jurisdiction - Name for placement on their respective Web sites. The Consultant shall review the Web sites and recommend updates to the Web sites on a regular basis. The Consultant shall provide suggested Web site wording and format configuration about the start of the Project to partnering jurisdiction - Name for their placement on their Web site along with brochure.

(h) Additional Public Outreach

The Consultant shall create and provide a media backgrounder and a press release regarding start of the Project. The District shall contact local media (e.g. radio, newspaper) and arrange an informal meeting (e.g., brown bag lunch meeting) and

review Project and provide media fact sheet and press release as approved by the District's Project Manager.

3.6.3.8. Right-of-Entry, Rights-of-Way, Easements, and Land Ownership

The District will coordinate with the Public Works Real Estate department for all aspects related to Rights-of-Entry, Rights-of-Way, Easements, and Land Ownership.

(a) Rights-of-Entry

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. Occasionally the Scope of Work may identify if the Consultant will notify all property-owners and obtain any necessary rights-of-entry for the study area. In such a case, the Consultant will furnish the District with a list of all the property-owners notified and a sample rights-of-entry letter.

(b) Rights-of-Way

The District will:

Prepare all legal descriptions for rights-of-way and easements necessary for Project from the Consultant's exhibits, plans, and/or strip maps.

The Consultant shall:

Review parcel ownership maps and identify which properties will be affected by the proposed Project.

Identify all existing rights-of-way adjacent to the Project site that may be disturbed by Project construction.

Identify permanent rights-of-way and easements requirements necessary for the Project features and indicate all property impacts and acquisition requirements on preliminary or 30% plans.

Complete a drawing showing the existing land ownership property lines and the anticipated rights-of-way required to be purchased for the recommended plan.

Provide a separate drawing which shall include the grading and improvements proposed, limits of proposed construction, and proposed Right-of-Way for review by the District.

The estimated costs to purchase the rights-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 is required. The required acreage and costs shall be included in the Project cost estimate as a separate line item.

(c) Property, Section Surveys, and Right-of-Way Monumentation

The Consultant shall conduct surveys per 4.12, Survey, Photogrammetry & Mapping.

3.6.3.9. Survey, Photogrammetry & Mapping

All requirements for survey, photogrammetry & mapping can be found in 4.12, Survey, Photogrammetry & Mapping.

(a) Surveying

(Include any specific surveying the needs to be conducted)

(b) Photogrammetry & Mapping

(Traditional mapping)

The Consultant shall provide topographic mapping at 1-foot contours interval for the length of the Project. See Figure 3.2 – Project Area Map for mapping limits, survey limits, and number of panels.

(Aerial Mapping)

The Consultant shall provide digital and hard copies of the aerial photos to the District. The submittal shall include the original scale of the mapping, the flight date, and a plate index of the mapping. The digital version shall be in TIF format.

(# of blind panels) Blind Panels will be placed per the guidelines as referenced above.

All of the survey will be on the ground control and grid conversion factor will be provided by the Consultant.

3.6.3.10. River Mechanics

All sediment transport, scour, deposition, lateral migration and other river mechanics will be analyzed following the general procedures based on Chapter 11 Sedimentation from the District's 2010 "Drainage Design Manual Volume II, Hydraulics", "DDMSW River Mechanics Reference Manual", and those found in 4.10, River Mechanics.

The following tasks shall be performed (select which tasks should be conducted and which ones should be deleted):

- Total Scour
- Sediment Yield and Sediment Transport
- Sediment Sampling and Testing
- Lateral Migration
- Riprap Sizing

3.6.3.11. Structural Engineering

(District Project Manager to provided Project specifics here.)

3.6.3.12. Traffic

The Consultant shall identify requirements for public and private access within and across the Project limits, both for construction and post-construction. This will include review of traffic control requirements, providing traffic control plans, and, if necessary, detour or diversion 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.

3.6.3.13. Utilities

(a) Identification of Major Existing Utility Corridors

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 as-built and/or record drawings for the alignment and size of all the utilities both above ground and buried. 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.

(b) Identification of Potholing

The Consultant shall identify potholing and designating requirements. The Consultant / District (choose one), will have potholed and/or designated ALL potentially conflicting utilities and shall survey the location and elevation of utilities at locations where potholes and/or designating has been completed. (If the Consultant conducts the potholing), The Consultant shall submit in writing a proposed plan and associated costs to complete the required potholing and designating.

Performance of potholing and designating is not authorized with the Notice to Proceed (NTP) for this scope of work but, upon review of the Consultant plan, the District may authorize the work under a separate written NTP. The unit base costs for performance of potholing and designating will be included in the fee schedule as a separated item to be negotiated by the District.

(c) Utility Map

The Consultant shall identify and show utilities on the planimetric mapping and Project layout. The Consultant shall include existing utility locations on the 30% plan submittal. All subsequent plan submittals shall include existing, relocated, and abandoned-in-place utility locations.

(d) Establishment of Permanent Survey Ties

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.

(e) Utility Relocation Coordination

The Consultant shall coordinate any utility relocation with the owner or 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. The Consultant shall prepare and maintain a spreadsheet identifying each of the utilities impacted by this Project, the location, owner, type, size, material, and disposition of the utility (relocate or protect in place). The Consultant shall maintain this spreadsheet through design to track the relocation activities required for the Project.

3.6.3.14. Design Data Report (DDR)

The Consultant shall maintain a design data 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:

- A recommendation of lateral design, configuration, alignment, and feature locations. (Include a 1"=100' scale preliminary plan).
- Location of conflicting utility relocations and potholing and designating locations.
- Requirements for public and private access.
- Rights of way and easement information.
- Identification of hazardous materials.
- Hydraulic and hydrologic calculations.
- Quantity calculations.
- Engineering Estimate(s).
- Design review and permitting requirements.
- Construction duration and schedule.
- Special Project features, including unusual construction techniques, special materials, and/or conditions.
- Maps, sketches, calculations, and other supporting documentation as required.
- Results of the Value Engineering Session.

3.6.4. 30% Submittal

Following the Project Kick-off meeting and the review of appropriate reports and studies, the Consultant shall perform preliminary hydrology, hydraulic, civil, and structural calculations

necessary to prepare the 30% Submittal. All submitted items shall be dated and marked "Preliminary, 30% Submittal". The following submittals shall be included:

3.6.4.1. Plans

- Indicate existing topography.
- Indicate alignment, plan/profile, cross-section, and traffic control requirements.
- Include the approximate size and configuration of Project features
- Show limits of grading to include landscape grading.
- Indicate rights-of-way and easements required.
- Indicate all utilities and identify conflicting utilities that are to be relocated and/or protected in relationship to Project control and monument lines.
- Details need not be included.
- Submit six (6) hard copy sets to the District for review. These may be half-size or full size as directed in the Scope of Work.
- Submit a PDF copy on a CD or DVD of the plan set.
- Submit copies as required to all Project partners, utility companies, other outside agencies, and to municipalities for review of water and sewer relocations.

3.6.4.2. Bid Quantities and Engineer's Construction Cost Estimate

Submit three (3) copies to the District for review and approval. (For example, see Exhibit 7- Bid Schedule.)

3.6.4.3. Plans Delineating Rights-of-Way and Easements Requirements

Separate rights-of-way acquisition plans shall be prepared for the Project. The plans shall provide sufficient information such as dimensions of acquisitions, ties to monument lines, section corners and other dimensions to allow preparation of maps and legals for acquisition purposes. The plans will include ties to the County's GDACS grid. Refer to the Consultant Guidelines Sections 3.3 Scope of Work - Survey, Photogrammetry, and Mapping and 4.9.3, Maps and Legals.

Submit two (2) copies for use by the District to begin the final rights-of-way acquisition process.

3.6.4.4. Survey Data and Report

Submit two (2) copies to the District for review and approval.

3.6.4.5. Geotechnical Report

Submit two (2) copies to the District for review and approval.

3.6.4.6. Preliminary Design Calculations and Analyses

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

3.6.4.7. Design Data Report

Submit two (2) copies and one pdf to the District for review and approval.

3.6.5. Value Analysis

Upon review and approval of the 30% Submittal by the District, the Consultant shall coordinate a Value Analysis study. The Consultant / District (choose one) shall be responsible for scheduling, coordinating, and soliciting third party Value Analysis (VA) facilitator outside expert team members and planning of the VA workshop. The Consultant / District (choose one) will be responsible to notify and coordinate participation by other agencies and stakeholder.

See 4.13, Value Analysis / Value Engineering for requirements to preform the Value Analysis study.

3.6.6. 60% Submittal

Upon review and approval of the 30% Submittal by the District, the Consultant shall incorporate review comments, including those from the VA Session, 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."

3.6.6.1. Plans

Plans shall be complete with the exception that details and schedules may be preliminary in nature.

Include:

- Layout and internal dimensions for structures
- Bid items and units of payment
- Traffic Control evaluation
- Utility relocation evaluation
- Temporary Construction Easements (TCE's) and any new easements

Submit six (6) sets to the District for review. These may be half-size or full size as directed in the Scope of Work.

Submit a PDF copy on a CD or DVD of the plan set.

Submit copies as required to all Project partners, utility companies, other outside agencies and to municipalities for review of water and sewer relocations.

3.6.6.2. Construction Supplementary General Conditions (SGCs) and Special Provisions (SPs)

The basis for the SGC's and the SP's shall be the Maricopa Association of Governments (MAG) specifications. Other agency specifications may be used and included in the SGC's and SP's only if the MAG specifications are not adequate for the intended use and only with the approval of the District Project Manager, and the Consultant must have reviewed the standard for applicability.

3.6.6.3. Bid Quantity Calculations and Engineer's Construction Cost Estimate

Submit three (3) copies, and one electronic Excel spreadsheet version to the District for review. (For example, see Exhibit 7- Bid Schedule.)

3.6.6.4. Design Data Report

Submit two (2) hard copies and one pdf file on a CD/DVD to the District for review and approval.

3.6.7. 90% Submittal

Upon review and approval of the 60% Submittal by the District, the Consultant shall incorporate review comments, including those from the Constructability Analysis Session, 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."

3.6.7.1. Plans

- Plans shall be complete and appear ready to bid and shall include:
    - Utility relocation design.
    - Finalized geometric control.
    - Special provisions (SP), bid tabs, engineers estimate, draft supplementary general conditions (SGC).
    - Backup calculations for bid quantities.
- Submit five (5) sets to the District for review and approval. These may be half-size or full size as directed in the Scope of Work.
- Submit a PDF copy on a CD or DVD of the plan set.
- Submit copies as required to all Project partners, other outside agencies, and to municipalities for review of water and sewer relocations.
- Submit plans and other documents required for permit reviews to partners and/or municipalities.
- Submit Approval to Construct (ATC) application to Environmental Services for water and sewer relocations.

3.6.7.2. Construction Supplementary General Conditions (SGCs) and Special Provisions (SPs)

The SGCs and SPs shall be complete and appear ready to bid.

Submit four (4) paper copies and one electronic version in Microsoft WORD to the District for review.

3.6.7.3. Bid Quantity Calculations and Engineer's Construction Cost Estimate

Submit three (3) copies, and one electronic Excel spreadsheet version to the District for review. (For example, see Exhibit 7- Bid Schedule.)

3.6.7.4. Anticipated Construction Schedule

Submit two (2) copies of the update and refined Construction Schedule to the District for review.

3.6.7.5. Administrative Documentation

Correspondence and Minutes of Conversations and Meetings with the District, other Affected Agencies and Utility Owners

Submit one (1) copy for District records.

3.6.7.6. Design Data Report

Submit two (2) hard copies and a PDF on a CD/DVD to the District for review and approval.

3.6.8. 99% Submittal

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

3.6.9. Final (100%) Submittal

Upon approval of the 90% Submittal, or if required the 99% Submittal, 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 Data Report, Plans, SGC's, SPs, calculations, and the bid quantity calculations, and Engineer's construction cost estimate.

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 SP's 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.

3.6.9.1. Plans

Submit original sealed plans with Mylar cover sheet and a CD containing the sealed plans (pdf) ready for reproduction and one (1) half-size set. Consultant shall coordinate obtaining signatures of project partners or approving municipalities on Mylar Cover sheet prior to District Chief Engineer signature.

Submit CD-ROMs or DVD with the original drawing files.

Plans are to be prepared in MicroStation format per the District's CADD Standards.

3.6.9.2. Construction Supplementary General Conditions (SGC's) and Special Provisions (SPs)

Submit sealed original documents ready for reproduction.

Submit CD containing files in Microsoft WORD format compatible with District WORD version.

The District Contracts Branch shall prepare the final construction contract documents to include District standard boilerplate contract, bidding schedule, SGC's, SP's and any required appendices. The Consultant will then be required to seal the cover sheet for the documents.

3.6.9.3. Design Data Report

Submit two (2) sealed copies to the District in final bound format.

3.6.9.4. Bid Quantity Calculations and Engineer's Construction Cost Estimate

Submit one (1) sealed copy.

An original copy of the final Engineer's Construction Cost Estimate shall be sealed by a civil engineer registered in the State of Arizona, and placed in an envelope. The envelope shall be identified by Project name and contract number.

(For example, see Exhibit 7- Bid Schedule).

3.6.9.5. Operation and Maintenance Plan for the Completed Project

The Consultant shall provide a maintenance plan to provide guidance for operation and maintenance of the facility, based on design criteria and assumptions, to ensure proper functioning. Submit two (2) copies for the District and appropriate number of copies for the District's partner review.

3.6.9.6. Technical Data Notebooks (TDN) per ADWR and FEMA for processing a LOMR

See Chapter 3.4, Scope of Work - Floodplain Delineation Studies for requirements.

3.6.10. Post Design Services

When the District provides construction management services during construction of a design Project, the District serves as the Construction Manager and is in charge of all items related to the construction contract including, but not limited to, the construction schedule, contract conditions, and payment.

The District may authorize the Consultant to provide the following post design services during the construction phase of the Project:

- Attend meetings:
    - Pre-Bid meeting.
    - Initial Partnering Session.
    - Monthly Partnering Meetings.
    - Post Design Review Meeting.
    - Meetings with the Construction Manager as requested.
- Review shop drawings and other submittals for conformance with the intent of the design.
- Provide phase certification if designated that responsibility by the District Construction Manager.
- Respond to requests for information and provide added, corrected, and/or revised replacement drawing sheets to the plan set as necessary.
- Observe and comment on the work, review testing procedures and results, and comment on site specific conditions exposed during construction.
- Visit the site as determined necessary by the District, review specific problem areas or render opinions on items that may affect critical features of the Project.
- Provide design services for changes to the design plans and/or specifications as determined necessary by the District. Civil engineering work requested under this contract shall be completed under the responsibility of a civil engineer registered in the State of Arizona. All work submitted shall bear the "wet seal" and original signature of the responsible registered civil engineer.
- Prepare and seal the record "As-Built" drawings based on field measurements and contractor's records.
- Provide field surveying services for quality assurance checks of line and/or grade of Project features and structures as determined necessary by the District.
- The fee for such post design services is based on a time and materials compensation for actual services provided. This fee for post design services shall not be used for revisions to plans and specifications that are corrections of Consultant's errors or omissions, as determined by the District.

3.6.11. Meetings

3.6.11.1. 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 have draft responses and be prepared to discuss all review comments. Any problems will be identified and corrective actions agreed upon at this meeting.

Authorization to Proceed with the 60% submittal may be given at the completion of this meeting.

3.6.11.2. Value Analysis (VA)

Following the 30% Submittal Meeting, or at another appropriate time in the Project design schedule, a VA Session may be conducted. The Consultant shall provide all the necessary planning and design documents, copies of reports and visual displays for use by the Value Engineering Team to evaluate potential cost saving measures and value improvements for the Project. The VA Session may be from one (1) to four (4) days in length depending on the complexity of the Project. Generally the District will provide a certified (C.V.S.) professional (P.E. or A.I.A.) VA Team Leader and independent expert team members. The VA Team Leader shall prepare a VA Report of the Session for distribution and inclusion in the Design Data Report. The Consultant shall include the District approved VA Recommendations in the 60% submittal.

3.6.11.3. 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 have draft responses and 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. Authorization to Proceed with the 90% submittal may be given at the completion of this meeting.

If the subject Project is within a delineated FEMA floodplain, the Consultant shall make sure that submittals conform to the initial concept of the plan that was processed as a CLOMR through FEMA.

3.6.11.4. Constructability Analysis (CA) Session

As part of or immediately 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 CA Session will be no more than one day in duration. 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.

3.6.11.5. 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. Authorization to Proceed with the final (100%) submittal may be given at the completion of this meeting.

3.6.11.6. Final (100%) Submittal Meeting

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

3.7. Scope of Work – Dam Safety

3.7.1. General

The Consultant shall provide engineering services for; field investigations, analysis, material testing, planning, alternative analysis, design, surveys, inspection services and engineering support during construction for various flood control dams managed by the District. The work shall include all required tasks for the site-specific corrective actions, general dam safety improvements or project wide dam rehabilitations and dam modifications as needed to address dam safety issues and potential failure modes at District managed dams. Additional services involving; dams land management, environmental permitting, cultural resources and biological clearances, landscaping and aesthetics and evaluation of appurtenant features will typically be involved for larger scale dam safety projects.

The work may also involve implementation of site-specific dam safety corrective measures, when feasible, to be implemented in conjunction with the field investigation work. Knowledge and capabilities of implementing procedures and in utilizing conventional and highly specialized instrumentation involving the investigations, predictions and ongoing monitoring of ground subsidence and earth fissure formation is required. The various methods of monitoring authorized under this contract include conventional and advanced techniques.

3.7.2. Personal Qualifications

The Consultant shall accomplish the work under the direction of a Registered Engineer, Geologist, or Architect with the State of Arizona in the appropriate discipline. The technical services that are anticipated for completion of work authorized under this contract include geology, geotechnical engineering, dam safety technology, hydrology and hydraulics, sediment studies, structural engineering, general civil engineering, surveying , biological sciences, archaeology, landscape architecture, and risk assessments performed by an experienced dams risk assessment facilitator. Field investigations such as test pits, test trenches, borings, material sampling, material testing and analysis are anticipated to be required. Additional technical services that may be required include, but are not limited to, geomorphology, aerial mapping and public involvement.

3.7.3. Contract Type

Due to the nature the dam safety work on existing dams, all consultant services contracts for dam safety work are on-call contracts. The District will issue individual work assignments under the on-call contract. Thus, the amount of work requested during the life of the contract is unknown; the least amount being zero and the maximum amount being limited to the "not-to-exceed" amount of the contract.

3.7.4. Specific Tasks

The following is a list of Project-specific tasks any of which the Consultant may be required to perform under a dam safety work assignment. Detailed guidelines regarding methods for completing each of these tasks can be found in the Project SOW or elsewhere in these Consultant Guidelines.

- Project Administration & Coordination
- Data Collection
- Existing Reports, As-builts, data, and records
- Technical literature research related to dam safety issues and technology
- Stakeholder Coordination & Public Involvement
- Survey(s)
- Topography
- Structural / Field Surveys
- Construction Surveys
- Field Investigations & Monitoring
- Inspection of Existing Facilities
- Ground Displacement
- Construction Inspection Services
- Geotechnical Investigations and Analysis
- Test Pits
- Test Trenches
- Borings
- Material Sampling
- Laboratory Testing
- Engineering Analysis
- Develop Earth Fissures Risk Zones
- Interferometry (InSAR data review and Analysis)
- Geologic and Groundwater Mapping
- Foundation Investigations and Analysis
- Hydrologic Analysis
- Hydraulic Analysis
- Sedimentation Engineering and Geomorphic Evaluation
- Sediment Yield
- Scour
- Lateral erosion
- Dam Technology, Engineering Design
- Failure Modes and Effects Analysis
- Risk Assessments
- Environmental Studies and Services
- 404 Permitting and associated studies and reporting
- Cultural Resources Investigations and Reporting
- Hazardous Materials
- Biological
- Social
- Planning/Alternative Analysis
- Permitting
- Value Engineering / Value Analysis

- Landscaping and Aesthetic Analysis & Design
- Emergency Action Plan
- Flood Warning/Flood Response Plan
- O&M Plan
- Deliverables

3.7.5. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in 3.2, Scope of Work - Project Administration of this Scope of Work and the following.

(District's Project Manager to add or delete the following Addition Coordination requirements)

- Special Coordination with ADWR Dam Safety Section:
  - Meetings and Written Responses
  - Applications
  - Check list of Items Required for a complete Application
  - Permit to Construct
  - All Required Engineering Reports and Supports as needed
  - Other items
- Special Coordination with NRCS/USACE
- Meetings and Written Responses
- Special Coordination with Project Stakeholders
- Special Coordination with Coordination with other Consultant's performing work for the District under other contracts.

3.7.6. Data Collection

The Consultant shall collect, organize, and review existing data, reports, and records. This shall include existing and proposed utilities, existing and future development, and all information on the existing dam project relevant to the assigned tasks.

The Consultant shall collect Technical literature research related to dam safety issues and technology relevant to the identified overall Project or work assignment goals.

The Consultant shall analyze the existing data and prepare a data summary report(s) and geotechnical appraisal report(s) relevant to the identified overall Project or work assignment goals. The Reports shall identify and recommend work assignments for further investigations as well as document the existing conditions as applicable.

3.7.7. Stakeholder & Public Involvement

The Consultant shall participate in public involvement activities and tasks as assigned in conjunction with the Stakeholder Involvement Plan per 4.7, Landscape Planning & Design within three (3) week after the NTP.

3.7.8. Surveys

The Consultant shall analyze existing topographic mapping and related survey design collected under the data collection. The Consultant shall document make recommendations for additional surveys in the following areas:

- Topography
- Structural / Field Surveys
- Construction Surveys

All survey work tasks shall be done in accordance with section 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

3.7.9. Field Investigations & Monitoring services

3.7.9.1. Inspection of Outlets and other Dam Works

The Consultant shall inspect the existing outlet works, spillways, and other dam works. This shall include video documentation of outlet works conditions and activities related to outlet work inspections.

3.7.9.2. Ground Displacement

The Consultant shall perform visual ground inspections by an experienced person walking the site area looking for indications of ground movement.

The Consultant shall evaluate horizontal measurements of ground displacement measurements performed on tape and rod extensometer arrays. Tape and rod extensometer measurements will be performed and provided by the District unless the Consultant is directed through a work assignment to perform the measurements. If the consultant is directed to perform the measurements, the District will provide the tape extensometer to ensure consistent readings using the same instrument.

The Consultant shall evaluate the results of conventional surveys completed by the District. Conventional surveying will include vertical leveling of relative vertical monuments using optical equipment and techniques, and horizontal and vertical position of selected monuments using GPS equipment and techniques.

Prepare detailed report of instrumentation and inspections. Provide analyses with conclusions and recommendations.

3.7.9.3. Construction Inspection Services

Provide technical support in the form of a qualified field technician on an on-call basis to provide construction services. This technician shall be well qualified in field inspection of concrete placement, soil compaction, paving, and the writing of required daily Project reports. Provide construction material testing services on an "as-needed" basis as directed by the District. The type of service shall conform to one of the following categories:

- Field sampling and/or testing of construction materials, and/or preparation of field test samples, including but not limited to, Portland cement concrete, asphalt concrete, reinforcing steel, structural steel, soils, wood, masonry, pre-

manufactured construction components (such as pre- and post-stressed concrete elements, concrete pipe, asbestos cement pipe), and other similar materials.

- Laboratory testing of sampled materials. For soil, such tests may include maximum density/optimum moisture content determinations, gradations, plasticity index, permeability, calcium carbonate and other mineral content tests, and similar soil tests. Other material tests may include compression and tensile testing, shrinkage tests, mix designs, and other defined tests for concrete, grout, flowable grout, roller compacted concrete, cement stabilized aggregate, and soil cement. Other materials may require tests, such as geotextiles or geomembranes, as appropriate and defined by nationally recognized standard organizations.

- Technical evaluation of test results with respect to defined improvements; the evaluation being prepared by or under the direct supervision of an Arizona registered civil engineer.

3.7.9.4. Additional Terms and Conditions

The presence of the Consultant's or its subcontractor's field personnel, either full-time or part-time, may be for the purpose of providing Project administration, assessment, observation and/or field testing of specific aspects of the Project, as authorized by the District. Should a contractor(s) not retained by the CONSULTANT be involved in the Project, the District will advise such contractor of the extent of the Consultant's responsibilities while on the Project site. Contractor(s) will be solely and completely responsible for working conditions on the job site in accordance with the existing contract between the Contractor and the District.

Test specimens or samples that are generally consumed or substantially altered during testing and any remnants may be disposed of immediately upon completion of tests. Remaining samples and other specimens may be disposed of thirty (30) days after submission of the Consultant's report unless otherwise directed by the District.

At the District's written request, the CONSULTANT will retain preservable test specimens or the residue there from for thirty (30) days after submission of the Consultant's report free of storage charges. After the initial thirty (30) days and upon the District's written request, the CONSULTANT will use its best efforts to retain test specimens or samples but only for a mutually acceptable storage charge and period of time.

The Consultant's laboratory shall be certified to state or national standards as specified in each task assignment.

3.7.10. Geotechnical Services

The Consultant shall provide geotechnical services on an "as-needed" basis as directed by the District. The type of service shall conform to one of the following categories:

- Exploratory drilling (including triple tube samples), soil sampling (both disturbed and undisturbed), soil field tests such as penetrometer tests, percolation tests, permeability tests, pressure meter tests, and similar soil tests, seismic refraction surveys, and gravity surveys. The services may include the furnishing of labor and equipment for obtaining the samples, such as trenchers, backhoes, water trucks, dump trucks, drilling equipment, and compaction equipment. The latter for backfilling test pits and trenches.
- Laboratory testing of soil samples such as plasticity index, gradations, shear testing (both direct and triaxial), bulk density, consolidation, and similar soil tests.
- Engineering evaluation of test results with respect to defined improvements; the evaluation being prepared by or under the direct supervision of an Arizona registered civil engineer.
- Preform Geohazard investigation and analysis per "Procedural Documents for Land Subsidence and Earth Fissure Appraisals", dated May 2011 by AMEC Earth & Environmental, Inc. which includes the following:
- Interferometry (InSAR)
- Photogeological Lineament Analysis
- Geological Reconnaissance of Photolineaments and Terrestrial Search for Earth Fissures
- Deep Resistivity Soundings
- Deep Refraction Microtremor (ReMi)
- Shallow Refraction Microtremor (ReMi)
- Fissure Detection by Seismic Refraction Signal Trace Analysis
- Subsurface Characterization by Seismic Refraction
- Trench Investigation
- Future Subsidence Prediction
- Stress-Strain Modeling

Each procedural document includes detailed descriptions of each geohazard investigative/assessment method inclusive of supporting documentation, qualifies the level of uncertainty associated with each method, allows for transfer of methods to future similar Projects, and establishes procedures with all interested agencies and stakeholders.

3.7.11. Hydrologic and hydraulic studies

The Consultant shall conduct hydrologic and hydraulic models as required to complete tasks as defined in this section and in accordance with sections 4.6, Hydrology and 4.5, Hydraulics.

3.7.11.1. Hydrology

The Consultant shall model the 6-Hour And 24-Hour, 100, 200, 500-Year, PMF (Probable Maximum Flood): Existing And Future; (NRCS 100-Year 10-Day) for the watershed upstream of the facility.

3.7.11.2. Hydraulics

The Consultant shall conduct Dynamic Routing through the facility and evaluate the downstream facilities for both hydrology and hydraulics.

3.7.12. Engineering analyses related to dam safety

The Consultant shall perform pre-Design and final Design engineering services for dam safety modifications or dam safety related work. The analysis shall address technical issues Identified in following areas:

- Geological
- Sedimentation
- Hydrology
- Hydraulics
- Land Subsidence: Current And Future
- Earth Fissures And Earth Fissure Risk Zones: Current And Future
- Design Flood Protection: Nrcs, Usacoe, Fema
- Current Dam Design Standards And Procedures
- Environmental
- Landscape and Aesthetics
- Non-Dam Design
- Additional Engineering Analysis, Modeling And Special Studies As Needed To Identify And Address Other Technical Issues

The Consultant shall perform other engineering services as determined by District need and priority.

3.7.13. Dam Safety Risk Assessments and Failure Modes and Effects Analysis

The Consultant shall perform and document a Dam Safety Risk Assessment and Failure Modes and Effects Analysis.

3.7.14. Environmental Studies and Services

Provide environmental services on an "as-needed basis". The type of service shall conform to one of the following categories:

3.7.14.1. 404 Clearance / Determination

The Consultant shall analysis, develop, and prepare documents required for 404 Permits or other environmental regulatory permits.

3.7.14.2. Cultural Resources

The Consultant shall conduct cultural resource investigation in accordance with section 4.2, Environmental and Cultural Resource.

The Consultant shall conduct a field survey for cultural resources prior to any geotechnical activities that disturb the ground.

3.7.14.3. Hazardous Materials

For Phase I and II Hazardous Material Assessments the Consultant shall perform the requirements as follows and per 4.2, Environmental and Cultural Resource:

- Design of any required remediation plans and specifications.
- Perform laboratory testing of sampled materials. All Laboratory testing shall be in compliance with applicable state and federal standards.
- Perform Monitoring of any environmental remediation Projects.
- Provide written technical evaluation of test results, including preparation of written reports describing methods, results, and recommendations for further action. This work will be prepared by or under the direct supervision of an Arizona registered civil engineer

3.7.14.4. Biological

The Consultant shall conduct biological resource investigation in accordance with 4.2, Environmental and Cultural Resource.

3.7.14.5. Social

The Consultant shall conduct Social resource investigation in accordance with section 4.2, Environmental and Cultural Resource.

3.7.15. Planning/Alternative Analysis

3.7.15.1. Goals and Objectives

The Consultant shall develop the Goals and Objectives for the Project considering/addressing the following items:

- Public Safety & Flood Protection
- Landscaping, Aesthetics And Multi-Use
- Identifies And Addresses Public, Stakeholders, and Partners Issues

- Analysis Existing and Future Utility Issues to Include transportation on Both the Upstream and Downstream
- Environmental Issues, to include any Mitigation And Permitting
- Dam Permitting – ADWR, Identify And Address ADWR Issues Obtain ADWR Approval For Construction (ADWR Permit)
- Identifies And Addresses Federal Partner Issues; NRCS or USACOE
- Develop An Implementable Plan: Function, Cost, Permitting, Public And Stakeholders
- Identifies ROW issues and current Land Rights. As part of the Plan Identify Required ROW For The Project, and or ROW that can be Declared Excess Property
- Identifies Funding Sources

3.7.15.2. PLANNING

The Consultant shall identify where and what are the hazards and the magnitude of the hazards based on the investigations, data and engineering analysis specified in other sections of this scope or work.

The Consultant after completion of existing conditions analyses, identification of flood hazard limits, and identification of the goals and objectives shall formulate the flood protection alternative(s). This shall be done using a 3 phase planning process which is as follows:

- Alternative(s) Development – Formulation, and Preliminary / Fatal Flaw Analysis
  - (Many Alternatives)
- Alternative (s) investigation – Detailed Analysis of Alternatives
  - (Limited Number of Alternatives)
- Recommendation of the Alternative – Development of the Recommended Alternative to 30% Design Plans.

The Consultant shall at the minimum include the following structure types in the proposed alternatives:

- Dam Rehabilitation Alternatives
- Basin(s)
- Channel(s)
- Combinations
- Do Nothing

The Do Nothing alternative shall be carried through the Alternative Development and the Alternative investigation phases. Additionally, the Consultant shall develop a matrix to be

used to evaluated and score the alternative(s) for selection to the next phase of alternative analysis.

The Consultant shall develop exhibits and documents the alternative development and investigation phases.

The Consultant shall develop the recommended Alternative to ____% design plans. The plans shall include the proposed landscape aesthetics & multi-Use components, Rights-of-Way, existing and proposed utilities, and proposed transportation corridors.

3.7.16. Permitting

The Consultant shall identify requirements for permits or licenses from other agencies.

The Consultant shall develop and submit permit applications that can be finalized and submitted by the District to the applicable agency.

3.7.17. Value Analysis

Upon review and approval of the (Typically 30)% Submittal by the District, the Consultant shall coordinate a Value Analysis study. The Consultant / District (choose one) shall /will be responsible for scheduling, coordinating, and soliciting third party Value Analysis (VA) facilitator outside expert team members and planning of the VA workshop. The Consultant / District (choose one) shall/will be responsible to notify and coordinate participation by other agencies and stakeholder.

See 4.13, Value Analysis / Value Engineering for details on the Value Analysis study.

3.7.18. Landscaping and Aesthetic Analysis & Design

3.7.18.1. General

All Aesthetic Treatment and Landscaping activities shall be completed using the District's "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects" and the Landscape Planning and Designing manual guidelines. Detail of how to do these activities can also be found in 4.7, Landscape Planning & Design. The CONSULTANT Landscape Architect shall prepare a fully integrated detailed site layout and landscape contour grading plan that adapts the flood control, aesthetic and multi-use functional design requirements and to the characteristics, opportunities and constraints identified in the site analysis, utilizing the same base sheets and map scale used for the engineering drawings for the Project.

3.7.18.2. Project Aesthetics Advisory Committee

The District will form and utilize a Project Aesthetics Advisory Committee (PAAC) 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.

3.7.18.3. PAAC Meetings

The District will conduct (identify the number of meetings) PAAC meetings during the course of the Project. The Consultant including their Consultant's Landscape Architect shall attend the PAAC meetings. The PAAC meetings should be held approximate two weeks before any public meeting. The details for each PAAC meeting can be found in 4.7, Landscape Planning & Design.

3.7.19. Emergency Action Plan

The Consultant shall develop, document, and submit an emergence action plan for review and approval that address the following:

- Development, Updates, Implementation, Flood Exercises
- Emergency Spillway Discharges And Inundation Mapping
- Dam Breach Inundation Mapping

3.7.20. Flood Warning/Flood Response Plan

(The District's Project Manager to develop the full details on how to conduct these required analyses.)

3.7.21. O&M Plan

The Consultant shall develop and document an Operations and Maintenance Plan for the specific facility for review and approval by the District. The O&M Plan shall at the minimum address the following:

- Required Instrumentation and Monitoring
- New / Updated O&M Agreement With Federal Agency (If Applicable)
- Gated Outlet Operational Guidelines
- O&M Responsibilities & Costs

3.7.22. Deliverables

All deliverable shall follow the standards as set forth in 3.2.9, Deliverable Standards.

3.7.22.1. Reports

The following documents or reports shall be developed as a result of the Study. These may or may not be under the same cover.

- Data Collection Report
- Project Administration Report
- Public and Stakeholder Involvement Plan
- Project Survey Report
- Sedimentation Engineering Report
- Geomorphic Evaluation Report
- Environmental Overview Report
- FMEA Report
- Flood Warning/Flood Response Plan
- Landscape Character Analysis Report
- Multiple-Use Opportunities Assessment Report

- Alternative Analysis Report
- Preferred Alternative Analysis Report
- 15%, 30%, 60%, 90% 100% Plans
- Emergency Action Plan
- Operation and Maintenance Plan

The Consultant shall submit four (4) paper copies, one (1) electronic copy in PDF format, and one (1) electronic copy in the original software format of each draft report, estimates, schedules or drawings to the District and one (1) paper copy and (1) electronic copy in PDF format for each final report, estimates, schedules or drawings to each participating agency.

3.8. Scope of Work – Construction Management Services

3.8.1. General

The Consultant shall provide engineering services for construction management, testing, evaluation of construction materials, and inspection services of various District Construction Projects.

3.8.2. Personal Qualifications

The Consultant shall propose and submit a Construction Manager with his/her qualifications to the District for review and approval. If the District does not approve, the Consultant shall propose and resubmit another Construction Manager with his/her qualifications to the District for review and approval.

The District may request replacement of the Construction Manager if it becomes apparent that this would be in the best interest of the Project. Additionally, during the Project, the Consultant may submit a request for a replacement Project Manager to the District for approval. If the Consultant is unable to provide an acceptable replacement Construction Manager, the District reserves the right to terminate the contract.

3.8.3. Specific Tasks

The Consultant shall complete the following Project specific tasks. (Choose all that apply and delete the rest). Detailed guidelines regarding methods for completing each of these tasks can be found in the Project SOW or elsewhere in these Guidelines.

- Project Administration & Coordination
- Scheduling
- Submittals and Shop Drawings
- Weekly Meetings
- Quantities and Contactor Invoicing
- Change Orders Analysis
- Documentation and Invoicing
- Stakeholder Coordination & Public Involvement
    - Partnering
    - Public Notification

- Survey(s)
  - Construction Surveys
  - Quantities
  - As-built
- Construction Inspection
  - Field Investigation / Testing
  - Field
  - Laboratory
  - Technical evaluation
- Engineering
  - Shop Drawings
  - Alternative Evaluation & Recommendations
- Deliverables

3.8.4. Project Administration and Coordination

The Consultant shall perform the tasks for Project administration and coordination as detailed in the 3.2, Scope of Work - Project Administration.

3.8.5. Stakeholder Coordination and Public Involvement

The Consultant shall administer and coordinate as detailed in the 3.2, Scope of Work - Project Administration of this Scope of Work and the following specific administration tasks:

- (District Project Manager to insert specific administration tasks here).

3.8.6. Surveys

The Consultant shall perform construction, quantity, and as-built surveys as requested by the District's Project Manager.

All survey work tasks shall be done in accordance with section 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

3.8.7. Construction Inspection

The Consultant shall provide technical support in the form of a qualified field construction inspector to provide construction inspection services. The person shall be well qualified in field inspection of general construction, earthwork, concrete placement, paving, and the writing of required daily Project reports. Provide construction material testing services on an "as-needed" basis as directed by the District. The type of service shall conform to the following categories:

- Inspection of On-site Stored Materials to assure that the Contractor is providing and maintain proper security, storage, and damage prevention; the materials conform to the contract specifications; and the quantity of materials equal the amount in the Contractor's payment request.

- Inspection at the Site of Manufacture when applicable for materials such as but not limited to pre-cast concrete.

- Inspection and assurance that all filed testing and sampling are performed in accordance to applicable testing procedures and by qualified testing technicians. Additionally, the Consultant shall make the Contractor aware of the contract required testing prior to the work being commenced.

- Inspection of Work to verify progress and conformance to contract specifications and industry standards. Special care and inspection shall be given to terminal operations such as backfilling, foundations, steel reinforcement and concrete placement, structural, pipeline testing, and asphalt placement.

- Inspection of Job Site for any unsafe condition or work practices.

- Structural inspections of footing excavations or drilling operation to verify that soil condition are in accordance with the specifications.

- Monitor the Contractor's Construction Schedule to anticipate and forecast delays, identify potential conflicting work activities, and to provide the District's Construction Manager with progress updates of the Contractor progress.

- Photographing of all activities to help document site conditions and construction activities to include but not limited to: flood damage, accidents, substandard work, structural failure, work in progress, completed work, exceptional workmanship, and / or any other instance that is deemed pertinent by the Inspector. These photographs shall be made part of the Project record.

- Preparation of daily inspection log/reports to document all construction activities to include items above, manpower and equipment usage, other inspection actions, testing, any field directions given to the Contractor, weather conditions, unusual site conditions that would or may result in Contractor claim for money or time. This inspections report shall be submitted to the District's Construction Manager with a weekly summary at the end of each week.

3.8.8. Field Investigation / Testing

The Consultant shall provide technical support in the form of a qualified field technician on an on-call basis to provide construction services. This technician shall be well qualified in field inspection of concrete placement, soil compaction, paving, and the writing of required Project reports. The Consultant shall provide construction material testing services on an "as-needed" basis as directed by the District. The type of service shall conform to one of the following categories:

3.8.8.1. Field Sampling and Testing

Field sampling and/or testing of construction materials, and/or preparation of field test samples, including but not limited to, Portland cement concrete, asphalt concrete, reinforcing steel, structural steel, soils, wood, masonry, pre-manufactured construction

components (such as pre- and post-stressed concrete elements, concrete pipe, asbestos cement pipe), and other similar materials.

3.8.8.2. Laboratory Testing

Laboratory testing of sampled materials. For soil, such tests may include maximum density/optimum moisture content determinations, gradations, plasticity index, permeability, calcium carbonate and other mineral content tests, and similar soil tests. Other material tests may include compression and tensile testing, shrinkage tests, mix designs, and other defined tests for concrete, grout, flowable grout, roller compacted concrete, cement stabilized aggregate, and soil cement. Other materials may require tests, such as geotextiles or geomembranes, as appropriate and defined by nationally recognized standard organizations.

3.8.8.3. Evaluation of Tests

Technical evaluation of test results with respect to defined improvements; the evaluation being prepared by or under the direct supervision of an Arizona registered civil engineer.

3.8.8.4. Additional Terms and Conditions

The presence of the Consultant's or its subcontractor's field personnel, either full-time or part-time, may be for the purpose of providing Project administration, assessment, observation and/or field testing of specific aspects of the Project, as authorized by the District. Should a contractor(s) not retained by the Consultant be involved in the Project, the District will advise such contractor of the extent of the Consultant's responsibilities while on the Project site. Contractor(s) will be solely and completely responsible for working conditions on the job site in accordance with the existing contract between the Contractor and the District.

Test specimens or samples that are generally consumed or substantially altered during testing and any remnants may be disposed of immediately upon completion of tests. Remaining samples and other specimens may be disposed of thirty (30) days after submission of the Consultant's report unless otherwise directed by the District.

At the District's written request, the Consultant will retain preservable test specimens or the residue there from for thirty (30) days after submission of the Consultant's report free of storage charges. After the initial thirty (30) days and upon the District's written request, the Consultant will use its best efforts to retain test specimens or samples but only for a mutually acceptable storage charge and period of time.

The Consultant's laboratory shall be certified to state or national standards as specified in each task assignment.

3.8.9. Engineering & Technical Support

Provide engineering and technical support in regard to quantities, problem analysis, change orders, as-builts, with the analysis of problems that arise with result in any structural change or

any alteration, Assist the engineer in the analysis of the alternative actions with will lead to the best solutions

3.8.10. Deliverables

(District's Project Manager to insert all anticipated deliverables and number of copies required)

3.9. Scope of Work - Operations and Maintenance

Section Not used at this time.

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4.2. Environmental and Cultural Resource

4.2.1. Cultural Resources –Planning Studies

4.2.1.1. General Requirement

Any ground disturbing work (e.g. geo-technical and construction work) shall require a Class III Cultural Resource Survey in the proposed disturbance area before the work is performed. Depending on the property ownership of the proposed disturbance area, a SHPO clearance may be required before work is initiated. The District is responsible for obtaining any required rights of entry before the cultural resource field work is conducted.

4.2.1.2. Class I Cultural Literature Search

Using Arizona State Museum (ASM) guidelines, Consultant shall conduct archival research to identify any known prehistoric and historic resources for the entire Project study area, plus the standard one-mile buffer around the Project study area boundaries.

4.2.1.3. Cultural Resources Summary Report

The Consultant shall prepare a report summarizing the results of the Class I Cultural Literature Search findings including, but not limited to, location, site size, type, physical features, current condition, significance, and bibliographic references.

The Consultant shall include a standard table of this information in the report.

The Consultant shall locate all identified cultural resources on full-scale USGS 7.5-minute quadrangle topographic maps, on large-scale aerial photographs, and/or as approved by the District's Project Manager. This information is confidential and is for internal use only by the District.

The Consultant shall submit the GIS shape files developed to show cultural resources.

4.2.2. Cultural Resources –Design Studies

4.2.2.1. General

The Consultant perform Class III Cultural Resource Survey and prepare appropriate documentation in accordance with the National Historic Preservation Act, the Archeological and Historic Antiquities Act of 1974, the Archeological Resources Protection Act of 1979, the Native American Graves Protection Act of 1990, the State Historic Preservation Act of 1982, the Arizona Antiquities Act of 1992, NPS Bulletin 38 on Traditional Cultural Properties, and any other local, State, and Federal regulations that are applicable when Project surveys are initiated. The documentation will be used by the District and consulting parties to guide discussions, review, and obtain cultural resources clearance of the Project area. The District's objectives are to avoid and minimize impacts to cultural resources when practicable.

4.2.2.2. Site Investigation

The Consultant shall arrange for access to the Project site with the District, and obtain all necessary permits. The District will provide the Consultant with aerial photographs depicting the Project area and obtain the rights-of-entry. The Consultant shall submit a "Notification of Intent" to conduct the survey to the ASM and other appropriate Federal or State agencies. The Consultant shall not collect artifactual materials encountered during the survey. The survey will provide intensive (100%) coverage of the permanent rights-of-way and all temporary construction easements within the Project area. The Standard Survey Method for the (100%) intensive pedestrian survey is parallel transects with swaths spaced no more than 20 meters (65.6 ft) apart.

The Consultant shall make field records according to the following:

- The determination of the significance of a cultural resource site will be based on Federal, State, Tribal, and/or ASM definitions and criteria as appropriate.
- In accordance with current standards as interpreted by the lead agency in consultation with SHPO.
- Isolated Prehistoric and historic artifacts shall be recorded as directed by the lead agency in consultation with SHPO.
- All Project sites shall receive official ASM site designation, and all ASM site cards and records shall be properly completed.
- Each site shall have a site map.

4.2.2.3. Site Documentation

The Consultant documents the sites by photographing all surface archeological features.

The Consultant shall delineate the sites on aerial photographs.

The Consultant shall provide the Global Positioning System (GPS) coordinates for each site in the report and on the aerial photograph.

The Consultant shall provide a daily journal of all relevant aspects of the Project. The Consultant shall produce a professionally acceptable report describing the results of the survey.

4.2.2.4. Coordination

The Consultant shall coordinate with the District, ASM, SHPO, and others as appropriate. If significant cultural resource sites are located in the Project area, the report shall document reasonable alternatives, which may result in avoiding, limiting, or mitigating adverse impacts that 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 separate appendices.

4.2.2.5. Analysis

The Consultant shall assess the type and level of direct, indirect, and potential impacts to all historic properties within the Project area. 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.

4.2.2.6. Mitigation Plan

If necessary, the Consultant shall develop and document a mitigation plan that meets all permit and regulatory requirements that shall be incorporated into the final design plan. Additionally, the mitigation plan shall address stakeholder concerns and issues.

The Consultant shall submit the mitigation plan for review and approval as a section in the Environmental Overview Technical Memorandum.

The final design for the Project shall incorporate the final approved mitigation plan and include separate line(s) item cost for performing the tasks for the performing the mitigation measures.

4.2.3. Biological Resources – Planning Studies

4.2.3.1. Field Reconnaissance

Using high resolution aerial photographs as a guide, Consultant shall conduct a "broad brush" field reconnaissance to evaluate vegetation types, significant habitat patches, and any other biological aspects present (e.g. a conservation area or preserve) of the entire Project study area. The Consultant shall invite the District to attend the field reconnaissance. The District will provide aerial photographs and obtain rights of entry if necessary. GPS points and digital photographs shall be taken where appropriate for use in the Summary Report.

4.2.3.2. Access AZGFD Heritage Data Management System

The Consultant shall access the AZGFD Heritage Data Management System to determine if there are any special status species that have been located in the Project area vicinity. In addition, the Consultant shall review the special status species list in Maricopa County to determine if any of the listed plants or animals are likely to occur in the Project area based on their habitat and ecological requirements and the existence of suitable habitat within the Project area.

4.2.4. Biological Resources – Design Studies

4.2.4.1. Biological Surveys

The Consultant shall perform a 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 clearances of the Project area.

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

The Consultant will conduct a biological survey of all areas that may be disturbed during construction and operation of the Project, including temporary construction easements and proposed maintenance roads. Using aerial photographs, agency coordination, and field inspections, the Consultant survey shall document:

- The vegetation and habitat types that will be affected by the Project implementation.
- The potential for Threatened and Endangered Species and their designated critical habitat to be in the Project area.
- The presence of other protected species in the Project area (e.g., birds protected by the Migratory Bird Treaty Act that may be breeding in the area, plants protected by the Arizona Native Plant Law, etc.).

4.2.4.2. Mapping

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 vegetation communities and wildlife species, and all threatened or endangered species. These species may include both terrestrial and aquatic species. The Consultant shall prepare a report documenting the results.

4.2.4.3. Biological Assessment and Consultation with USFWS

This work may not be 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.

If, based on the results of the Biological Survey, the Consultant determines that the Project may affect a listed or proposed threatened or endangered species or affect critical habitat, the Consultant shall immediately notify the District. The District will be responsible for initiating 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 affect 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.

The Consultant shall coordinate at least once a week with the District Agent by telephone. If significant problems exist, the Consultant will notify the District Agent within 24 hours.

4.2.4.4. Wetlands Delineation

This work may be 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.

If potential wetlands are identified based upon the results of the ecological assessment, the Consultant shall perform 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.

4.2.4.5. Permit/Regulatory Requirements

The Consultant shall develop a mitigation plan that meets all permit and regulatory requirements for the final design plan. Additionally, the mitigation plan shall address stakeholder concerns and issues.

The final design for the Project shall incorporate the mitigation plan and include separate line(s) item cost for performing the tasks for the performing the mitigation measures.

4.2.4.6. Biological Resources Summary Report

Consultant shall submit the summary report for review and approval as a section of the Environmental Overview Technical Memorandum. The report shall include the mitigation plan, estimated costs for the mitigation, references to applicable regulatory requirements and the minimum required mitigation. The document shall also include all supporting documentation to develop the mitigation plan which may include but not limited to: results of the Field Survey's findings including locations and descriptions, GPS points, photographs taken, [USGS maps or high resolution aerial maps?] to show significant habitat areas and other biological aspects of note, and concept drawings and narrative description of the proposed mitigation plan.

4.2.5. Hazardous Materials – Planning Studies

A Hazardous Materials Overview will not be required in Phase I of the Planning Study [Phase I - where brainstorming occurs and first, large set of alternatives is generated].

In Phase II of the Planning Study, Consultant shall provide a Hazardous Materials Overview which includes findings from a search of the Environmental Data Resources, Inc. database, or equivalent, and its respective search radius (ASTM 1527-00 or newer) for each Phase II alternative.

The results shall appear as a summary report, a table showing - where known - the source and type of contamination, the status of the site (i.e. closed or open), and the potentially-responsible party/parties, and an aerial photograph with the locations of the regulatory sites shown. In addition, potential contaminated sites (e.g. illegal dumping, large areas of stained soil, etc.) that were observed during any field reconnaissance for other tasks shall also be documented on the aerial photograph and noted in the table.

Consultant shall include in the Environmental Overview Technical Memorandum the results of a Hazardous Materials site search and review using the Environmental Data Resources, Inc. database and its respective search radius (ASTM 1527-00) for each Phase II alternative. The results of the findings shall include - where known - the source and type of contamination, the status of the site (i.e. closed or open), and the potentially-responsible party/parties.

Consultant shall document the locations of the regulatory sites that may require remediation on aerial photographs. In addition, potential contaminated sites (e.g. illegal dumping, 55-gallon drums, large areas of stained soil, etc.) that were observed during field reconnaissance for other tasks shall be documented on the same aerial photographs.

For the Preferred Alternative, Consultant shall provide recommendations for further study and relative costs, including for testing and mitigation if required, for use in the Implementation Plan.

4.2.6. Hazardous Materials – Design Studies

4.2.6.1. General

The Consultant shall conduct a Phase I Environmental Site Assessment (ESA) and prepare a corresponding report as a section in the Environmental Overview Technical Memorandum for the defined Project area. The Phase I ESA should be conducted before the District acquires land or easements for a Project. If rights-of-entry are necessary to access property, the District will obtain them for the Consultant. The Phase I ESA shall be conducted in accordance with ASTM 1527-00 (or the most current ASTM standards for Phase I ESAs) and any other current applicable local, state, or federal regulations.

Upon the results of the Phase I ESA, the Consultant shall provide a recommendation to perform further investigations for a Phase II Investigation or Phase III remediation.

4.2.6.2. Mitigation Plan

The Consultant shall develop and document a mitigation plan that meets all permit and regulatory requirements that shall be incorporated into the final design plan. Additionally, the mitigation plan shall address stakeholder concerns and issues.

The Consultant shall submit the mitigation plan for review and approval as a section in the Environmental Overview Technical Memorandum.

The final design for the Project shall incorporate the final approved mitigation plan and include separate line(s) item cost for performing the tasks for the performing the mitigation measures.

4.2.7. Environmental Overview Technical Memorandum – Planning Studies

Consultant shall prepare an Environmental Overview Technical Memorandum that will be used during the Project and Alternative Analysis process to evaluate the environmental issues and impacts associated with each Phase II alternative. The Technical Memorandum shall address each of the following areas.

- Consultant shall determine the potential impacts of each Phase II alternative on the identified cultural resources and biological resources in the Area of Project/Potential Effect (APE). Emphasis shall be placed on significant cultural sites and Special Status Species present in the APE. Consultant shall recommend methods to avoid or minimize any adverse effects the Proposed Alternatives may have on the cultural and biological resources present. If the adverse effects cannot be avoided or minimized,
- Consultant shall estimate the general costs for mitigation.
- Consultant shall also identify any opportunities for enhancing or restoring cultural and biological resources for the Proposed Alternatives. If the Recommended Alternative is not the "least environmentally damaging practical alternative", CONSULTANT shall briefly summarize the reason the alternative was chosen instead of the other Preferred Alternatives. This documentation shall be included in the final Planning Document.

Consultant shall include in the Environmental Overview Technical Memorandum the results of a Hazardous Materials site search and review using the Environmental Data Resources, Inc. database and its respective search radius (ASTM 1527-00) for each Phase II alternative. The results of the findings shall include - where known - the source and type of contamination, the status of the site (i.e. closed or open), and the potentially-responsible party/parties.

Consultant shall document the locations of the regulatory sites that may require remediation on aerial photographs. In addition, potential contaminated sites (e.g. illegal dumping, 55-gallon drums, large areas of stained soil, etc.) that were observed during field reconnaissance for other tasks shall be documented on the same aerial photographs.

For the Preferred Alternative, Consultant shall provide recommendations for further study and relative costs, including for testing and mitigation if required, for use in the Implementation Plan.

4.2.8. Environmental Overview Technical Memorandum – Design Studies

The purpose of the Environmental Evaluation for the design phase of proposed flood control Projects is to conduct a more site-specific environmental evaluation of the Project area. The Project area and proposed impacts will be well defined for the Consultant.

The Consultant shall perform the following tasks as identified unless otherwise stated.

- Phase 1 Environmental Site Assessment
- Biological Surveys
- Biological Assessment and Consultation with USFSW
- Cultural Resource Survey
- 404 Jurisdictional Delineation
- Title VI Environmental Justice Assessment

4.2.9. Social Population And Demographic Study ("Environmental Justice")

Consultant shall conduct a Social Population and Demographics study that addresses the Principals and Guidelines "Other Social Effects Account" based on the United States Census Bureau current decennial census data reported for the most recently available census year. Title VI of the Civil Rights Act and related statutes, along with Executive Order 12898 on Environmental Justice, will be addressed as follows:

- Identify US Census Bureau Census Tracts/Block Groups for the Project study area.
- Review US Census Bureau data sets from most recent census year for Title VI/Environmental Justice populations:
- Total Population/Population Demographics
- Racial and Ethnic Populations/Demographics
- Low-Income Populations/Demographics
- Population by Age/Elderly Demographics
- Disabled Population/Demographics
- Female Head-of-Household Demographics
- Limited English Proficiency (LEP) Population/Demographics
- Review demographic data provided by MAG, CAAG, Department of Economic Security
- Perform Data Set Calculations
- Analyze Census Data
- Provide a Summary on Population and Demographic Characteristics
- Identify Populations with the Potential for Disproportionate Adverse Impacts
-

Consultant shall prepare a draft and final Social Populations and Demographics Study Technical Memorandum.

4.3. Geomorphology

To be developed at a later date.

4.4. Geotechnical

This Section shall be developed for each specific Project. It is critical that the various purposes for performing the geotechnical investigations is clear in the project scope of work, for example:

- The determination of the hardness of excavated material so appropriate costs and project impacts can determined such as rock or cemented soil.
- Lenses of sand and other non-cohesive materials in considering constructability and stability of open cuts.
- Cobbles that may impact excavation.
- Trash that may be encountered during excavation.
- Ground water level and the impacts thereof.
- Any other specific information needed to adequately design, bid and construct the project

The following are typical considerations for Design Investigations.

4.4.1. Field Tests

Borings shall be performed along the project alignment by a truck-mounted drill rig. Each boring will be advanced to approximately 10 feet below the lowest structural element. For estimating purposes, each boring is assumed to have a maximum depth of 20 feet. A Maricopa County Dust Control Permit will be obtained and dust control measures, such as a rubber-tire water truck with operator will be implemented during fieldwork.

One boring will be performed by a truck-mounted drill rig at each low flow crossing or proposed culvert location to approximately 10 feet below the lowest structural element. For estimating purposes, each boring is assumed to have a maximum depth of 20 feet. Each location is assumed to require the drafting of a traffic control plan and the use of traffic control devices during field activities. A Maricopa County Dust Control Permit will be obtained and dust control measures, such as a rubber-tire water truck with operator, will be implemented during fieldwork.

Test pits will be performed along the channel alignment. The objective of the tests pits will to provide supplementary data to the boring program and to provide representative bulk samples for laboratory analysis to provide grain size distribution data to the design team. A Maricopa County Dust Control Permit will be obtained and dust control measures, such as a rubber-tire water truck with operator will be implemented during fieldwork.

Anticipated test location shall be provided to the District in advance of any field test, since cultural surveys or other clearance may be required prior to subsurface explorations. Additionally, Right-of-Entry may also be required prior to field testing.

Seismic refraction and/or testing methodology shall be used as necessary and as described in the SOW for purposes of determining subsurface conditions as required

4.4.2. Fissures

An earth fissure and subsidence data review and field reconnaissance will be conducted prior to the geotechnical boring and test pit fieldwork. The objective of this study will be to attempt to identify earth fissures which may be expressed at the surface or in aerial photographs as lineations within the Project area and within the areas immediately adjacent to the Project area. If suspect lineations are identified, then these features may be excavated and logged as part of the test pit program in an attempt to confirm or deny the presence of earth fissures. Another objective of this study will be to review historical subsidence data in an attempt to quantify the magnitude of subsidence which has occurred at the site. With this data, we may be able to quantify the subsidence which may be expected to occur over the life of the Project. The results and recommendations of this effort will be presented in the geotechnical report.

4.4.3. Detention basin geotechnical borings

(Where applicable): If the need for a detention area is identified by the design team, then additional borings may be performed upon approval from the District. The results of tests as defined below will be included in the geotechnical report.

4.4.4. Lab Tests

The following tests shall be performed in a quantity to be determined in collaboration with the District:

- Include agronomy tests along the length of proposed channel alignments.
- Sieve analysis,
- Plasticity index tests,
- Consolidation,
- Swell
- Ring density and moisture content
- Standard proctor
- PH and resistivity,
- Sulfate and chloride

4.4.5. Earth Fissure Hazard Mitigation Plan

If the presence of an earth fissure(s) are confirmed to be within the Project area, or if a confirmed earth fissure trace is documented to be trending towards the Project area from a nearby offsite location, then an Earth Fissure Hazard Mitigation Plan will be drafted upon approval from the District. This plan may include additional documentation and field mapping of the fissure(s) and recommendations for fissure monitoring during and after construction of the channel. In addition, this report may contain design recommendations intended to mitigate the effects should an earth fissure activate within the Project easement.

4.5. Hydraulics

The Consultant shall follow the procedures outlined in the Drainage Design Manual (DDM) for Maricopa County, Volume 2 Hydraulics, latest version, for all required design, modeling and calculations.

For earth-lined channels, hydraulic analysis shall include a range of Manning "n" values to be determined in collaboration with District staff: low "n" values representing non-armored and/or non-vegetated conditions immediately after construction to determine velocities for assessing scour; high "n" values representing mature landscaping prior to maintenance for assessing channel capacity and freeboard.

Appropriate methodology as determined by the District shall be used to assess or verify channel performance of open channel hydraulics and for analyzing closed conduits such as storm drain pipes and box culverts. For final design where accurate and sufficiently detailed topographic information is available, HEC-RAS shalled be used to verify hydraulic performance of open channels. For pipes and closed conduits, various methods are acceptable including Culvert Master, SWMM, HY8, WSPGW, StormCAD and others.

Earth-lined channels shall be designed for stability with respect to erosive velocities. Where the channel gradient is such that erosive velocities occur for the design flow, grade control structures should be utilized and the gradient and conveyance section should be adjusted to provide non-erosive velocities.

Channels shall provide a minimum gradient within the low flow portion to avoid ponding of water and associated vector problems.

4.6. Hydrology

The hydrology shall be developed at a level of effort appropriate for the Project type and as specified in the Project Scope of Work.

4.6.1. Procedures

The Consultant shall follow the procedures outlined in the Drainage Design Manual (DDM) for Maricopa County, Volume 1 Hydrology, latest version, for all hydrologic modeling and calculations including rainfall, losses, and channel and storage routing.

- Subbasins - 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 any other control feature located along the canals and railroads being studied.
- Channel Routing: Average cross sections will be developed using the 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 RAS will be adjusted after the HEC RAS cross sections are available. The resulting velocities and depths, for all reaches, must be assessed for realistic values.
- Storage 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.

4.6.2. Modeling

4.6.2.1. Computer Based Model

The Consultant shall use a detailed computer-based model, approved by the District, to develop the flows at significant inflow locations.

If the U.S. Army Corps of Engineers computer program HEC-1, Version 4.1 is used to develop the flows, the Consultant shall use the District's Drainage Design Management System for Windows (DDMSW), (latest version) to develop the hydrologic model for the area

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.

Output of the computer model must be reviewed to see if the peak flows and volumes are realistic. Adjustments to input for obtaining the most realistic results are normal to the scope.

The CONSULTANT is required to obtain the approval of the DISTRICT at each of the following steps:

- Subbasin boundaries
- Soil maps, watershed boundary maps, land use maps and HEC 1 parameter estimation
- HEC 1 flow diagram and input parameters
- Locations of hydraulic barriers
- HEC 1 results

4.6.3. Documentation

4.6.3.1. General

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.

4.6.3.2. Tables and Figures for the appendices:

- 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 one (1) inch = 2000 feet.
- Soils map(s) at the same scale as the base map (with References).
- Land use map(s) at the same scale as above (with References).
- Schematic map for the HEC 1 showing the topography, sub basins (area, Tc), the flow paths, the routing reaches (length, slope, friction, width, velocities, transmission losses, etc.), order of combining the hydrographs, channel, pipe or culvert dimensions (where appropriate). On the final version of the HEC-1 schematic include peak discharges at major concentration points.
- Pertinent data on all the structures in the watershed (such as spillway elevation, rating curves, etc.).
- 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.

4.7. Landscape Planning & Design

The purpose of these services is to develop and implement solutions that provide effective flood protection, complement and enhance the landscape settings of Maricopa County, protect the natural resources of floodplain and their beneficial functions and achieve acceptance from local communities, other public agencies and stakeholders.

4.7.1. General Provisions

4.7.1.1. Staff Qualifications, Roles and Responsibilities

All work in this Chapter shall be carried out under the direct supervision of a landscape architect who is licensed in the State of Arizona, unless otherwise approved by the District's Project Manager.

The Consultant Landscape Architect shall be knowledgeable and experienced in the application of the principles of landscape architecture to the planning and design of large scale flood hazard mitigation solutions.

The Consultant landscape architect shall have a demonstrated understanding of the functional requirements related to the full range of flood hazard mitigation solutions that are routinely considered by the District in Project planning and design and shall have a demonstrated ability to assess the valued characteristics of landscape settings and skill in the use of this information and the application of the design arts to develop integrated solutions that are complementary to the physical and visual environment, acceptable to the community and effective in reducing flood hazards.

The Consultant Landscape Architect shall exercise a leadership role in promoting the integration of the principles of landscape architecture in all phases of the planning and design of flood hazard mitigation solutions in accordance with the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects, December 16, 1992. The Consultant Landscape Architect shall actively participate in all phases of Project planning, design and implementation as appropriate or required.

4.7.1.2. Approach and Coordination

The Consultant shall implement the District's CSFHM Planning and Design Approach for all Projects, unless otherwise stated in writing by the District. This approach is intended to serve as a framework for development of CSFHM solutions that integrate the three basic functions of being acceptable to local communities, compatible with the environment and effective in reducing the risks of flooding.

In accordance with District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects, the Consultant shall fully integrate, as appropriate, landscape architectural aspects throughout all phases of Project planning, design and implementation utilizing an interdisciplinary approach.

The Consultant shall include, as a part of the Project work plan, a process workflow chart and schedule that coordinates the timing of all work tasks and deliverables in this Chapter with all other tasks that are undertaken to carry-out the Project. The District will provide a sample of this work product if requested by the Consultant.

The Consultant shall complete and submit all data collection and analysis tasks and deliverables prior to the initiation of alternatives formulation for all planning and Project pre-design studies to ensure that this information is available to be used in the formulation and evaluation of the alternatives

The Consultant shall ensure that all landscape architectural components outlined in this Chapter are included as an integral part of all submittals for planning studies and Project pre-designs and designs. Submittals that fail to include the integrated landscape architectural components will be considered incomplete and will be returned to the Consultant for completion and re-submittal.

The landscape architectural planning and design aspects shall be discussed as a separate agenda item at each Project meeting. A separate one (1) hour breakout meeting may be held at the conclusion of each Project team meeting once monthly, or more frequently, for the purpose of reviewing the status of the landscape architectural aspects of the Project.

The landscape architectural aspects of will be evaluated and coordinated with District Operations and Maintenance staff at key milestones in the Project to ensure compatibility.

4.7.2. References

The Consultant shall utilize the information contained in the references listed in 1.4.4, References & Other District Guidance Documents: as guidance for completing the tasks and deliverables outlined in this section. The Consultant shall utilize the resource information contained in these references to the maximum degree and shall minimize the collection or creation of redundant or otherwise un-necessary data.

The Consultant shall utilize the land and resource goals and objectives listed in the SOW as guidance and direction for developing and implementing multiple-purpose CSFHM plan solutions. These goals and objectives establish standards for CSFHM solutions and protection of the natural resources of floodplains and their beneficial functions. They also are intended to guide the data collection and analysis efforts, focus the scope of the alternatives and provide a frame of reference for measuring and evaluating the performance of alternative solutions.

4.7.3. Data Delivery Standards for Landscape Architectural Submittals

All work submitted shall bear the 'wet seal' and original signature of the responsible registered landscape architect.

All reports shall be submitted in 8-1/2x11 inch format and may include 11x17 inch maps and tables inserted as foldouts.

All maps and drawings shall be submitted in a format that is consistent with the District's data delivery standards and as agreed to by the District. Digital copies of all graphics prepared shall be provided to the District in a format as directed by the District's Project Manager.

4.7.4. Project Aesthetic Advisory Committee

The District will form and convene a Project Aesthetics Advisory Committee (PAAC) in accordance with the provisions of the District's Policy for the Aesthetic Treatment and Landscaping of flood Control Projects, December 16, 1992, to assist in the development of context sensitive multiple-purpose flood hazard mitigation solutions that are acceptable to the local community, stakeholders and other organizations. The PAAC will assist in the identification of multiple-purpose functions, features and concepts to be incorporated into plan alternatives, recommended plans and Project designs. It will provide reviews and input to the Project goals and objectives, issues, the land and resource data collection and analysis, alternatives formulation and analysis and components of the recommended plan or design. The PAAC will include:

a) The District's Project Manager, Landscape Planner, Environmental Planner and Public Involvement Coordinator;

b) the Consultant Project Manager and Landscape Architect;

c) Agency representatives, stakeholders, local community representatives and private citizens having an interest in the multiple-use aspects and context sensitivity of the Project;

d) Other landscape architects and knowledge experts capable of providing peer reviews and creative input. The District will have responsibility for obtaining agreement and consensus within the PAAC and approval of the recommendations of the PAAC.

4.7.4.1. Documentation

The Consultant Project Manager and Landscape Architect shall participate in all activities of the PAAC and shall document and distribute the results of all PAAC meetings within 5 working days following each PAAC meeting.

The Consultant shall incorporate the recommendations of the PAAC as directed by the District's Project Manager into the Project, subject to the approval of the District. Up to four PAAC meetings may be required for the Project.

4.7.4.2. Schedule

Unless otherwise directed in writing by the District and within 14 days of the Notice to Proceed, the Consultant shall provide a schedule for the Project PAAC meetings. Each PAAC meeting shall be scheduled to take place a minimum of 10 working days in advance of a corresponding public meeting unless otherwise directed by the District.

4.7.4.3. PAAC Meeting Objectives

The following is intended as guidance for defining the purpose, desired outcomes and subject matter of the four PAAC Meetings:

(a) PAAC Meeting Number One

Describe the purpose and role of the PAAC

Provide an overview of the Project including its purpose; need; scope; history and direction from previous phases, if any; planning process; schedule, including PAAC and public meetings; and range of possible solutions

Provide an overview of the data collection and analysis pertaining to the land and resource, community and flooding contexts

Solicit feedback from the PAAC regarding Project goals and objectives, issues, data collection and analysis, and other desired functions including opportunities for multiple-uses, desired landscape design themes and other enhancements

(b) PAAC Meeting Number Two

Present and receive feedback on the preliminary alternatives for planning studies including the proposed Flood hazard mitigation strategies, structure types and their sitting, proposed structural methods and landscape design themes.

Present and receive feedback on the preliminary design alternatives for design Projects, including site design alternatives and the sitting, arrangement, configuration and preliminary aesthetic treatment concepts for Project components

Brainstorm and develop additional landscape design themes for Planning studies and design motifs for Project pre-designs

(c) PAAC Meeting Number Three

Present and receive feedback on the landscape architectural design of the aesthetic and multiple-use features of the proposed alternatives in planning studies and the site and facility designs contained in 30% Project designs

(d) PAAC Meeting Number Four

Present and receive feedback on the landscape architectural designs for the Project components and multiple-use features contained in the recommended plans for planning studies and Project pre-designs, and the 60% Project design submittal

4.7.5. Planning Studies

The work tasks identified in this Section are referenced to and are a part of the work tasks outlined in 3.5, Scope of Work – Planning Studies.

4.7.5.1. General Objectives

The Consultant shall provide an integrated assessment of the community, land & resource and flooding contexts of the Project study area and its surrounds that identifies the range of flood hazard mitigation solutions that are acceptable to local communities, compatible with the environment and effective in reducing the risks of flooding.

The Consultant shall utilize the range of CSFHM solutions identified in the integrated assessment of the community, land & resource and flooding contexts as the building blocks for development of context sensitive Project alternatives.

The Consultant shall provide an assessment of opportunities for capturing other desired multi-use functions as a part of flood hazard mitigation solutions. The CONSULTANT shall utilize the assessment of opportunities for capturing other desired functions to select, organize and arrange solutions found within the range of CSFHM solutions into alternatives that emphasize performance of various other desired multi-purpose functions and other Project goals and objectives.

The Consultant shall evaluate the performance of the alternatives in meeting the goals and objectives of the community, land & resource and flooding contexts established over the course of the study.

The Consultant shall provide a cost estimate for each alternative that includes the cost of landscaping, aesthetic and multiple-use features of the Project.

The Consultant shall prepare a recommended plan containing floodplain management strategies and implementation methods, including development and resource protection guidelines and conceptual designs and design guidelines for all structural solutions.

4.7.5.2. Project Direction

The District will provide the Consultant with the initial Project specific goals, objectives and required basic functions for development of CSFHM solutions and other desired Project goals, objectives and functions related to the flooding and land & resource contexts at the Project kick-off meeting. The Consultant shall meet with stakeholders and representatives of local communities and other agencies to identify and document other desired Project specific goals, objectives and functions including multiple uses that are desired to be integrated into flood hazard mitigation solutions. The Consultant shall schedule this meeting to include the District's Project Manager and Landscape Architecture Branch representative.

4.7.5.3. The Range of Possible Flood Hazard Mitigation Solutions

The preliminary range of possible flood hazard mitigation solutions that shall be considered and evaluated in District planning studies are described and assessed in the flood hazard mitigation strategies, structure types, methods and landscape design themes handbooks referenced in 1.4.4, References & Other District Guidance Documents:. The range of

possible flood hazard mitigation solutions referenced in these handbooks shall serve as the basis for the analysis of acceptability, compatibility and effectiveness for the community, land & resource and flooding contexts for the planning study.

4.7.5.4. Inventory and Analysis

The Consultant shall provide an integrated assessment of the community, land & resource and flooding contexts of the Project study area and its surrounds that identifies the range of flood hazard mitigation solutions that are acceptable to local communities, compatible with the environment and effective in reducing the risks of flooding. The Consultant shall complete all tasks in this Section to the satisfaction of the District prior to initiating the formulation of alternatives.

4.7.5.5. Base Map

The Consultant shall prepare two (2) base maps of the study area, each with a maximum finished size of 36"x48" unless otherwise approved by the District. The first base map shall include a map display area (data frame) containing the study area boundary and an area of land extending a minimum of ten (10) miles beyond the perimeter of the study area boundary for use in displaying information at the regional scale of the study area. The second map shall contain a display area containing the study area boundary and an area of land extending one mile beyond the perimeter of the study area for use in displaying map information at the Project scale. Each map shall contain a one (1) inch border, legend area, map title, study title, north arrow, map scale and other information and graphics specified in the District's Standardized Guidelines for Graphics and Printed Material. The District will provide a sample of the deliverable for this product at the Project kickoff meeting. The Consultant shall obtain approval of this deliverable from the District prior to preparing the remaining map deliverables in this Section.

4.7.5.6. Existing and Planned Land Uses

Utilizing data provided by the District and the Project scale base map, the Consultant shall provide one (1) hard copy map each displaying the MAG existing and planned future land use categories. The Consultant shall obtain the most current existing and planned land use maps from local communities and land management agencies represented within the Project study area boundary and produce a consolidated existing and future land use maps for the study area. The Consultant shall perform a comparative analysis of the MAG and local community land use maps and make a recommendation to the District regarding the need to update either of the MAG land use maps. In the event the District elects to update the existing or planned future land use map for the study area, the Consultant shall translate the local community and land management agency land use codes contained on the consolidated local community land use maps into MAG equivalent codes and after review and approval by the District, the Consultant shall utilize the consolidated local community map and the approved MAG land use translation codes to produce an updated land use map(s) of the study area displaying the MAG land use codes.

4.7.5.7. Land & Resource Context Inventory and Analysis

The District will provide the Consultant with digital file copies of the map coverages and other data from the District's Landscape Inventory and Analysis (LIA) for the Project study area. This information will typically be provided at two scales: the regional scale and the Project scale. The regional scale will typically include regionally significant existing scenery, recreation and open space resources situated within ten (10) miles of the Project study boundary. The Project scale will typically include inventories of existing and planned landscape character, and existing recreation and open space resources situated within one (1) mile of the Project study boundary. The Project scale will also typically include landscape compatibility analyses for the range of possible flood hazard mitigation strategies, structure types, structural methods and landscape design themes for scenery, recreation and open space resources. The Consultant Landscape Architect shall review and develop a working knowledge of the District's Project LIA.

In the event the District elects to update the existing or planned future land use map for the study area, the Consultant Landscape Architect shall provide the following updates to the Landscape Character Inventory and Analysis in the Project LIA:

- Planned Future Cultural Settings Project map;
- Planned Future Landscape Character Units Project map;
- Planned Future Landscape Character Compatibility Class maps for flood hazard mitigation strategies, structure types and structural methods.

Utilizing information previously obtained from local communities, stakeholders and the public, the Consultant Landscape Architect shall update the Recreation and Open Space Inventory Project scale maps to include any existing or planned future parks, trails, open space or wildlife areas not presently shown on the maps provided by the District.

The Consultant Landscape Architect shall graphically distinguish existing and planned recreation and open space resources from one other on the updated maps.

The Consultant Landscape Architect shall provide a brief assessment of opportunities for integrating desired recreation use functions or enhancing existing recreation functions within the study area with various flood hazard mitigation solutions. This assessment shall include research into District land rights associated with existing structures to identify any restrictions on multi-uses.

Utilizing the Biological and Cultural Resource inventory maps prepared under another chapter of this scope of work and compatibility matrices provided by the District, the Consultant shall provide Biological and Cultural Resources Compatibility Class maps at the Project scale for the study area.

Utilizing the compatibility class maps from the preceding tasks, the Consultant Landscape Architect shall prepare two (2) sets of Combined Resources Compatibility Class maps for 1) flood hazard mitigation strategies; 2) structure types; and 3) structural methods. The first set shall be built using the compatibility class maps for existing landscape character units, existing recreation, open space, biological and cultural resources. The second set shall be built using the compatibility class maps for planned future landscape character units, existing recreation, open space, biological and cultural resources. The District will provide additional direction for producing this deliverable.

The Consultant Landscape Architect shall produce one (1) set of board mounted inventory maps at the regional scale by copying and pasting the MXD data layers contained in the District's LIA for the following: Landscape Character Physical Settings, Existing Landscape Character Cultural Settings, Planned Future Landscape Character Cultural Settings, and Open Space Resources. The Consultant Landscape Architect shall provide one (1) set of board mounted Project scale inventory maps utilizing the MXD data layers contained in the District's LIA for the following: Existing Landscape Character Units, Planned Future Landscape Character Units, Parks & Recreation Resources, Open Space Resources, Biological Resources and Cultural Resources. The Consultant Landscape Architect shall provide one (1) set of board mounted Project scale combined resources compatibility class maps utilizing the MXD data layers contained in the District's LIA for each of the maps.

4.7.5.8. Data Collection Report

The Consultant Landscape Architect shall document the findings and results of the inventory and analysis of the Land & Resource Context in the Study Data Collection Report. The report shall include:

The goals, objectives, required basic functions for context sensitive solutions and the goals and objectives related to other desired functions identified for the Project

A summary of the findings of the landscape inventory and analysis for each map including identification of the valued characteristics of the land & resource context that should be protected

The analysis of opportunities for incorporating other desired multiple uses into the range of possible flood hazard mitigation solutions.

The report shall include all of the regional and Project scale inventory and compatibility class maps produced in the inventory and analysis of the land & resource context.

4.7.5.9. Community Context Acceptability Analysis

The Consultant shall provide a predictive analysis of the acceptability of the range of flood hazard mitigation solutions to the local community, utilizing direction contained in local community general plans, plan elements and the land management direction contained in other agency land management plans situated within the Project study area. The

community context predictive analysis shall focus on an evaluation and comparison of the character, scale and probable magnitude of landscape modification that is likely to result from implementation of the range of possible flood hazard mitigation strategies, structure types, structural methods and landscape design themes in relation to the character, scale and acceptable level of modification that is reflected in local community plans and agency land management plans. The Consultant shall review the predictive analysis of the community context with representatives of local communities and land management agencies having jurisdiction within the study area and modify it as requested. Utilizing the delineations contained on the land use map and other relevant plan element information, the Consultant shall prepare a Community Context map of the study area. The Consultant shall utilize the approved predictive analysis of the acceptability of the range of flood hazard mitigation and the solutions and the Community Context map to produce individual Project scale Community Context Acceptability maps for:

- Flood Hazard Mitigation Strategies
- Structure Types;
- Structural Methods.

The Consultant shall document the results of the community context acceptability analysis and maps in the Data Collection Report.

4.7.5.10. Flooding Context Effectiveness Analysis

Utilizing the assessment and mapping of geomorphology, flooding types, flood risk, land use, flood exposure and flood hazards developed in another chapter of this scope of work, the Consultant shall provide a predictive analysis of the effectiveness of the range of flood hazard mitigation solutions to reduce the risks of flooding for the study area. Unless otherwise directed by the District, the Consultant shall utilize the base 100 year flood as the basis for evaluating the effectiveness of the range of flood hazard mitigation solutions. The predictive analysis shall focus on relative ability of the range of flood hazard mitigation solutions to effectively reduce flooding within the different classifications of flooding types, flood risk and flood exposure found within the study area.

The Consultant shall review the predictive analysis of the flooding context with the District and revise as directed by the District's Project Manager. The Consultant shall utilize the approved predictive analysis of the flooding context and the flooding context map components to produce individual Project scale Flooding Context Effectiveness maps of the study area for the following:

- Flood Hazard Mitigation Strategies
- Structure Types
- Structural Methods

.

The Consultant shall document the results of the flooding context effectiveness analysis and maps in the Data Collection Report.

4.7.5.11. Comparative Analysis

The Consultant shall provide a comparative analysis of the Land & Resource Context Compatibility Class maps, Flooding Context Effectiveness Class maps and the Community

Context Acceptability Class maps that identifies the range of floodplain management strategies and implementation solutions that will be concurrently effective, compatible and acceptable for various geographic areas within the study area. The District will provide additional direction for preparation of this deliverable. The Consultant shall document the results of the comparative analysis in the Study Data Collection Report.

4.7.5.12. Alternatives Formulation

Preliminary Alternatives Formulation and Analysis:

The Consultant shall utilize the range of effective, compatible and acceptable floodplain management strategies, structure types, structural methods and landscape design themes identified in the aforementioned comparative analysis of the Flooding, Land and Resource and Community contexts as building blocks for development of context sensitive Preliminary Alternatives.

All alternatives shall be designed to be context sensitive to the maximum degree possible. Utilizing a watershed based approach, flood hazard mitigation strategies shall be prescribed for the entire study area in each Preliminary Alternative.

In accordance with the direction in the Drainage Policies and Standards for Maricopa County, preserving natural channel systems is the preferred approach and shall be the focus of the planning effort wherever it can be effective in reducing the risks of flooding.

For all areas designated for application of the Control Flooding strategy, the Consultant shall schematically depict the location, configuration and approximate extent of all proposed flood control structural features and shall identify the structural methods and landscape design themes proposed for all structural solutions on the Preliminary Alternatives maps.

The Consultant shall design and depict the form and configuration of all structural solutions shown on the preliminary alternatives maps to emulate the characteristics described in the structure types, structural methods and landscape design themes handbooks referenced in 1.4.4, References & Other District Guidance Documents:.

For all geographic areas designated for application of the other strategies, the Consultant shall identify the implementation method(s) (tools) that are proposed for implementation of the strategy. If more than one tool is to be utilized within an area designated for a particular strategy, the Consultant shall subdivide the strategy area to differentiate the application of the different tools.

The Consultant shall also identify any multiple-use functions that are proposed for each strategy and implementation method on the Preliminary Alternatives maps.

The Consultant shall develop recommendations for channel lining type, Mannings N-Value and maximum velocity required to carry out the recommended structural methods and landscape design themes for use in the Normal Depth Analysis for all conveyance channel Projects shown in the Preliminary Alternatives.

(a) Analysis and Documentation

Utilizing the Landscape Inventory and Analysis maps and the Preliminary Alternative maps, the Consultant shall provide a written qualitative analysis (high, medium, low) of the performance of the alternatives in meeting the goals and objectives of the Land and Resource and Community contexts of the study area and provide a comparison of their differences in performance. This analysis and comparison of the alternatives shall include an assessment of the relative compatibility of the alternatives with the land and resource context of the study area. The Consultant shall submit the analysis of the alternatives to the District a minimum of five (5) working days prior to the Preliminary Alternatives Evaluation Meeting.

(b) Proposed Alternatives Formulation and Analysis

The Consultant shall refine the floodplain management strategies and implementation solutions contained in the Preliminary Alternatives that are selected for further study to improve their effectiveness in providing flood protection, compatibility with the landscape settings of the study area, protection of the natural resources of floodplains and their beneficial functions and acceptability to the community. The Consultant shall fine tune the boundaries of all areas proposed for application of floodplain management strategies and implementation solutions based upon further analysis of the study area. The Consultant shall identify preliminary resource protection guidelines, land use regulations, implementation methods and agency roles and responsibilities for each floodplain management strategy area. For all structural solutions, the Consultant shall identify the functional and spatial requirements for the flood control, aesthetic and multiple use functions of the Project and delineate them on the Proposed Alternatives maps. The Consultant shall provide one color rendered cross section drawing for each unique combination of structure type, structural method, landscape design theme and multiple-use emphasis contained in the Proposed Alternatives.

(c) Cost Estimate

The Consultant shall include the cost of the landscaping, aesthetic and multiple purpose components and the cost of the rights of way required for these components in the cost estimate for each alternative. The Consultant shall provide a comparison of the estimated cost and the estimated cost ceiling limits for

landscaping and aesthetic treatments and the multiple use components for each alternative.

(d) Analysis and Documentation

The Consultant shall document a quantitative and graphical analysis of the performance of the alternatives in meeting the goals and objectives of the Community, Land & Resource and Flooding contexts of the study area. The Consultant shall compare the performance of the Proposed Alternatives with the acceptability, compatibility and effectiveness predictive analyses to assess the extent to which each of the Proposed Alternatives are predicted to be acceptable to the community context, compatible with the land & resource context and effective in reducing the risks of flooding. The Consultant shall also assess the extent to which the Proposed Alternatives are predicted to perform the other desired goals, objective and functions identified for the study area. The Consultant shall submit the analysis of the alternatives to the District a minimum of five (5) working days prior to the meeting of the District and Consultant teams to evaluate the alternatives.

4.7.5.13. Recommended Alternative

The Consultant shall refine the landscape architectural and multiple-use concepts of the schematic plan of the Proposed Alternative that is selected as the Recommended Alternative based upon direction provided by the District.

(a) Conceptual Plans and Details

The Consultant shall prepare a 15% color rendered site development and landscape grading concept plan for each structural component of the Recommended Alternative utilizing the same map scale chosen to depict the engineering design concepts. The concept plans shall include the entire Project area for non-linear structures such as storage basins and segments extending for a length of 1000 feet linear Projects such as conveyance channels, channel levees, or flood retarding structures selected by the District.

The concept plans shall illustrate the location, extent and configuration all flood control and multiple use features of the Project including, but not limited to, the Project right of way, Project setback area, overall grading design, top and toe of slopes, islands, natural features to be preserved, low flow channel, inlets, outlets, grade control structures, weirs, walls, maintenance roads, public entry points, trails, other multiple-purpose features and use areas, and general planting design concept.

The Consultant shall identify the Structure type, structural method, multiple-use emphasis and landscape design theme for each Project on the concept plan sheet for each structural component.

Utilizing the Structural Guidelines contained in the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects and the District's Landscape

Design Guidelines in 1.4.4, References & Other District Guidance Documents:, the Consultant shall develop and include landscape design guidelines on the plan sheets for the Project setback limits, overall form, configuration and scale of the Project and its features, features to be preserved in place and the surficial treatment including materials, colors and textures and plant pallet to communicate the design intent for subsequent design implementation of the structural components of the Recommended Alternative. Additionally, the CONSULTANT shall provide a color rendered cross section illustrating the flood control, aesthetic and multiple-use features for each of the above design concept plans.

The Consultant shall prepare land use development guidelines designed to preserve or protect in place the valued natural resources and their beneficial functions for application to areas identified for implementation of the floodplain regulation management strategy.

The Consultant shall provide recommended implementation guidelines for any areas within the study area that are assigned to the floodplain preservation management strategy.

(b) Cost Estimate

The Consultant shall include the estimated cost of the landscaping and aesthetic treatment and multiple-use components of the recommended plan and comparison to the allowable costs per the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects.

(c) Analysis and Documentation

The Consultant shall document and provide a narrative summary of the goals and objectives pertaining to the Community, Land & Resource and Flooding contexts of the Project study area, the data collection effort, recommended land use and resource protection guidelines, and the aesthetic treatment, landscape architectural and multiple use concepts contained in the Recommended Plan.

4.7.6. Project Pre-Design

The work tasks identified in this Section are referenced to and are a part of the work tasks outlined in 3.5.4, DCR/Pre-Design. The Consultant shall provide all landscape architectural services necessary for the development of a context sensitive multi-purpose Project pre-design that provides effective flood protection, compatibility with the landscape settings of the Project area and acceptability to local communities, partners and stakeholders. The work tasks in this Section include: identification of Project specific goals, objectives and requirements; identification, analysis and integration of the functional and spatial requirements of flood hazard mitigation with the environmental, aesthetic and multi-purpose functions of the Project; development of a Project LIA and site analysis; formulation and analysis of CSHHM alternatives; development of a recommended Project site development concept plan and Project implementation and design guidelines to guide the final design phase of the Project; and development of cost estimates for the aesthetic and multi-purpose components of the Project.

4.7.6.1. Project Direction

The District will provide the Consultant with the initial Project specific goals, objectives and required basic functions for development of CSFHM solutions and other desired Project goals, objectives and functions related to the flooding and land & resource contexts at the Project kick-off meeting. The Consultant shall meet with stakeholders and representatives of local communities and other agencies to identify and document other desired Project specific goals, objectives and functions including multiple uses that are desired to be integrated into flood hazard mitigation solutions. The Consultant shall schedule this meeting to include the District's Project Manager and Landscape Architecture Branch representative.

4.7.6.2. Review

The Consultant shall review all work products generated from the efforts outlined in this section including the overall direction identified for the Project, the range of possible solutions that were considered, the inventory of the community, land & resource and flooding contexts for the Project area, the analysis of the range of flood hazard mitigation solutions that were determined to be acceptable to the community, compatible with the environment and effective in reducing the risks of flooding within the Project area, the alternatives formulation and analysis, and the flood hazard mitigation strategy, structure type(s), structural methods, landscape design theme, conceptual site plan, cross sections and landscape design guidelines identified for the Project.

4.7.6.3. Data Collection and Analysis

The Consultant shall complete all tasks in this Section to the satisfaction of the District prior to initiating the formulation of alternatives.

The Consultant shall provide a Project Functional Analysis that identifies and integrates the required flood protection, environmental, aesthetic and multiple-use functions of the Project and their spatial and other design requirements within the Project study area.

The Consultant shall prepare a base map of the study area as directed by the District. The District will provide a sample of the deliverable for this product at the Project kickoff meeting. The Consultant shall obtain approval of this deliverable from the District prior to preparing the remaining map deliverables in this Section

The District will provide the Consultant with a Project Landscape Inventory and Analysis (LIA) and design direction, including the flood protection structure type, structural methods, multiple-use emphasis, landscape design themes and design implementation guidelines for the Project study area from the ADMP, or alternatively, a summary of this information from the District's LIA for Maricopa County.

The Consultant shall visit the Project site to review and verify the information contained in the Project LIA maps provided by the District and to photo document existing conditions within and adjacent to the Project study area.

Utilizing the LIA as a framework and starting point, the Consultant shall provide a site analysis of the Project area to further identify and access existing site conditions, constraints and opportunities for locating the required functions of the Project within the Project study area. The site analysis may include, but is not limited to, an identification and analysis of landforms and topography, drainage patterns, vegetation, landscape character, important views and landscape focal points, scenic quality and existing visual conditions, biological and cultural resource features, existing and planned future land uses including utilities, roads, parks, trails and open spaces, and protected or otherwise distinctive or otherwise valued natural or cultural landscape features that should be preserved or retained in place.

Based upon the site analysis, the Consultant shall prepare an opportunities and constraints map(s) that will serve as a tool to guide the location and configuration of the components of the preliminary, proposed and recommended alternatives.

The CONSULTANT shall document the Project specific goals and objectives, the Project LIA, design direction, functional analysis, site analysis and Project design goals and objectives in the Project Data Collection Report for review and approval by the District.

4.7.6.4. Alternatives Formulation and Analysis

(a) Preliminary Alternatives

Utilizing the range of effective, compatible and acceptable floodplain management strategies, structure types, structural methods and landscape design themes identified in the Project LIA, and the Project site functional analyses, the Consultant shall develop preliminary CSFHM Project alternatives. All alternatives shall be

designed to be context sensitive to the maximum degree possible and to incorporate desired multi-use functions. In accordance with the direction in the Drainage Policies and Standards for Maricopa County, preserving natural channel systems is the preferred approach and shall be the focus of the planning effort wherever it can be effective in reducing the risks of flooding. Accordingly, the Consultant shall develop a minimum of one alternative that allocates the Preserve and Restore Natural Resources flood hazard mitigation strategy to all areas of the study area for which this strategy will be effective in reducing the risks of flooding. For all areas designated for application of the Control Flooding strategy, the Consultant shall schematically depict the location, configuration and approximate extent of all proposed flood control structural features and shall identify the structural methods and landscape design themes proposed for all structural solutions on the Preliminary Alternatives maps. The Consultant shall design and depict the form and configuration of all structural solutions shown on the preliminary alternatives maps to emulate the characteristics described in the structure types, structural methods and landscape design themes handbooks referenced in 1.4.4, References & Other District Guidance Documents:. For all geographic areas designated for application of the other strategies, the Consultant shall identify the implementation method(s) (tools) that are proposed for implementation of the strategy. If more than one tool is to be utilized within an area designated for a particular strategy, the Consultant shall subdivide the strategy area to differentiate the application of the different tools. The Consultant shall also identify any multiple-use functions that are proposed for each strategy and implementation method on the Preliminary Alternatives maps. The Consultant shall develop recommendations for channel lining type, Mannings N-Value and maximum velocity required to carry out the recommended structural methods and landscape design themes for use in the Normal Depth Analysis for all conveyance channel Projects shown in the Preliminary Alternatives.

Utilizing the Project LIA maps, the site analysis opportunities and constraints map(s) and the Preliminary Alternative maps, the Consultant shall provide a written qualitative analysis (high, medium, low) of the performance of the alternatives in meeting the Project specific goals and objectives of the Land and Resource and Community contexts of the Project area and provide a comparison of their differences in performance. This analysis and comparison of the alternatives shall include an assessment of the relative compatibility of the alternatives with the land and resource context of the study area. The Consultant shall submit the analysis of the alternatives to the District a minimum of five (5) working days prior to the Preliminary Alternatives Evaluation Team Meeting.

(b) Proposed Alternatives

The Consultant shall refine the flood hazard mitigation strategies and implementation methods contained in the schematic Preliminary Alternatives that are selected for further study, based upon comments provided by the District. The

Consultant shall fine tune the boundaries of all areas proposed for application of floodplain management strategies and implementation solutions based upon further analysis of the study area. The Consultant shall provide a conceptual plan view delineation of all structural features contained in each of the preliminary alternatives. The Consultant shall identify preliminary resource protection guidelines, land use regulations and implementation methods for each flood hazard mitigation management strategy area. The Consultant shall provide one cross section for each structural solution in the proposed alternatives containing a unique combination of structure type, structural method, landscape design theme and multiple-use functions contained in the Proposed Alternatives.

The Consultant shall provide a preliminary cost estimate for the landscaping, aesthetic and multi-purpose components contained in each of the Proposed Alternatives, including the cost of the rights of way required for these components. Utilizing the Cost-Ceiling guidelines contained in the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects, the Consultant shall provide a written estimate of the cost-ceiling limits for each of the alternatives. The Consultant shall provide a written comparison of the estimated cost and the estimated cost ceiling limits for landscaping and aesthetic treatments and the multiple use components for each alternative.

The Consultant shall provide a written quantitative analysis of the performance of the alternatives in meeting the goals and objectives of the Land and Resource and Community contexts of the study area. Utilizing the Project LIA maps, site analysis map(s), and the Performance Measures the Consultant shall provide a written quantitative analysis and comparison of the approximate differences in the performance of the alternatives in meeting the Project goals and objectives for the land and resource and community contexts. The Consultant shall submit the analysis of the alternatives to the District a minimum of five (5) working days prior to the meeting of the District and Consultant teams to evaluate the alternatives.

(c) Recommended Alternative

The Consultant shall prepare a 15% color rendered site development and landscape grading concept plan for each structural component in the Recommended Alternative utilizing the same map scale chosen to depict the engineering design concepts. The concept plans shall include the entire Project area for non-linear Projects such as storage basins, or typical segments extending for a length of 1000 feet for linear Projects such as conveyance channels, channel levees or flood retarding structures selected by the District. The concept plans shall illustrate the location, extent and configuration all flood control and multiple use features of the Project including, but not limited to, the Project right of way, Project setback area, overall grading design, top and toe of slopes, islands, natural features to be preserved, low flow channel, inlets, outlets, grade control structures, weirs, walls, maintenance roads, public entry

points, trails, other multiple-purpose features and use areas, and general planting design concept. The Consultant shall identify the Structure type, structural method, multiple-use emphasis and landscape design theme for each Project on the concept plan sheet for each structural component. Utilizing the Structural Guidelines contained in the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects and the District's Landscape Design Guidelines in 1.4.4, References & Other District Guidance Documents:, the Consultant shall develop and include landscape design guidelines on the plan sheets for the Project setback limits, overall form, configuration and scale of the Project and its features, features to be preserved in place and the surficial treatment including materials, colors and textures and plant pallet to communicate the design intent for subsequent design implementation of the structural components of the Recommended Alternative. Additionally, the Consultant shall provide a color rendered cross section illustrating the flood control, aesthetic and multiple-use features for each of the above design concept plans.

The Consultant shall prepare land use development guidelines designed to preserve or protect in place the valued natural resources and their beneficial functions for application to areas identified for implementation of the floodplain regulation management strategy.

The Consultant shall provide recommended implementation guidelines for any areas within the study area that are assigned to the floodplain preservation management strategy.

The Consultant shall provide a narrative summary of the goals and objectives pertaining to the Land and Resource and Community contexts of the Project, the data collection effort, recommended land use and resource protection guidelines, and the aesthetic treatment, landscape architectural and multiple use concepts contained in the Recommended Plan.

The Consultant shall prepare a written cost estimate of the landscaping and aesthetic treatment and multiple-use components of the recommended plan and an updated estimate of the cost-ceiling limits.

4.7.7. Project Final Design

The work tasks identified in this Section are referenced to and are a part of the work tasks outlined in 3.6, Scope of Work – Final Design and Construction Documents. The Consultant Landscape Architect shall provide all professional landscape architectural services for completion of final landscape architectural plans, designs and construction documents necessary to fully integrate landscape aesthetics, environmental protection and identified multiple-use functions into the final design of the Project. The work encompassed within this Section includes, but is not limited to: identification of Project goals and objectives; data collection and analysis; development of interim submittals and final design drawings and construction documents for the Project, including site layout plans, grading plans, facility designs and construction details, planting plans, irrigation plans, contract specifications, special provisions, detailed quantities, and cost estimates. The Consultant shall integrate landscape architectural aspects into all components of the Project including their location, form, layout and alignment, grading design, materials and landscape planting. The Consultant shall ensure the full integration of the landscape architectural aspects in all phases of the Project.

4.7.7.1. Project Direction

The District will provide the Consultant with the initial Project specific goals, objectives and required basic functions for development of CSFHM solutions and other desired Project goals, objectives and functions related to the flooding and land & resource contexts at the Project kick-off meeting. The Consultant shall meet with stakeholders and representatives of local communities and other agencies to identify and document other desired Project specific goals, objectives and functions including multiple uses that are desired to be integrated into flood hazard mitigation solutions. The Consultant shall schedule this meeting to include the District's Project Manager and Landscape Architecture Branch representative.

4.7.7.2. Data Collection, Analysis and Preliminary Design

The DISTRICT will provide the Consultant with a Pre-design for the Project, if available, including the functional analysis, site analysis, recommended site development plan and narrative report containing the goals and objectives, design direction and other information pertaining to the Project, including the recommended structure type, structural method, multiple-use emphasis and landscape design theme. The Consultant shall review and develop a working knowledge of the information contained in the Project pre-design. If a Pre-design does not exist for the Project, the Consultant shall complete the tasks and provide the deliverables outlined in 4.7.6, Project Pre-Design.

The Consultant shall utilize the integrated functional analysis, site analysis, preliminary site development plan and recommended design guidelines from the Project Pre-Design as guidance for development of the interim submittals, final plans and construction documents for the Project.

The Consultant shall update the integrated functional analysis, site analysis, preliminary site development plan and Project design direction contained in the Project Pre-Design as necessary to respond to changes in Project design requirements, the need for more detailed site conditions information and/or refinement of the landscape design theme/design motif for the Project.

The Consultant shall document the results of the data collection, analysis and all review comments for subsequent design phases pertaining to landscaping, aesthetics and multiple-use aspects of the Project in the Project Design Report

4.7.7.3. 30% Design

Utilizing the plans and design direction contained in the Project Pre-design, the Consultant Landscape Architect shall prepare a fully integrated detailed site layout and landscape contour grading plan that adapts the flood control, aesthetic and multiple-use functional design requirements and to the characteristics, opportunities and constraints identified in the site analysis, utilizing the same base sheets and map scale used for the engineering drawings for the Project. For linear Projects, such as conveyance channels, flood walls and flood retarding structures, the Consultant shall provide the detailed site layout and landscape contour grading plan as a strip map of the entire Project at the same scale as the plan sheets for the engineering design in paper and digital format. The purpose of this work product is to serve as a tool for development of the line and grade, preliminary planting plan and preliminary aesthetic design concepts for the structural features of the Project.

Utilizing the plant palette, conceptual planting plan and planting design direction contained in the Project Pre-design and design direction contained in the references cited in 1.4.4, References & Other District Guidance Documents: the Consultant Landscape Architect shall prepare a preliminary planting plan for the Project depicting major plant materials groupings artistically arranged to accentuate the topographic forms of the Project, create spatial definition, screen discordant features, enframe views of prominent focal points, and accentuate and create a sense of entry at public access points into the Project area while providing dust control, soil erosion protection, urban wildlife habitat and other identified beneficial functions.

The Consultant Landscape Architect shall provide a preliminary analysis of the irrigation system requirements to support the preliminary planting plan and prepare a preliminary irrigation plan that identifies the location of water and electricity sources, mainlines and other major components of the system.

Utilizing the design direction in the Project Pre-design, the Consultant Landscape Architect shall prepare preliminary design concept sketches, drawings or provide photos or drawings of similar existing structural features depicting the proposed aesthetic treatment for all structural features of the Project including, but not limited to, inlets, outlets, walls, grade control structures, energy dissipaters, low flow channels, slope treatments, operations and

maintenance facilities and multiple-use features that are included in the Project. The drawings shall depict the form, color and textures proposed for application on the Project.

The Consultant shall review and ensure the rights of way requirements needed to implement the required landscaping, aesthetic and multiple-use functions of the Project will be met.

As a part of the Project cost estimate, the Consultant shall provide a breakout estimate of the cost for the landscape architectural components of the Project, including the cost for landscaping, aesthetic treatments and rights of way needed to incorporate landscaping and aesthetic treatments.

4.7.7.4. 60% Design

Utilizing the review comments from the District, stakeholders, partners and the PAAC, the Consultant shall modify and refine the 30% submittals, including the grading plan, planting plan, irrigation plan and construction details. All submitted items shall be marked as "60% Submittal".

Plans shall be complete and accurately depict the location, configuration and full extent of features including all aesthetic treatments, with the exception that details and schedules may be preliminary in nature. The plans shall include general notes, title and legend. Engineering and landscape architectural plans shall be fully coordinated and integrated and, unless otherwise indicated in writing by the District, shall be submitted together as a complete set. Engineering plans that are submitted without the landscape architectural drawings will be marked as incomplete and returned to the Consultant.

As a part of the Project cost estimate, the Consultant shall provide a breakout estimate of the cost for the landscape architectural components of the Project, including the cost for landscaping, aesthetic treatments and rights of way needed to incorporate landscaping and aesthetic treatments.

The Consultant shall provide preliminary Construction Special Provisions and Supplementary General Conditions for all landscaping and aesthetic treatments included in the Project.

4.7.7.5. 90% Design

The Consultant shall incorporate the review comments from the 60% submittals including the grading design, planting plan, irrigation plans, structural features aesthetic treatments and construction details for the planting plan and irrigation system. All submitted items shall be marked as "90% Submittal". The plans shall appear to be complete and ready to bid.

As a part of the preparation of the Project Bid Quantities and Engineers Cost Estimate, the Consultant shall provide a complete estimate of Bid Quantities and an Engineers Cost

Estimate for the landscaping and aesthetic treatment components of the Project in a form that appears to be complete and ready to bid.

As a part of the development of the Project Construction Special Provisions and supplementary General Conditions, the Consultant shall provide Construction Special Provisions and Supplementary General Conditions for all landscaping and aesthetic treatment components included in the Project in a form that appears to be complete and ready to bid.

4.7.7.6. Final Design

The Consultant Landscape Architect shall incorporate review comments and make required changes and corrections to the 90% construction drawings, Special Provisions, Supplementary General Conditions, Bid Quantities and Cost Estimate as directed by the District.

4.7.8. Project Post Design Services

The District will provide construction management services during construction the Project. The District will serve as the Construction Manager and will be in charge of all items related to the construction contract including, but not limited to, the construction schedule, contract conditions, and payment.

The District will require post design services from the Consultant as described herein during the construction phase of the Project. The District will provide the Consultant Landscape Architect with direction regarding their role, responsibility, lines of communication and a "Post Design Services Checklist" that identifies the landscape architectural components of the Project that may require post design services from the Consultant.

The Consultant may be required by the District to review requests for information, shop drawings and other submittals for conformance with the intent of the design.

The Consultant may be required to provide one or more persons to attend meetings, observe and comment on the work, review testing procedures and results, and comment on site specific conditions exposed during construction.

The Consultant may be required to participate in the following meetings:

A. Initial Partnering Session
B. Monthly Partnering Meetings
C. Post Design Review Meeting
D. Meetings with the Construction Manager as requested

The Consultant may be required to visit the site as determined necessary by the District; and may be requested to review specific problem areas or render opinions on items that may affect critical features of the Project.

The Consultant may be required to provide design services for changes to the design plans and/or specifications. Landscape architectural work requested under this contract shall be completed under the responsibility of a landscape architect registered in the State of Arizona. All work submitted shall bear the 'wet seal' and original signature of the responsible registered landscape architect.

At the completion of construction, the Consultant may be required to prepare and seal the record drawings for any changes related to landscape architectural items.

The Consultant Landscape Architect shall coordinate with the District's Construction Project Manager and Landscape Architecture Branch Manager prior to submitting final recommendations to the District.

4.8. Public & Stakeholder Involvement

4.8.1. Public and Stakeholder Involvement Plan

The Consultant shall develop a Public and Stakeholder Plan for review and approval by the District.

4.8.2. Project Informational Brochure/Newsletter And Press Release

The Consultant shall develop for review and approval the content, such as text and graphics, for a Project Informational Brochure/Newsletter to be designed and produced by the District.

The purpose of the brochure/newsletter will be to educate stakeholders and the general public about the Project and identify the Project purpose, background, current status, frequently asked questions, and schedule. The brochure/newsletter shall have contact information for interested parties to contact the Project team and ask questions or give comments.

The brochure can be designed as a one page, 11-inch by 17-inch, double-sided, four color, two-fold format or a one page, 8.5-inch by 11-inch, double-sided, four color, tri-fold format

Preparation should begin eight (8) to twelve (12) weeks prior to distribution

PDF of brochure will be made available for posting on the District web site Project page.

Mail brochure to study area boundary based on tax owner address. Include past public meeting attendees and those who requested to be on mailing list

Mail brochures to key stakeholders with a personalized cover letter. The personalized letter will be drafted by the Consultant for District review and approval.

Place brochures in key locations in study area – schools, libraries, etc.

As part of the Project, a press release(s) shall be created announcing the start of Project, public meetings, developments, and other Project milestones.

4.8.3. Project Web Site

The link to the Web information shall be included in all press releases, brochures, meeting notices, agendas and minutes, alternative plans and draft and final plans and reports, and other review documents produced by the District, agencies, and the Project team

Project documents such as press releases, brochures, meeting notices, agendas and minutes, alternative plans and draft and final plans and reports shall be provided by the Project team to the District in a format suitable for posting on the Web site Project page.

The Project page on the District's Web site should be updated at all Project milestones/deadlines and any other times as necessary.

4.8.4. Public Involvement

4.8.4.1. District Responsibility

The District is responsible for placing the legal advertising at the beginning of the study. After the advertisement is published, the District will supply the Consultant with a copy of the original affidavit of publication from each of the newspapers for each day that the advertisement was published to be included in the final reports.

4.8.4.2. Consultant Responsibility

Consultant / District shall be responsible for identifying potential locations for each public meeting. The District will secure the location. The Consultant / District shall be responsible for coordinating the setting up and taking down of each meeting, besides participating in the meetings.

The Consultant shall participate in (number of meetings) open house meetings and/or public meetings. The Consultant shall utilize those meetings as an opportunity to engage stakeholders and, if deemed appropriate and approved by the District, additional agency or non-agency stakeholders may be added to the stakeholder working group as a result of the public meetings.

4.8.4.3. Public Meetings

The public meetings shall be planned to address the following items:

- Create critical path calendar outlining deadlines/key dates three (3) months before each public meeting.
- Total preparation time for each public meeting is at least eight (8)weeks
- Type of meeting (open house, working session, etc.) must be determined in advance.
- Confirm public meeting date does not conflict with partner city/town council meetings, planning commission meetings, or District's FCAB meetings or other high-profile public events including but not limited to elections, holidays, and major sporting events.
- Meeting notices, such as a newspaper advertisement, must be posted at least 15 days prior to all public meetings
- Location of the public meeting must be reserved in advance by District.
- Certificate of Insurance is required at least two (2) weeks in advance of the meeting.

The Project team will attend one (1) or two (2) planning meetings to be held prior to each public meeting. The purpose of these meetings will be to discuss the specifics of the public meeting, put the presentation into practice, and refine the content of the presentation, deliverables and exhibit boards.

Initial draft of the PowerPoint presentation must be completed by three (3) weeks prior to the public meeting to allow sufficient time for review, edits and dry run of presentation.

Exhibit boards will be designed by the District using graphics developed and provided by the Consultant. The Consultant will print hard copies of the exhibits or provide the Distrcit with electronic files of the exhibits at least 1 week prior to the meeting so the Distrcit may mount the exhibits.

Produce fact sheets and other handouts, name tags, sign in sheets and comment sheets for meeting.

Create and mail public meeting announcement.

The announcement can be designed as a one page, 11-inch by 17-inch, double-sided, four color, two-fold format or a one page, 8.5-inch by 11-inch, double-sided, four color, tri-fold format. Other formats may be used as needed

Prepare legal advertisement – required only for floodplain delineation studies

Place the display advertisement in two (2) area newspapers (one week apart). Proof of advertising will be provided by the District to the Consultant for inclusion in the Project files and public involvement summary report

Work with partner agencies to utilize their newsletters and Web sites to advertise public meeting

Provide computer(s) or printed map workstations for floodplain delineation public meetings

Provide refreshments (cookies, bottled water, napkins) for public meeting attendees

Prepare meeting minutes of the Public Meeting including documenting concerns and comments from the public.

4.8.4.4. Post Public Meeting Tasks

Consultant shall make electronic copies of the exhibit boards and handouts available to the District and City/Town to post on their websites

Consultant shall document each outreach event (e.g., mailing, public meeting, stakeholder meeting) in a Community Outreach Activity Log. To include the following:

- Mailing list
- Material provided
- Delivery method
- Location, time and duration of meeting(s)

4.8.4.5. Public Information Media

The Consultant shall prepare material announcing the beginning of the study, the study schedule, and introducing the public to the District and the study process as follows:

- Create draft brochure (final and printing to be done by the District)
- Create draft cover letter for mailing brochure to residents, businesses and stakeholders.

- District will mail brochure to affected and identified properties located within the study area boundaries
- Place brochures in key area locations in study area – schools, libraries, etc.

4.8.5. Stakeholder Involvement

As part of the Project, a stakeholder list and mailing list for the study area shall be developed based on the Assessor data provided by the District – Identify stakeholders, elected officials in that area (mayor and city council), and city staff (city manager, engineer, and PIO) to invite to public meetings. Large landowners included as potentially interested stakeholders will be identified by the District through a GIS query based on pre-determined property size

A stakeholder Group Kick-Off Meeting shall be held to provide an overview of the Project, Project schedule and milestones, identification of stakeholder opportunities and constraints and identification of evaluation criteria for alternatives

Additionally, one-on-one meetings with all stakeholders shall be conducted to obtain input and identify specific stakeholder issues to be considered in the alternatives analysis and recommendations. The District must attend all meetings

Stakeholder meetings are to precede all public meetings (initial stakeholder meeting followed by initial public meeting, etc)

PAAC (Project Aesthetic Advisory Committee) meeting(s) shall be included per the Scope-of-Work.

4.8.6. Deliverables

The District shall receive final copy(s) of the following for a Project:

- Project Overview – details Project history, opportunities and constraints, potential issues, area information, costs and timeline.
- Project Schedule -- Public Involvement Schedule
- Public meeting announcements and Project materials (PDF format)
- Original copies of all public meeting sign in and comment sheets
- Project report or executive and technical summary (PDF format)
- Original copies of display advertising and affidavits of legal advertising
- All Project photographs (JPEG format)

4.9. Real Estate

The District's Project Manager to develop this Section as needed for the specific Project.

Typical Final Design Projects, Consultant shall include the following:

4.9.1. Rights-of-Entry

At the earliest practicable stage in the Project design, the Consultant shall identify areas requiring rights-of-entry (ROE) to set aerial controls for mapping, geotechnical testing, and other site investigations. These areas shall be presented on a map that indicates parcel lines and Assessor Parcel Numbers (APN). Access paths shall be shown on the map from public roadways to control points and geotechnical test sites. No control points shall be set nor tests conducted until cultural/environmental clearances have been obtained and ROE acquired for the sites and access paths.

4.9.2. Right-of-Way

The required rights-of-way for the Project implementation shall be determined for the 60% submittal. Rights-of-way shall include:

- Drainage Easements (DE) and or Fee right-of-way (ROW) for Project features including conveyance (channel or storm drain), multi-use features (paths for maintenance access and/or pedestrian/cycling, detention/retention basins, inlets, spillways, downdrains, etc.), and buffer.
- Access easements (AE) outside of conveyance area for maintenance access to manholes and/or inlets.
- Temporary construction easements (TCE) to provide construction access and room to construct Project.

For required rights-of-way that cross or are within an existing power transmission corridor, easement rights or permits from the corridor manager, usually APS, SRP or WAPA must be obtained.

For required rights-of-way that cross or are within railroad rights-of-way, easement rights or permits from the railroad must be obtained.

For required rights-of-way that cross or are within public road rights-of-way, including cities, towns, and ADOT, easement rights or permits from the jurisdiction must be obtained.

For required rights-of-way that cross or are within rights-of-way owned or controlled by a municipality, easement rights or permits from the municipality must be obtained.

4.9.3. Maps and Legals

Typically the District's Real Estate Division (RED) will generate all maps and legal descriptions for the acquisition. The Scope of Work may identify preparation of the maps and legals by the

consultant. RED will provide the template to be used for the preparation of the maps and legals by the consultant.

Consultant shall provide the following deliverables at 60% submittal:

- For RED submittal a full sized hard copy and electronic file (CADD in "ground" coordinate system) showing the following:
- Sectional control, bearings and distances between corners, quarter corners and center section
- Project centerline/construction CL, lines and curves notated, tie information at every intersection of a section line and Project control line.
- Existing road r/w if any and width notation
- Proposed r/w requirements, all lines, curves, jogs and angle points notated.
- Each of the above items should be on their own levels or layers and not be a reference file.
- No property lines are to be included for the RED submittal

For the submittal to the District's Project Manager, full sized hard copies, digital pdf file, and electronic file (CADD in "ground" coordinate system) showing the following:

- A "roll plot" or strip map at a scale of 1"=40' (or as directed by District's Project Manager) showing approximate street and property lines (derived from GIS and translated to "ground" coordinate system), APN numbers, existing planimetrics (streets, structures, and other ground culture derived from photogrammetry), Project required ROW, DE, AE, and TCE, dimensions, and Project features such as grading limits, landscape contouring of channel overbanks, channel top and toe of side slopes, storm drains, appurtenances, inlets and outlets headwalls and aprons, riprap blankets, downdrains, spillways, multi-use and maintenance paths and ramps, and utility relocations by Project contractor. This plot shall be used for District review to ensure all proposed construction will occur within appropriate rights-of-way. Linework for Project features and rights-of-way shall be the same as used on the construction plans.

- A "roll plot" or strip map at a scale of 1"=40' with all the above plus color aerial imagery with proposed ROW, DE, AE & TCE shaded in contrasting color highlights.

4.10. River Mechanics

The Consultant shall follow the procedures for river mechanics outlined in the latest Hydraulics Manual (Drainage Design Manual for Maricopa County, Volume II Hydraulics) for all required design, modeling and calculations related to total scour estimation, erosion protection, toe-down requirement, sediment yield, sediment transport, riprap sizing, lateral erosion, and other river mechanics issues. The Consultant shall use DDMSW software, latest version, for river mechanics computation. The following is a partial list of important task items related to river mechanics.

4.10.1. Total Scour

The total scour analysis shall include the estimation of long-term scour, general scour, bend scour, bed-form scour, low-flow incisement and local scour. In general, a safety factor of 1.3 shall be used, and the total scour depth should be measured from channel thalweg. However, a smaller safety factor may be used under special conditions. Total scour depth may also be measured from channel adjacent ground under special conditions. The latest Hydraulics Manual has more discussions on safety factor and total scour depth measurement references. The latest version of DDMSW should be used to compute the scour depth.

4.10.2. Sediment Yield and Sediment Transport

4.10.2.1. General

The sediment yield consists of two parts and is defined as the sum of the wash load and the total bed material load delivered to a point of interest. The sediment yield analysis should be based on the latest verison of Hydraulics Manual. The latest version of DDMSW software should be used to estimate the sediment yield. For detention basin or dam design, the sediment storage should be the sum of the 100-year flood sediment volume and 3 years of annual sediment yield. If sediment is cleaned annually, the sediment storage should be the 100-year flood sediment volume.

An empirical sediment transport equation may be used to give a preliminary assessment about the sediment capacity of the study reach. However, for a detailed sediment transport analysis of the study reach, computer software, such as HEC-6, HEC-6t, Fluvial-12, or other District-approved software can be used. The sediment transport modeling details can be found in the latest version of Hydraulics Manual.

4.10.3. 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 if possible. The sampling procedures shall be consistent with procedures described in the Bureau of Reclamation's, Computing Degradation and Local Scour, January 1984, or the U.S. 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. Fine grained samples will be sieved to determine the size distribution.

The sediment distribution for coarse grained samples will be estimated using a pebble-count procedure. A combined gradation curve for fine sediment and cobbles should be developed. 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 report.

4.10.4. Lateral Migration

The Consultant shall conduct a qualitative geomorphic analysis based on published soil maps, most recent topography and field visits to the selected study reaches. Geomorphic/geologic principles shall be used to identify bedrock outcrops, armored channel beds, cutbanks, and existing man-made bank protection structures.

The Consultant shall follow the latest version of Hydraulics Manual to estimate the 100-year lateral migration hazard zone. The CONSULTANT shall prepare a summary report describing the methodologies and results of the lateral migration analyses. .

4.10.5. Riprap Sizing

The Consultant shall follow the latest version of Hydraulics Manual to size riprap and estimate the gradation limits. The latest version of DDMSW software shall be used.

4.11. Structural Engineering

This section to be developed for each specific Project.

Plans shall show:

- Structure plan view
- Structure elevation view
- Formliner application
- Section views at critical locations showing reinforcement details and callouts, dimensions to concrete face from reinforcement, concrete thickness dimension, and other critical information
- Details for formliners
- Section views showing formliner depth of relief, dimension of minimum coverage of reinforcement
- Reveals, banding, formliner treatment at edges, angle points, and joints, dimension below riprap and/or to footing
- Notes calling out:
    - Concrete class and/or minimum compressive strength
    - Concrete type
    - Details for construction joints
    - Details for expansion joints
    - Footing details
- In plan view show control point with elevation, station and offset from Project control line to locate structure and any control dimensions from control point to orient structure
- At each corner, end point, angle point, step or other critical location of retaining or non-retaining walls, show top of wall (TW), bottom of wall (BW), and top of footing (TF) elevation or vertical dimension relative to the control point
- For quality assurance, field check critical formwork for location and elevation prior to placing concrete, filed check to be performed by post-design consultant at request of District's Construction Manager and/or Contractor.

- reinforcement details and schedules
- handrails
- details for end treatments, angle point treatments, step treatments
- material and finish specifications, whether galvanized and/or painted or stained
- details for connection to walls whether bolted or welded

Special Provisions to include:

- concrete finish schedule for all structures with exposed surfaces
- staining
- painting
- Formliner release specifications appropriate to finish
- Preparation of surfaces for finish

Structural Calculations shall be prepared and submitted with the plans. The calculation shall be assembled into a book with the design criteria, illustrative diagrams and sketches, calculation printouts, and backup information. The books shall be submitted for review by the District as well as other agencies issuing permits for the structures.

4.12. Survey, Photogrammetry & Mapping

4.12.1. General

The purpose of this chapter is to guide the proper development of a scope of work for the disciplines of land survey and mapping.

4.12.1.1. Project Requirements

The Consultant shall perform all survey, photogrammetry, and mapping tasks needed to complete the Project, unless otherwise directed by specific tasks identified in this SOW, all to more stringent requirements of either this SOW or the Federal Emergency Management Agency (FEMA) document, Flood Insurance Study: Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003, or most recent revised document, hereinafter referenced as the FEMA Document.

4.12.1.2. Control and Geodic Reference

Most survey work for the District is tied to the Arizona State Plane Coordinate System. However, some surveys, such as design and construction surveys, may be tied to "ground," i.e., local monuments such as section corners where direct measurements are made on an assumed plane coordinate system without conversion to a regional, state, or geodetic coordinate system.

4.12.1.3. Mapping Methods

Mapping is generally developed using one or a combination of three methods: field surveys, photogrammetry, and LiDAR. Field surveys are typically used for small sites of no more than a few acres where it is more economical to conduct field surveys than to use aerial methods. Field surveys are also used to supplement photogrammetry or LiDAR mapping methods such as determining the location, elevation, and configuration of bridges, culverts, and spillways which may not be visible from the air or when more precise measurement that that attainable through remote means is required.

The mapping method shall be as specified in 3.3, Scope of Work - Survey, Photogrammetry, and Mapping.

4.12.1.4. Supervisory Qualification Requirements

Survey: The Consultant shall conduct all field surveys and prepare all mapping necessary to complete the Project. All survey work shall be supervised by an Arizona Registered Land Surveyor (RLS).

Photogrammetry: The Consultant shall conduct all work items as it relates to photogrammetry or LiDAR to extract measurements, make maps, and interpret data from images under the supervision of a Certified Photogrammetrist by the American Society of Photogrammetry and Remote Sensing (ASPRS) and an RLS.

4.12.1.5. Quality Control and Quality Assurance

To maintain high standards of accuracy and precision necessary for District mapping Projects, the District has established a number of specific quality control and quality assurance procedures. These generally include the use of a blind aerial target protocol and independent survey checks for comparison with the mapping products. Therefore, the scope-of-work includes the following:

The parties to the contract shall be the District and the Consultant. For purposes of quality control and quality assurance, the Consultant shall employ an independent survey Subconsultant as part of the Consultant's team. The Subconsultant shall supply certain information specified in the SOW directly to the District until such time as the District authorizes the Subconsultant to release the information to the Consultant.

4.12.1.6. Public Notification

Survey tasks often require entry on to lands not owned in fee or easement by the District. State law allows land surveyors to enter upon such lands in the conduct of their work. The following describes the process under which land surveyors gain entry on such lands:

The Consultant shall identify all property owners within the Project Area on whose lands entry may be required and notify them by mail and obtain any necessary Rights-of-Entry (ROE) for the Project Area. [Note: To reduce the number of notifications, the Consultant may be asked to identify where entry is needed, such as common areas within a subdivision, existing public rights-of-way, state lands or public lands. This avoids sending letters to potentially thousands of homeowners within subdivisions when entry on individual properties is not necessary.]

- **Right-of Entry Letter:** The District shall furnish the Consultant with a draft notification letter and ROE form for the Consultant to finalize for prior approval by the District's Project Manager.

- **Assessor's Data:** The District will provide the Consultant with Maricopa County Assessor's data to develop the list of property owners. The Consultant shall review and modify the list to ensure that the current property owners are notified prior to entering the property.

- **Property Owners List:** The Consultant will develop a list of property owners within the Project Area. The District and Consultant may edit the mailing list to target specific properties where entry will be required and avoid sending notices to landowners upon whose property no entry will be required (e.g., individual residents of platted subdivisions).

- **Transmittal of Notice:** The Consultant will notify by first-class mail property owners within the Project Area on whose property entry is potentially needed and request ROE for the Consultant and survey Subconsultant. The District will furnish the Consultant

with twenty-four (24) laminated copies of the finalized notification letter. The Consultant shall furnish the District's Project Manager with a list of all property owners notified.

4.12.1.7. Flight Plan

Aerial mapping techniques require a flight plan to coincide with the mapping area, tile layout, map scale, and mapping precision (more precise mapping requires a lower flight altitude). Other factors apply, such as Federal Aviation Administration (FAA) restrictions on flight routes and clearance near airports, military airspace, or critical facilities (e.g. Palo Verde Nuclear Generating Station - PVNGS). To verify the proposed aerial data acquisition is appropriately designed.

The Consultant shall develop and submit a flight plan that includes, at a minimum, the aircraft description and identification number, flight personnel, proposed flight lines, and proposed date and time of the aerial mission. The draft flight plan summary shall be submitted at the Project kick-off meeting. The final flight plan shall be submitted a minimum of ten (10) calendar days prior to the proposed date of the aerial mission.

Flights nearby or over certain critical facilities require special notification in advance of the flight. The North American Aerospace Defense Command (NORAD) monitors aircraft flights over the continental United States and will alert critical facilities, such as the Palo Verde Nuclear Generating Station (PVNGS), of unidentified approaching aircraft. In the case of PVNGS the Arizona Public Service (APS) Emergency Planning Department must be contacted before take-off if the aircraft will be flying near the facility. If APS has not been properly notified in advance of the aircraft's identity and timing of approach, NORAD can order interception by armed military aircraft.

4.12.2. Survey Tasks

For boundary, non-mapping control, design, construction, and as-built surveys, see the specific survey tasks specified in the scope-of-work .

All survey work performed to obtain topographic mapping shall meet or exceed FEMA minimum criteria as defined in the FEMA Document unless stated otherwise within this scope of work. This includes, but is not limited to, field control surveys and verification of profiles.

4.12.2.1. Data Collection

The Consultant shall collect and review pertinent data from the District and other outside sources. Data to be collected shall include existing digital topographic mapping for the purpose of surface profile comparison, Maricopa County Department of Transportation (MCDOT) Geodetic Control Survey data, orthophotography, and other pertinent information. The Consultant shall obtain the control data from the existing mapping within and adjacent to the Project Area and identify and resolve any discrepancies. The Consultant will provide a Data Collection Report within thirty (30) days of Notice to Proceed (NTP) summarizing the data collected and the data collection effort.

4.12.2.2. District Supplied Data

The District will provide the following data to the Consultant:

- Existing digital mapping and Digital Terrain Model (DTM) adjacent to the Project area.
- Control data used for the existing mapping.
- Assessor land ownership data.

Geodetic Densification and Cadastral Survey (GDACS) control data can be obtained from www.mcdot.maricopa.gov/survey/home.htm.

4.12.2.3. Coordinate System

All digital mapping data shall be submitted to the District using the Arizona Coordinate System, 1983, Central Zone (international feet). The Consultant shall reduce any terrestrial ground surveying measurements to said grid Projection. The Consultant shall provide the combined factor(s) used to reduce said ground measurements in the Project Survey Report. [Note: Design surveys and construction staking may be tied to a "ground" plane coordinate system. For such Projects, the above text should be revised to reflect this type of coordinate system.]

4.12.2.4. Survey Control

Survey horizontal and vertical control for the Project shall be tied to uniform datum compatible with floodplain delineations within Maricopa County.

Horizontal Control: All horizontal control surveys shall be tied and delivered in NAD 83 (1992 epoch). Arizona coordinate system, 1983, central zone using the international feet as the units of measurement (A.R.S. § 33-132). All horizontal control points and corresponding coordinates shall be listed in the Project Survey Report. Horizontal control points shall also be noted on the appropriate plan sheets, indicated by symbol at the true position and completely documented in the map sheet margin.

Vertical Control: All vertical surveys shall be based on NAVD 88, per the FEMA Document. A conversion factor, including documentation on how it was derived, shall be provided by the Consultant to allow comparison of NAVD 88 elevations to NGVD 29 elevations and shall be included in the Project Survey Report. The conversion outlined in the FEMA Document shall be used. All vertical control points and corresponding coordinates shall be listed in the Project Survey Report. Vertical control points shall also be noted on the appropriate map sheets.

4.12.2.5. Aerial Control

The Consultant shall establish horizontal and vertical control points and systematically set aerial targets throughout the areas to be mapped for use in compilation by the CONSULTANT. 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.

- **Geodetic Control Network**: Where readily available, surveys will tie into the nearest primary and secondary control points from MCDOT Geodetic Control Network. All ground control shall be positioned at a 5 cm (two-sigma) Federal Geodetic Control Subcommittee accuracy standard in both horizontal and vertical position.

- **Blind Aerial Targets**: In addition to the aerial targets required for the photogrammetry, blind aerial targets will be independently established for purposes of quality control and quality assurance by the survey Subconsultant hired by the Consultant.

- **Location and Spacing:** One (1) blind aerial target every other square mile throughout the Project shall be set or as otherwise approved by the District's Project Manager. These blind aerial targets shall be spaced throughout the Project Area, and both horizontal and vertical values shall be established and documented. The location of the blind targets will be agreed to by District's Project Manager and the Subconsultant.

- **Positional Accuracy:** All blind targets shall be positioned at a 5 cm (two-sigma) Federal Geodetic Control Subcommittee accuracy standard in both horizontal and vertical position.

- **Blind Aerial Target Protocol:** The SUBCONSULTANT shall furnish the surveyed horizontal and vertical positions of the blind aerial targets directly to the District. The District will provide approximate values of the blind aerial targets to the Consultant to aid in identification on the aerial photographs. The Consultant shall independently determine the elevation and coordinates of these blind aerial targets with ninety-five percent (95%) of the points meeting the accuracy requirements established in the FEMA Document for the required Project accuracy. The Consultant will then furnish the calculated positions of the blind aerial targets to the District for comparison with the surveyed positions furnished by the Subconsultant.

- **AT Refinement:** Upon approval of the blind aerial target comparison, the District will furnish the surveyed positions of the blind aerial targets to the Consultant. The surveyed location of the blind targets may then be used to improve the aerotriangulation solution, at the discretion of the Consultant, prior to proceeding with the topographic mapping.

- **Ties to Existing Monuments:** If Real Time Kinematic (RTK) Global Positioning System (GPS) methods are used for performing the aerial control surveys, ties shall be made from ground control points and blind aerial target points to nearby existing monuments, including section and quarter-corner monuments, if found during the course of field navigating to designated aerial control targets and blind aerial targets. Existing monuments shall be considered nearby if they are visible and within

approximately two hundred (200) feet of a designated aerial control target or blind aerial target. Found monuments shall be located using RTK GPS methods for a minimum of one hundred eighty (180) epochs and will tie to the nearest primary and secondary control points from the MCDOT Geodetic Control Network. The District will not hold the Consultant responsible for any defects or inaccuracies in regard to the legal position of any section or quarter corners collected during the course of this Project.

- **Removal of Targets:** Target paneling material for aerial targets and blind aerial targets shall be removed following completion of the aerial photography, while the actual surveyed markers are to remain in place.

4.12.2.6. Real Time Kinematic Global Positioning System Procedures

If Real Time Kinematic (RTK) procedures utilizing Trimble Global Positioning System (GPS) equipment are used for performing 4.12.2.4, Survey Control and 4.12.2.5, Aerial Control the Consultant and survey Subconsultant shall adhere to the following standards of practice:

QC1 & QC 2 Records: QC1 & QC2 records shall be recorded.

- **Occupation Time:** Occupation time on each point shall be no less than 180 seconds with a minimum of one hundred eighty (180) measurements.
- **Horizontal Tolerance:** Horizontal tolerance shall be set to 0.030 international feet and Vertical tolerance set to 0.050 international feet.
- **Occupation of Points:** Horizontal tolerance in the data collector(s) shall be set to 0.030 international feet and Vertical tolerance set to 0.050 international feet.
- **Applicability of Standards:** The above standards, though specific to Trimble products, are intended to be globally utilized for other manufacturer's products in their specific language and protocol.

4.12.2.7. Verification and Certification of Accuracy

The Consultant shall verify the accuracy of the mapping by the procedures called for in the FEMA Document or other methods approved by FEMA and at a minimum shall analyze the Control Network, the Aero Triangulation (AT), LiDAR Digital Elevation Model (DEM), and final Digital Terrain Model (DTM) in addition to the surveys required within this SOW.

- **Field Surveyed Cross-Section Checks:** The survey Subconsultant shall perform on-the-ground surveys of cross sections. The District will determine and provide the Consultant the locations and lengths of cross sections to be surveyed. The cross-sections will be located across stream beds and/or impoundment areas at approximately one-mile spacing, and the Consultant shall have the option of shifting the location of the cross-sections up to five hundred (500) feet upstream or

downstream of the specified locations to avoid obstacles such as difficult terrain, trees or other obstructions to line-of-sight from the aircraft to the ground. All break lines (grade-breaks) along the cross section alignments shall be collected and no point shall be further than fifty (50) feet from another. Cross section alignment shall be perpendicular to the main thread of the streambed. The survey Subconsultant shall submit the results of the surveyed cross sections directly to the District. The survey Subconsultant shall not provide the results of the surveyed cross sections to the Consultant until authorized by the District's Project Manager. The survey results shall be delivered in a Microsoft Excel spreadsheet and shall include the point number, northing, easting, elevation, description & note (PNEZDN). The description and note fields shall indicate the Sheet/Tile name and the name of the wash, if applicable. All survey data shall be tied to the MCDOT Geodetic Control Network, Geodetic Densification and Cadastral Survey (GDACS) and be delivered in grid Arizona SPCS, NAD83 (92 epoch), International Feet, and NAVD88 vertical datum.

- **Digital Terrain Model Checks:** The Subconsultant shall perform on-the-ground surveys of DTM check shots. A minimum of four (4) check shots per tile are required. Should a blind target or primary control point fall in a tile, said point may count as one of the four (4) check shots. Should a field surveyed cross section check be completed prior to the DTM checks, one (1) point of the cross section may be applied toward one (1) of the four (4) DTM check shots. The Subconsultant shall make a reasonable attempt to proportionately disburse the positions of the DTM check shots throughout the individual tiles. Consultant shall not be provided the results of the DTM checks. The Subconsultant shall submit the results of the DTM checks directly to the District. The DTM check shots shall be delivered as a Microsoft Excel spreadsheet and shall include the PNEZDN. The description and note fields must indicate the Sheet/Tile name and the name of the wash if applicable. All survey data must be directly tied to the MCDOT Geodetic Control Network, GDACS and be delivered in grid Arizona SPCS, NAD83(92 epoch), International Feet and NAVD88 vertical datum.

- **Consultant Certification of Accuracy:** The Consultant's Registered Land Surveyor shall conduct a review of products and technical data at key audit points during the Project. The Consultant shall make a final review of all deliverables before sealing and signing them, certifying to their accuracy and completeness as required under A.R.S., prior to releasing them to the District.

- **DISTRICT Verification of Accuracy:** The District and/or its agent may [or "will" as appropriate] survey additional cross-sections and perform random point testing of the photogrammetric and/or LiDAR results in addition to the minimum criteria defined in the FEMA Document to independently verify the accuracy of the DTM and mapping.

4.12.2.8. Global Positioning System (GPS) Base Stations

The Consultant shall systematically select the location of GPS Base Stations to support aerial photography data acquisition missions to ensure the reliability of horizontal and vertical control throughout the Project Area.

- **Base Station Density**: The Consultant shall limit the baseline distance between the Base Stations and the airborne receiver to a maximum of eight (8) miles, and there shall be a minimum of two (2) (specify number per note, below) Base Stations operated simultaneously during the flight. The Consultant shall submit for approval by the District the proposed locations for the Base Stations as part of the Flight Plan. [Note: Two GPS base stations are the minimum required for redundancy, since problems can occur with the units during the data acquisition mission, such as a dead battery. The number of required base stations should be matched to the size and configuration of the mapping area to maintain redundancy and limit the distance from a base station and airborne receiver to the maximum of eight (8) miles.]

- **Base Station Location**: The Base Stations shall be located on a MCDOT B Order Geodetic Control point or a point of higher order where available. Where Base Stations must be located in areas where B Order or higher control points are not readily available, the Consultant shall conduct surveys to establish the control points with a positional accuracy of 0.2 feet in support of two (2) foot contour interval mapping.

- **Reception Quality:** The Consultant shall ensure that there are no obstructions or Radio Frequency (RF) sources within the field of view of the Base Stations that could degrade or block data reception at the receiver.

- **GPS Receiver Criteria:** Base Station GPS receivers shall be of geodetic quality, dual frequency, and capable of collecting C/A, P Code and carrier phase measurements.

- **Data Collection Criteria:** GPS satellite data shall be collected once per second for all satellites at least ten degrees (10º) above the horizon.

- **Base Station Documentation:** The Consultant shall document the Base Station equipment used to support aerial photography data collection mission in the Project Survey Report, including the make and model and serial number of the receiver, antenna model or production number, names of the operators, and redundant height of instrument (HI) measurement in feet.

4.12.2.9. Field Surveys of Structures

Structures, in the context of mapping Projects, typically refer to culverts and bridges. For mapping purposes, field surveys of culverts and bridges are useful for verifying spot elevations and contour lines near the inlet and outlet where it may be difficult or

impossible for adjacent aerial photographs to both "see" a common point on the ground in a stereo model. It is often not cost-effective to make detailed "as-built" type surveys of potentially hundreds of drainage structures over the entire area at the mapping stage of a Project. Instead, it can be more cost effective to make basic survey measurements and shift the work of detailed surveys to the delineation phase, when as-built plans can be obtained and supplemented by targeted field surveys at the discretion of the floodplain modeler. Taking the basic measurements is often sufficient for the majority of the floodplain modeler's needs.

Surveying the horizontal and vertical location of the streambed near the inlet and outlet is generally sufficient to verify the accuracy of remotely measured spot elevations and contour lines. For wide, flat bottom washes, the measurements should include at least the toe of the banks. For bridges, cross sections should be surveyed upstream and downstream of the bridge, parallel to the bridge faces.

Since travel time is a significant cost factor in conducting field surveys of structures, it is appropriate to measure additional basic data on the structure while the survey crew is on site, such as inverts and dimensions, and to note the number and type of culvert barrels and the nature of any end treatments (headwall, flared ends, etc). If the invert of the culvert is buried by sediment, it may be necessary to dig down to expose the invert. Bridge surveys should include the bridge deck and any vehicle or pedestrian barriers, the low chord, location and dimensions of bridge piers, noting their number, skew, and shape, along with any riprap or revetment and any wing walls or guide banks.

RTK GPS techniques are extremely efficient in conducting surveys at remote locations, since there is no need to establish vertical and horizontal control points in the vicinity of each structure. However, GPS techniques require a clear, unobstructed view of the sky and the constellation of GPS satellites. This may not be possible from the bottom of a deep wash next to a steep embankment and headwall or where trees or overhead utilities may otherwise interfere with satellite signals. Therefore, it is often more expedient to survey along the top of culvert headwalls and measure down to the invert with a rod or tape. The same applies to measuring down from a bridge deck to the low chord and even the streambed cross section. Measuring the corners of headwalls or bridge corners at the upstream and downstream ends establishes skew relative to the embankment and stream. The scope of work should describe where field surveys of structures are needed and define the criteria for conducting the surveys, as follows:

The Consultant shall perform on the ground field surveys of drainage structures crossing (names of streets and highways and the general limits of mapping – an exhibit can be useful in precisely defining the survey needs) in accordance with the following:

- Position and Elevation: Horizontal and vertical control shall be coincident with the mapping for the Project.

- Data Gathering: Data may be gathered with RTK GPS procedures or other methods as approved by the District.

Pertinent Elevations - Culverts: Collect the existing elevations of the top of bank and the streambed three (3) feet upstream and three (3) feet downstream of the culvert for the width of the wash and the upstream and downstream inverts of pipe culverts and the upstream and downstream corners of box culverts and the elevations of the outside corners of the tops of headwalls, if present. The size of pipe culverts and the dimensions of box culverts shall be measured and the number of barrels shall be noted. If culvert bottom is buried by sediment, the invert(s) shall be exposed in order to survey the elevation of the invert(s).

Bridges: Survey the bridge deck, vehicle or pedestrian barriers, low chord, piers and abutments. Survey cross-sections of the streambed adjacent to bridges upstream and downstream of the bridges without a paved bottom or concrete floor. It is acceptable to work from the bridge deck and measure down to the low chord, piers, and streambed.

4.12.2.10. Profiles

Linear constructed features, such as roadways, railroads, and canals, can have a significant effect on drainage patterns. Therefore, profiles of such features are typically surveyed, especially where such features include embankments or dip sections. Particularly high embankments which are unlikely to be overtopped during a flood do not ordinarily need to be profiled. Railroads have very strict permit and safety requirements for work performed in their right-of-way and especially near the track. The decision to survey railroad profiles needs to balance the need for precision with the need to calculate weir flow if it is overtopped. Remote methods, such as laser scanning and reflector-less total station survey methods may allow measurements to be made without working along the tracks and may be considered. The scope of work includes survey of profiles where appropriate, as follows.

The Consultant shall survey the profiles of (names of roads, highways, and canals to be profiled and their limits, i.e., from where to where; am exhibit may be useful) using continuous RTK GPS procedures, mobile ground based LiDAR or other methods as approved by the District. If continuous RTK GPS procedures are used, measurements shall be recorded at an interval no more than every 100 feet, except at dip sections, where measurements shall be recorded at an interval no more than 25 feet.

4.12.2.11. Project Survey Report

To be useful beyond the mapping phase and to verify adequate quality control procedures were met, the scope of work requires delivery of a Project Survey Report, as follows:

The Consultant shall prepare and deliver a Project Survey Report documenting surveys, aerial controls, and data collection for the Project. The Project Survey Report shall be 8½ inches by 11 inches (8½" x 11") in size and bound together. Any 11 inch by 17 inch (11"

x 17") maps included in the report shall be fan folded. Any larger maps shall be folded and contained in map pockets bound within the report. The Project Survey Report shall be sealed and signed by an Arizona Registered Land Surveyor in responsible charge of the survey aspects of the PROJECT.

Contents of Project Survey Report: The Project Survey Report shall include a summary of the CONSULTANT responsibilities and survey activities; copies of all survey notebooks and office calculations; electronically collected survey data; details of benchmarks, aerial control, and other horizontal and vertical control points and the datum upon which each benchmark was originally established, horizontal and vertical order and class, benchmark type, ground grid conversion factor(s), and a detailed description of the point location for ready recovery in the field; quality control; GPS session information; airborne GPS survey details; LiDAR calibration survey (if LiDAR is employed); metadata for control stations, primary control targets and blind aerial targets; and the results of structure and profile surveys.

Format for Electronically Collected Data: All survey data collected electronically shall be submitted as an ASCII text file readable in MS Word and WordPerfect.

4.12.3. Photogrammetry/LiDAR

The Consultant shall utilize photogrammetry or a combination of photogrammetry and LiDAR to collect data to complete the Project.

4.12.3.1. Airborne Data Acquisition

The Consultant will acquire photogrammetric data using aerial photography supported by airborne GPS or a combination of aerial photography and LiDAR.

- **Mission Planning:** The Consultant shall submit a draft flight plan at the Project kick-off meeting. The flight plan shall be of a known, even engineering scale, and shall show at a minimum the Project boundary, model outlines, flight lines with assigned altitudes, and control locations. Mapping limit boundaries shall fall within neat model limits of the photography. The Consultant shall be responsible for ensuring that photo scales and corresponding flight altitudes are appropriate for the accuracy and resolution needs of the Project.

- **Compliance with Laws and Regulations:** Airborne photographic operations shall be conducted in compliance with all applicable laws and in full cooperation with federal air traffic control authorities.

- **Coordination:** The Consultant shall be responsible for coordinating the aerial photo acquisition missions, ensuring that all targets have been set in advance of the flight and that all GPS Ground Base stations are in place to support airborne GPS data collection.

4.12.3.2. General Criteria

All aerial photography shall be acquired using a precision aerial mapping camera equipped with forward motion compensation and a six (6) inch nominal focal length lens having an AWAR of ninety-five (95) or better. Fresh fine-grain aerial negative film shall be used for the photography unless a digital aerial camera is used. Photogrammetric data collection shall meet the following criteria:

- **ENDLAP:** Consecutive photos in each flight line shall have average forward overlap of sixty percent (60%), plus or minus two percent (2%).
- **SIDELAP:** Adjacent parallel flight lines shall have average side overlap of thirty percent (30%), plus or minus five percent (5%).
- **CRAB:** Left-right deflection about the vertical axis shall not exceed three degrees (3º) between successive exposures or flight lines.
- **TILT**: The camera angle shall not deviate more than three degrees (3º) from the vertical axis at the instant of exposure, nor shall it exceed five degrees (5º) between successive exposure stations.
- **FLIGHT ALTITUDE:** Deviation from the planned flight altitude shall not exceed five percent (5%).
- **Weather and Sun Angle:** Acquisition of aerial photography shall be conducted during clear weather conditions with a sun angle of not less than thirty degrees (30º).
- **Calibration**: The Consultant shall furnish the District with calibration reports for the aerial camera(s) proposed for use on the Project. Calibration report shall be current within one (1) year of the Notice-to- Proceed.
- **Satellite Coverage**: Prior to each flight mobilization requiring the use of airborne GPS, the Consultant shall verify and document that there will be a minimum of six (6) satellites in the sky at least fifteen degrees (15º) above the horizon and a positional dilution of precision (PDOP) < 4.
- **Adverse Conditions:** The consultant shall document and submit to the DISTRICT any weather or air traffic restrictions which may negatively impact the delivery schedule for the Project.
- **Data Delivery Standards:** Digital terrain model, contour, and planimetric data delivery shall comply with the requirements of the 3.2.9, Deliverable Standards,

4.12.3.3. Airborne GPS

A GPS receiver in the aircraft, interfaced to the aerial camera, shall be used to obtain GPS time and position information at the mid-exposure pulse for each captured image.

- **Processing of GPS:** Data Upon completion of each mission, the Consutant shall process the GPS data from the airborne and ground Base Station receivers to establish precise GPS coordinates for the geometric center of each aerial image. The Consultnat shall provide documentation in the Project Survey Report of the repeatability of the final airborne GPS solutions. Comparison between forward, reverse, and combined solutions between multiple ground base stations should achieve repeatability of better than 0.4 feet (12cm) in all three components (X, Y, and Z) for two (2) foot contour interval mapping.

- **PDOP (Positional Dilution of Precision):** The Consultant shall verify and document in the Project Survey Report that a PDOP < 4 was maintained at all times during the flight. If this was not achieved, the Consultant shall re-fly the area unless approved in writing by the District's Project Manager.

- **Documentation:** The airborne GPS process and derived results shall be documented in the Project Survey Report. At a minimum, this shall contain the results of the airborne GPS positions, a graphic showing the camera exposure stations and flight lines; and there shall be a graphic showing the forward/reverse solutions demonstrating the precision of the final airborne GPS results. These graphics shall be to a scale and a size such that all text and graphic information is clear and legible.

4.12.3.4. Aerotriangulation

The Consultant shall perform digital analytical aerotriangulation (DAAT) in order to tie together the individual aerial photo images acquired for the PROJECT, verify the integrity of the framework of ground and airborne GPS control, and bridge a series of control points into every photograph, geo-referencing the entire image database, and enabling its use for photogrammetric purposes. The positional accuracy of horizontal and vertical photo control established by the DAAT must meet or exceed each of the following criteria:

- **Horizontal RMSE:** The horizontal RMSE of the final block adjustment must not exceed 1/15,000 of the flight height.

- **Vertical RMSE:** The vertical RMSE of the final block adjustment must not exceed 1/9,000 of the flight height.

- **Maximum Error:** The maximum allowable area error of any vertical or horizontal point must not exceed three (3) RMSE.

- **Mean Tolerance:** The mean of all points (taking into account positive and negative signs) must not exceed 1/15,000 of the flight height.

- **Documentation:** The digital aerotriangulation process and derived results shall be documented in the Project Survey Report.

- **Flight Index Map**: The Consultant shall produce a flight index map documenting the position of each exposure and providing metadata for the photo acquisition flights. The flight index map shall be submitted in hardcopy form as well as digitally in DXF file format.

4.12.3.5. Photographic Laboratory Services

Aerial photography is increasingly obtained with digital cameras. In such cases, delivery of the raw images is specified in a digital format, typically on a dedicated hard drive. Where photochemical film is used, contact prints are no longer required and the negatives are specified to be scanned to digital format and delivered in the same manner as digitally obtained images.

If photographic film is used for aerial data collection, the Consultant shall provide photographic laboratory services to promptly process the exposed film and scan the negatives.

Quality Control: The Consultant shall perform a quality control review of the aerial negatives or digital images to ensure that all photography complies with the Project flight plan, and industry-standard tolerances for endlap, sidelap, crab, tilt, and flight altitude are met. All images shall be clear and sharp, and any film negatives shall be free of blemishes or damage.

Contact Prints: Contact prints are not be required.

Film Scanning: Aerial negatives shall be converted to digital raster images using a precision photogrammetric scanner at a resolution appropriate to the needs of the Project. The District specifically forbids interpolation of digital raster images to a resolution finer than that achieved by the scanning device. The Consultant shall deliver the scanned negatives or digital images as photographic positives in .tif or .sid format, on a dedicated hard drive, sequentially numbered and cataloged. The CONSULTANT shall store any film negatives in an appropriate climate controlled storage facility until completion of the Contract.

4.12.3.6. LIDAR Data

The deliverables are to be generated from LiDAR data meeting or exceeding the following requirements:

- Data shall be acquired using instrumentation capable of recording multiple returns for each outgoing laser pulse.
- Intensity data shall be acquired for each recorded return pulse.
- Flight line swath overlap shall be configured for a minimum of 50% side overlap, with at least 95% of the project area covered by two or more swaths.
- Adjacent, parallel flight line swaths shall be flown in opposing directions.

- For planar, non-vegetated areas, the elevation reproducibility of closely spaced laser return pairs from overlapping flight swaths shall satisfy the following RMSE specifications as a function of slope for 2-foot contour areas:
    - 15 cm 0% < slope ≤ 20%
    - 30 cm 20% < slope ≤ 30%
    - 50 cm 30% < slope ≤ 40%
    - 70 cm 40% < slope ≤ 50%
    - 100 cm 50% < slope
- The density of laser pulse returns shall be at least 63 first returns per 1000 square feet at the 95th percentile per tile, exclusive of areas of open water or other known non-reflective surfaces. (NOTE: Check area should be selected to provide an integer number of check areas across final deliverable tile size.)
- **Full Feature or All Return Point Data** shall not be provided unless District's Project Manager / Survey Manager requests said data.
- **Bare Earth Point Data**
    - Data point density shall be filtered to provide a usable product.
    - Data shall be partitioned into individual files corresponding to USGS Quarter-Quads.
    - Data shall be delivered in ASCII, fixed length, formatted files with one record per return. The records shall be ordered sequentially according to time and return number with no duplicate records. The individual returns shall be classified as "Ground" or "water".
    - Data shall be delivered on DVD-ROM.

4.12.4. Mapping

4.12.4.1. General Provisions

The following subsection on mapping shall be modified as appropriate to the needs of the overall Project, such as adjusting the scale from 1" = 200' and the contour interval from two (2) foot for floodplain delineations and planning studies to a larger scale (as determined by the District's Project Manager) and more precise contour interval [typically one (1) foot] for design Projects or volumetric calculations. For typical mapping Projects for delineation and studies, the following scope of work is appropriate:

The Consultnat shall utilize the photogrammetrically collected data to prepare digital topographic mapping at 1" = 200' mapping scale for the Project Area, as shown in Figure A, which illustrates the Project boundaries. The mapping shall have a two (2) foot contour interval. Two (2) foot contours shall be discontinued for slopes in excess of fifteen percent (15%), where only the index contours will be provided.

- **Data Delivery Standards:** Digital terrain model, contour, and planimetric data delivery shall comply with the requirements of 3.2.9, Deliverable Standards.
- **Digital Terrain Modeling:** The Consultant shall perform terrain data extraction using photogrammetric methods. This may include interactive or automated means (autocorrelation). Where automated data extraction is used, it is required that all point information be corrected to ground level. While the District is not setting specific requirements for mass point or break line density, it is emphasized that the Consultant is liable for ensuring that the DTM is capable of supporting the creation of two (2) foot contours that meet the accuracy requirements for the Project.
- **Database Compatibility:** DTM data features shall be compiled in separate data layers to facilitate translation into the District's HIS database.
- **Phased Deliveries:** The Consultant may break the DTM into partial deliveries as approved by the District's Project Manager for initial review and approval prior to creating any derivative data products (contours). Separated DTM submittals shall be combined and resubmitted as a complete DTM for review and approval prior to proceeding with map finishing.

4.12.4.2. Contour Generation

The Consultant shall use the approved DTM to generate contours at two (2) (or as otherwise specified) foot intervals for the Project Area. Topographic features shall include index and intermediate contour lines, depression contours with ticks, obscured contours represented with dashed lines, and spot elevations. Spot elevations shall be placed along roadways and in roadway intersections, in saddles, depressions, and on significant high points. Topographic data features shall be compiled in separate data layers to facilitate translation into the District's HIS database.

- **Contour Smoothing:** Contour lines shall be smooth and aesthetically pleasing to the same level shown on the attached sample topographic map.
- **Index Contours:** Every index contour shall be labeled at appropriate locations. Contour strings shall be in true 3D and shall carry their elevations as an attribute. Elevations shall be rounded to the nearest even number.
- **Repeatability:** It is the expectation of the District that contours produced by District staff from the delivered DTM will overlay the contour strings delivered by

the Consultant. Only minor variations at sharp vertices due to the Consultant's use of smoothing routines will be accepted.

4.12.4.3. Planimetric Mapping

The type of planimetric features required varies by purpose and end user of the mapping. This is especially true for Projects involving 2-dimensional modeling. The types of required features listed in the scope of work shall be closely coordinated with the Engineering and GIS branches to ensure that delivery of important features, such as impervious surfaces, are delivered as closed polygons, occurs.

Planimetric features commensurate with 1" = 200' scale mapping (modify as needed), including but not limited to buildings, roads, fences, and trees (verify and delete unnecessary features) shall be extracted from the aerial imagery by the Consultant using stereoscopic photogrammetric techniques. A complete list of features to be captured is attached to and made a part of this Scope. Only buildings larger in dimension of 20 feet by 20 feet (20' x 20') shall be collected by the Consultant unless otherwise specificed in the SOW. The Consultant is not required to collect any bushes or cacti vegetation features. Planimetric data shall be compiled in separate data layers to facilitate translation into the District's HIS database.

4.12.4.4. Planimetric Specifications for 2-D modeling

Planimetric features for 2-D modeling Projects requires the Consultant's chief compiler to meet face-to-face with District (survey, engineering, and GIS) staff prior to the start of the Project. Assess the needed features and what determine the deliverable format. The Consultant and the District shall use as a guide in determining the need features the District's Interoffice Memorandum, FLO-2D Compliance Issues - Photogrammetric Mapping Compilation Guidelines, dated September 20, 2012.

4.12.4.5. Edge Matching

Projects shall match existing mapping for greater usefulness and inclusion into the GIS database. Therefore, the scope of work includes edge matching. Since it is not always a simple matter to match mapping products created at different times and by different Consultants, the scope of work acknowledges this by specifying an "initial effort" as part of base tasks and an optional item to allow for unforeseen difficulties in the edge matching process.

The District desires the Project contours be edge matched with existing District mapping Projects, specifically (include the names of each matching adjacent mapping Project to be matched along with the FCD contract number to facilitate identification of the most current mapping). The District recognizes the terrain may have changed between Projects of disparate mapping dates and that successful, accurate edge matching may not be achievable without additional effort.

Edge Matching – Initial Effort: The Consultant shall make a reasonable and diligent effort to perform edge matching of the current Project with the digital mapping data sets for the above mapping Projects identified by the District.

Edge Matching Memorandum: The Consultant will analyze and assess the success of the initial effort to edge match the current Project with the identified mapping Projects and prepare a memorandum to the District's Project Manager documenting the Consultant's assessment, including any recommendations for additional effort needed to achieve successful edge matching.

4.12.4.6. Map Finishing

Topographic map tiles consisting of the merged contour and planimetric data shall be formatted and finished in accordance with the sample map sheet provided at the kick-off meeting. The District will provide digital files of the sample map sheets to the Consultant. Finished map sheets shall be based on the sample cover and sample map sheet which are attached to and made a part of this SOW. The full map set shall include a cover/index sheet, control listing with cross-references to the applicable map tiles, and a legend sheet. Map sheet size shall be 34 inches by 40 inches (34" x 40").

Specimen Map/Cover Sheet: The Consultant shall submit a hard copy specimen map and Project cover sheet to the District for review, comment, and approval prior map finishing. The specimen map shall include the border and title block proposed for the finished maps. The cover sheet shall include the border, title, District logo, and legend of basic map features proposed for the finished map. The District's recommendations shall be incorporated by the Consultant into the cover sheet and all subsequent map sheets created for the Project.

- **Data Delivery Standards:** The Consultant shall make all terrain and planimetric features compliant with the sample map sheets provided by the DISTRICT or National Mapping Standards. Drafting standards, such as line types, line weights, symbols, font characteristics, grids, sheet borders, indexes, legends, and title blocks shall be applied.
- **Map Matching:** Data features between adjacent map tiles within this PROJECT shall match graphically and mathematically from tile to tile with no gaps, overshoots, crossing segments, angular deflections or other obvious discrepancies in transition.
- **Basic Map Features**: Each map, at a minimum, shall include the following items:

  I. North arrow;

  II. Current Flood Control District Logo;

  III. Location of any control symbolized and described in the notes;

  IV. Notation of scale (1"=200');

V. Legend of features and line types;

VI. Signed wet or electronic seal by the Arizona Registered Land Surveyor in responsible charge of the PROJECT; and

VII. Surveyor's certification

- **Sample Tile**: Immediately following approval of the DTM (or the first partial DTM) by the District, the Consultant shall promptly prepare and submit a completed sample map tile for review. The sample tile shall include all planimetric and topographic features and basic map features expected on a finished map, with the exception of the registrant's signature. Delivery of the sample map tile shall be made in digital and hardcopy formats. The District will review the sample map tile for compliance with all standards and specifications outlined in this scope of work and provide comments for future submittals.

- **Partial Review Sets**: The Consultant shall produce partial review sets of the draft plot files and hardcopy output from the completed digital map tiles for tiles selected by the District's Project Manager (plot files and pdf files of the partial review sets may be transmitted electronically by mutual agreement between the Consultant and the District's Project Manager, such as via an ftp site). The number of partial review sets shall not exceed twenty five percent (25%) of the total number of tiles within the PROJECT.

- **Draft Final Review:** The Consultant shall submit a full draft final set of the completed topographic map sheets for District review. The submittal shall consist of digital files of the mapping.

- **Comment Resolution Summary:** The Consultant shall submit a comment resolution summary for the draft and draft final submittal that shall indicate what action the Consultant performed for each of the District's comments. The comment resolution summary shall consist at a minimum of "accepted and made changes," "rejected and why, or "no action was required."

- **Final Submittal:** Upon final approval by the District, the Consultant shall submit a complete "Final" set of the topographic maps as electronically sealed and signed individual pdf files for each map sheet and a composite pdf file of all the map sheets (Adobe Acrobat "Booklet" format) on DVD-ROM.

4.13. Value Analysis / Value Engineering

4.13.1. Purpose

Value Analysis/ Value Engineering (VA) is a tool to be used in a systematic process designed to focus on the major and critical issues of the Project, using an independent multi-disciplined team to develop value improvement for the District's approval and implementation. Using this organized analytical process, with relevant information, the resulting management decisions will provide direction for the continued Project development. The outcome of VA studies is often cost reduction, but the primary focus is value improvement.

Note that: Value=Performance / Cost

The District uses the VA process to seek value improvement in various forms. This should result in improvements of the desired performance verses costs in any of the following areas:

- Design
- Constructability,
- Schedule
- Public/Political Acceptance
- Environmental impacts
- Multi-uses
- Aesthetics

The VA study should be a tool to advance the Project in the development process. Selecting the Project at the proper stage of development and the timing of the study are very important to the success of the VA program.

The Independent VA Team, led by a CVS, will perform a standard VA Workshop with the aid of the Performance Analysis and Weighted Evaluation Matrix tools, and all previously produced data, to assure the District of the best possible solution at the lowest life cycle cost. The selected Alternative may be modified by the VA Team, if it increases the functional performance and increase the Value of the Project. The end result by the VA Team will have to answer to the following questions: Will it work? Will it perform the required functions? Will it be Implementable?

In summary, the VA process will seek to utilize the experiences of the independent VA Team members. The important design decisions, which must be made, will be formulated from the recommendations developed and presented by the VA Team.

4.13.2. VA Process

The VA process uses a six step process as follows:

- **Investigation/ Information Phase** - Investigate the background information, technical reports (such as: geometrics, drainage, structures, earthwork, environmental,) and field observation, function analysis, and the partners, stakeholders and expectations and objectives.
- **Function Phase** – Identify and classify the Project functions as it relates to the Project goals and objectives. Also develop relationships with cost.
- **Speculation/Creative Phase** - Creative and brainstorm alternative proposals and solutions.
- **Evaluation Phase** - Analyze alternatives, technical evaluation, life cycle costs, documentation of logic, and rationale.
- **Development/Recommendation Phase** - Develop technical and economic supporting data to prove the feasibility of the desirable concepts or ideas. Develop team recommendations. Recommend long term as well as interim solutions as applicable.
- **Presentation/Implementation Phase** - Present the findings and recommendations of the VA Team in an oral presentation at the conclusion of the study, and in a written report and workbook following the completion of the study.

4.13.3. VA Study Timing

The timing of a VA study is critical to the success of the Project's programming and development. There are three potential windows of opportunity for accomplishing the VA study.

4.13.3.1. Planning Studies

In the planning stage, the development of the proposed Project's preferred Alternative (conceptual design) is under consideration. Thus, at this stage there is the maximum opportunity to consider (and build consensus with stakeholders) the various alternatives or solutions and there is high potential that the VA Team recommendations can be implemented.

The VA for Planning Studies should not be initiated until there is preliminary engineering information including rough costs should be available and the specific challenges or "issues" identified a preferred alternative. However, the study should not so far along as to cause major redesign costs for any required implementation based on the VA recommendations.

When conducting studies on Projects in the early conceptual stage, care must be taken to focus heavily on issues affecting Project "issues" of stakeholders and not to go after dollar

savings "per se". The focus here should be on tracking the way the recommendations are implemented.

4.13.3.2. Preliminary Design Studies

In the planning stage, the Project's technical approach and cost have been established and most of major design decisions have been identified. In the pre-design phase, minor re-alignment and structure types are being considered and refined, and the some opportunity to consider solutions that the VA Team recommendations can be implemented. Thus there is still opportunity for a VA study to consider the technical issues for each of the specific design elements.

The VA for a pre-design should occur early in the study just after completion of any alternative analysis and a rough cost estimate has been developed for the Project features proposed to be moved forward to 30% designs.

4.13.3.3. Final Design Studies

The VA should occur at the completion of the thirty percent stage and the engineering cost estimate.

However, most of the important Project decisions have been established and the opportunity to affect the Project design is somewhat limited. At this stage there is the opportunity to consider any significant design issues that have been identified during the design development. In addition, the constructability, construction sequencing, and channel lining (erosion protection) elements are important to consider at this stage.

4.13.4. VA Team

4.13.4.1. VA Consultant/Team Leader

The Consultant shall provide a certified professional VA Team Leader (CVS). The VA Team Leader affects the quality of the VA study significantly. This individual will guide the team in its efforts and be responsible for its actions during the study.

4.13.4.2. Team Members

The Consultant shall propose VA Team members and shall submit to the District for approval. The VA team is usually comprised of five to eight persons with diverse backgrounds relevant to the specific study. The team may be selected from MCDOT, other State or Federal agencies, or private individuals or firms. Team members should have the appropriate expertise to address the major functional areas and critical high cost issues of the study, and must be committed to the time required for the study. Local agencies, other state agencies, and communities groups should be invited to participate as team members on a case-by-case basis depending on Project issues.

4.13.5. VA Study Requirements

4.13.5.1. Duration

The time required to conduct a VA study may vary depending on the complexity and size of the Project, but typically will range from three (3) to five (5) days.

4.13.6. Coordination

(a) Site Visit

The VA Team shall conduct a ½-day field review of the study area and the proposed alternative alignments to become familiar with the site conditions prior to the VA Study.

(b) Data Collection / Information

The CONSULTANT shall distribute the Proposed Alternatives Analysis and Preferred Alternative to the VA Team at least 2 weeks prior to the VA Meeting. The VA Team will review the report prior to attendance at the meeting. The report shall document the development of the preferred alternative to evaluate the engineering feasibility, opportunities, constraints and the approximate costs.

(c) Meetings

Pre-VA Study- Alternative Analysis / Preferred Alternative Selection Meeting. - The Consultant shall have the VA Team, for planning Studies and Pre-design Studies, attend the Alternative Analysis / Preferred Alterative Selection Meeting to observe the evaluation process in order to gain an understanding of the issues, opportunities, and constraints that will drive the solutions. This will inform their subsequent independent VA review.

- **VA Kickoff Meeting -** The VA Team shall hold a kick off meeting to engage all Project stakeholder to solicited for Project goals and issues. Additionally, the VA team shall present all collected data, studies, and reports at this meeting to ensure that the VA team has all available documentation upon which to move forward to complete the VA study.

- **Independent VA Meeting** - The VA Team shall undertake an independent review of the recommended alternative for up to 5 days or as specified in the Scope of Work. The review will be based on the data provided under the Data Collection/Information.

- **VA Briefing Meeting –**The VA Team will make a formal presentation to the Project management staff, design team, and Project stakeholders, which will include a Q&A session. All comments are to be recorded and included in the final VA Report. The final Acceptance, Rejection or a Need Further Study comment will be the prerogative of the FCDMC Management, in close coordination with the Project partners and stakeholders.

- **District Internal Meeting -** The District will review the VA recommendations and identify which recommendations, if any, are to be incorporated into the recommended plan. The adopted VA changes will then be incorporated into the Project.

(d) Facility Accommodations

The CONSULTANT shall provide a meeting room facility which includes reasonable accommodations and support services for the VA Team during the independent review period.

4.13.6.2. Documentation

VA Study Report - The VA Study Report shall include a narrative description of Project input information, background and history, constraints and issues, VA team focus areas, and a discussion of the team speculation, evaluation, and recommendations. All of the team's evaluation documentation including sketches, calculations, analysis, and rationale for recommendations must be included in the final Report.

The final results will be documented by the VA Team facilitator in the final VA Report. The draft final VA Report shall be submitted within two (2) weeks following the VA review meetings.

Project Report - VA Team's recommendations shall be included in the final Project Report.

4.13.6.3. Implementation Of VA Recommendations

Upon receipt of the findings and recommendations from the VA Team, the Design and the appropriate Managers will review and evaluate the recommendations. The District shall then develop specific responses for each of the VA Team recommendations and a summary statement will be prepared, regarding the decisions for the further Project development.

This VA Decision Document will become a vital element in the decision record for the Project and shall be documented in Project final report. The Project development shall then continue based on the decisions developed from the VA study recommendation

5. Exhibits

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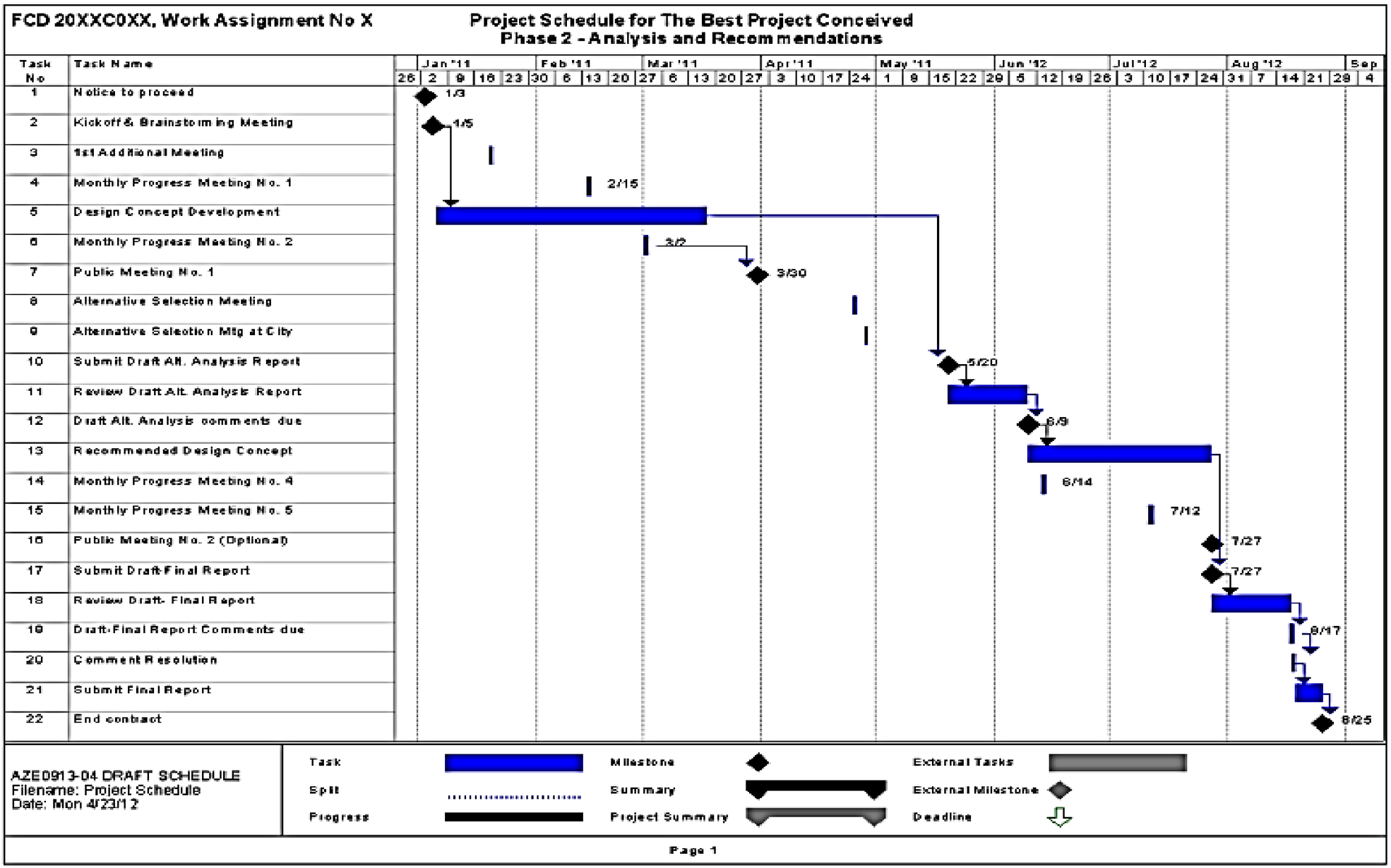
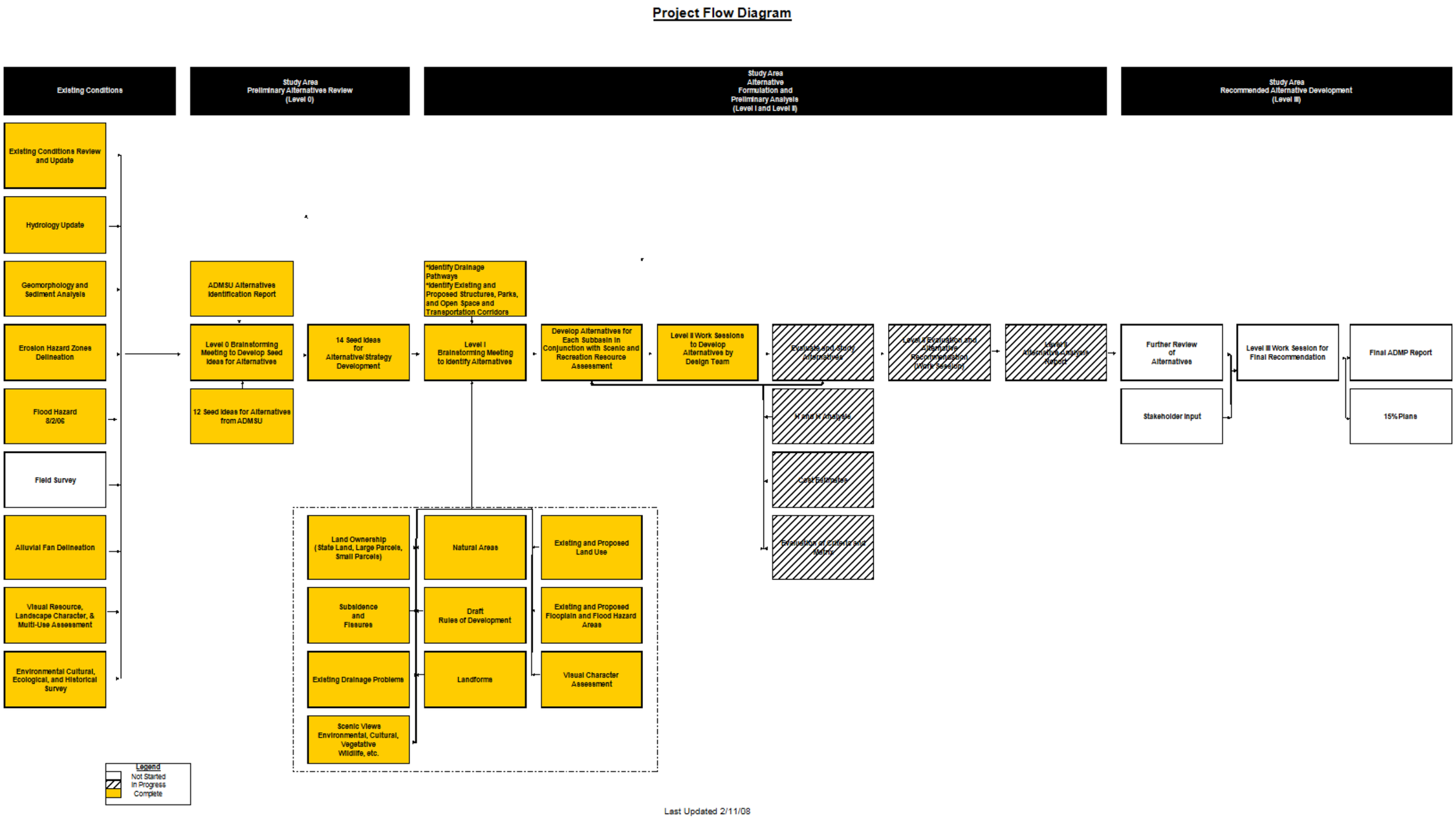
5.2. Exhibit 1 - Project Schedule



5.3. Exhibit 2 - Project Flow Chart



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5.4. Exhibit 3 - Sample Invoice

5.4.1. Exhibit 3a - Invoice

LOGO

The Best Consulant
911 Flood Way
Phoenix, AZ 85009
(602) 222-5151

INVOICE

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INVOICE NUMBER:	**draft**
TIME PERIOD:	**Through 3/31/2012**

DATE: 4/9/2012

ORIGINAL TO: Flood Control District of Maricopa County
Attn: Finance - Accounts Payable
2801 W. Durango Street
Phoenix, AZ 85009-6399

COPY TO: Flood Control District of Maricopa County
Attn: (FCD's Project Manager)
2801 W. Durango Street
Phoenix, AZ 85009-6399

CONTRACT NUMBER:	**20XXC0XX**
CONTRACT TITLE:	FCD Study
PROJECT CONTROL NUMBER (PCN):	**Get From FCD**
PROJECT / ASSIGNMENT NAME:	Study

TASK		CONTRACT AMOUNT - AUTHORIZED	CONTRACT AMOUNT – COMPLETED	PERCENT COMPLETE – AUTHORIZED	AMOUNT BILLED ON INVOICE	CONTRACT AMOUNT – REMAINING
CONSULTANT DIRECT LABOR						
2.0	Project Administration and Coordination	$79,742.92	$60,604.62	76%	$1,594.86	$19,138.30
3.0	Survey, Photogrammetry, and Mapping	$66,636.57	$61,305.64	92%	$0.00	$5,330.93
4.0	Public Involvement	$28,569.96	$14,284.98	50%	$0.00	$14,284.98
5.0	Hydrology	$320,307.28	$272,261.19	85%	$6,406.15	$48,046.09
6.0	Hydraulics	$260,884.34	$200,880.94	77%	$10,435.37	$60,003.40
7.0	Floodplain Delineation	$229,226.65	$142,120.52	62%	$9,169.06	$87,106.13
8.0	Planning Studies	$43,539.15	$30,477.41	70%	$1,306.18	$13,061.74
	SUB-TOTAL LABOR =	$1,028,906.87	$781,935.30	76%	$28,911.62	$246,971.57
CONSULTANT DIRECT AND OUTSIDE EXPENSES						
	Direct & Outside Expenses Base Contract	$38,927.00	$29,584.52	76%	$778.54	$9,342.48
	SUB-TOTAL EXPENSES =	$38,927.00	$29,584.52	76%	$778.54	$9,342.48
	SUB-TOTAL LABOR AND EXPENSES =	$1,067,833.87	$811,519.82	76%	$29,690.16	$256,314.05
CONSULTANT OPTIONAL TASKS						
	Opt. Task 3A (1): Add. Structure Surveys	$7,294.77	$7,294.77	100%	$0.00	$0.00
	Opt. Task 3A (1): Direct and Outside Expen.	$180.00	$180.00	100%	$0.00	$0.00
	Opt. Task 3A (2): Add. Survey Recent Devel.	$16,414.48	$16,414.48	100%	$0.00	$0.00
	Opt. Task 3A (2): Direct and Outside Expen.	$509.40	$509.40	100%	$0.00	$0.00
	Opt. Task 3A (3): Additional Surveys	$17,311.09	$17,311.09	100%	$1,731.11	$0.00
	Opt. Task 3A (3): Direct and Outside Expen.	$2,225.00	$2,225.00	100%	$222.50	$0.00
	Opt. Task 5A: Flo-2D, Grid Based Model	$69,057.68	$17,264.42	25%	$6,905.77	$51,793.26
	Opt. Task 5A: Direct and Outside Expenses	$687.00	$171.75	25%	$68.70	$515.25
	Opt. Task 6A: Hydrologic Models- Dams	$9,705.85	$8,249.97	85%	$970.58	$1,455.88
	Opt. Task 6A: Direct and Outside Exp.	$26.00	$22.10	85%	$2.60	$3.90
	SUB-TOTAL OPTIONAL TASKS =	$123,411.27	$59,741.72	48%	$9,901.26	$53,768.29
	SUB-TOTAL CONSULTANT =	$1,191,245.14	$881,162.80	74%	$39,591.42	$310,082.34
SUBCONSULTANTS						
	Sub A	$22,358.35	$16,180.16	72%	0.00	$6,178.19
	Sub B	$48,348.00	$33,485.31	69%	0.00	$14,862.69
	Sub C	$148,845.65	$112,222.68	75%	3,500.00	$36,622.97
	Sub D	$4,837.30	$2,017.11	42%	0.00	$2,820.19
	Sub E	$367,004.89	$236,776.71	65%	11,734.07	$130,228.18
	Sub F	$31,222.04	$15,890.34	51%	0.00	$15,331.70
	Sub G	$51,060.20	$43,074.75	84%	0.00	$7,985.45
	SUB-TOTAL SUBCONSULTANTS =	$673,676.43	$459,647.06	68%	15,234.07	$214,029.37
TOTAL =		$1,741,510.30	$1,271,166.88	73%	44,924.23	$470,343.42
TOTAL INCLUDING OPTIONAL TASKS =		$1,864,921.57	$1,340,809.86	72%	$54,825.49	$524,111.71

CONTRACT AMOUNT COMPLETED	$1,340,809.86
PREVIOUSLY BILLED	$1,285,984.37
TOTAL DUE	$54,825.49
LESS RETENTION	$0.00
TOTAL INVOICE	**$54,825.49**

PRINCIPAL/PROJECT MANAGER:_____

5.4.2. Exhibit 3b - Invoice, Progress Report

LOGO

The Best Consulant
911 Flood Way
Phoenix, AZ 85009
(602) 222-5151

PROGRESS REPORT

Page 2 of 3

DATE: 4/9/2012

INVOICE NUMBER:	**draft**
TIME PERIOD:	**Through 3/31/2012**

CONTRACT NUMBER:	**20XXC0XX**
CONTRACT TITLE:	FCD Study
PROJECT CONTROL NUMBER (PCN):	**Get From FCD**
PROJECT / ASSSIGNMENT NAME:	Study

PROGRESS REPORT	PERCENT COMPLETE OVERALL
2.0 Project Administration and Coordination 12 Monthly Project Meetings so far (2 in Wickenburg).	**75.1%**
3.0 Survey, Photogrammetry, and Mapping See Below	**92.0%**
4.0 Public Involvement Planning for Public Meeting Number 3 to occur in June or July 2012.	**58.6%**
5.0 Hydrology The Phase 2 HEC-1 Models are approved. Addressing comments on Geology Report.	**82.5%**
6.0 Hydraulics All the Phase 2 HEC-RAS models have been submitted. The models are in various stages for submittal/review.	**76.7%**
7.0 Floodplain Delineation Phase 1 TDN re-submitted to FEMA. Delineations for Phase 2 are in various stages for submittal/review.	**56.2%**
8.0 Planning Studies Existing and future planning information gathered. Continuing work on the Flood and Community Context Inventory Report. Preparing report to ultimately include Phase 2 and 3.	**60.7%**

OPTIONAL TASKS	PERCENT COMPLETE OVERALL
Optional Task 3A (1): Additional Structure Surveys Task Complete	**100.0%**
Optional Task 3A (2): Additional Survey Recent Develelopments Task Complete	**100.0%**
Optional Task 3A (3): Additional Survey Field Work Complete. Need to Compile and Submit Survey Notes.	**100.0%**
Opt. Task 5A: Flo-2D, Grid Based Model Ongoing - received comments on parameters and 'n' values	**25.0%**
Opt. Task 6A: Hydrologic Models- Dams Dam report re-submitted on 3-27-12	**85.0%**

UPCOMING WORK TASKS

5.0 Continue work on Phase 3 Hydrology and Flo-2D.
6.0 Ongoing
7.0 Ongoing
8.0 See above.

ISSUES / PROBLEMS

5.4.3. Exhibit 3c - Invoice, Forecast

LOGO

The Best Consulant
911 Flood Way
Phoenix, AZ 85009
(602) 222-5151

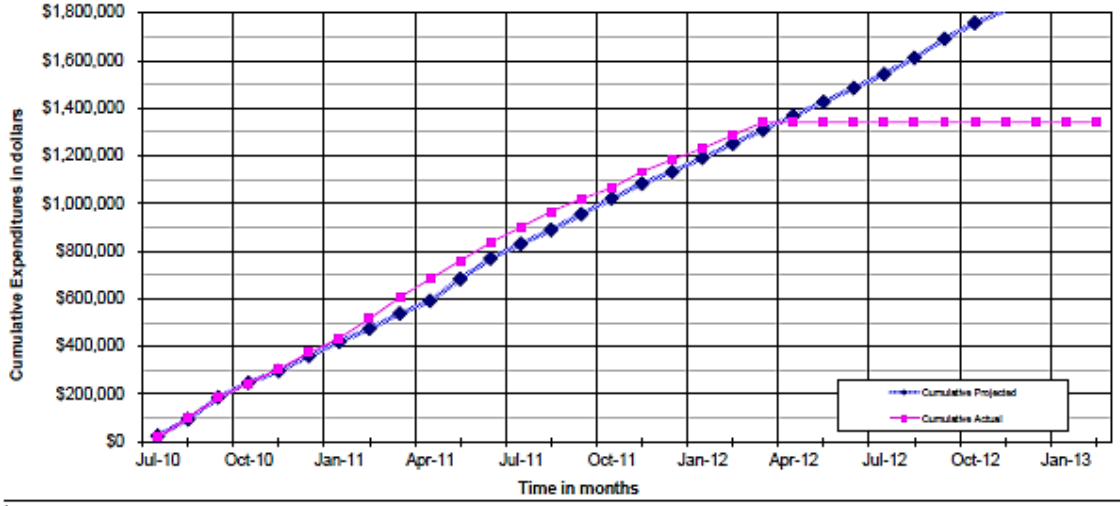
EXPENSE FORECAST

Page 3 of 3

DATE: 4/9/2012

INVOICE NUMBER:	**draft**
TIME PERIOD:	**Through 3/31/2012**

CONTRACT NUMBER:	**20XXC0XX**
CONTRACT TITLE:	FCD Study
PROJECT CONTROL NUMBER (PCN):	**Get From FCD**
PROJECT / ASSIGNMENT NAME:	Study



Month	Monthly Projected Expenditures	Cumulative Projected Expenditures	Cumulative Actual Expenditures	Monthly Actual Expenditures	% Actual Expenditures	Quarterly Projected Expenditures	Quarterly Actual Expenditures
Jul-10	$24,978	$24,978	$17,645	$17,645	0.9		
Aug-10	$69,063	$94,041	$100,411	$82,766	4.4		
Sep-10	$92,444	$186,485	$184,776	$84,365	4.5	$186,485	$184,776
Oct-10	$61,552	$248,037	$246,487	$61,712	3.3		
Nov-10	$49,056	$297,103	$305,580	$59,093	3.1		
Dec-10	$62,895	$359,999	$374,173	$68,593	3.7	$173,513	$189,398
Jan-11	$59,852	$419,851	$434,864	$60,691	3.2		
Feb-11	$54,740	$474,591	$516,453	$81,589	4.3		
Mar-11	$63,342	$537,932	$607,049	$90,596	4.8	$177,934	$232,876
Apr-11	$53,503	$591,435	$683,018	$75,969	4.0		
May-11	$91,874	$683,309	$760,529	$77,511	4.1		
Jun-11	$85,406	$768,715	$835,440	$74,911	4.0	$230,783	$228,391
Jul-11	$61,592	$830,307	$900,457	$65,017	3.5		
Aug-11	$58,386	$888,693	$965,802	$65,345	3.5		
Sep-11	$66,387	$955,080	$1,019,236	$53,434	2.8	$186,365	$183,796
Oct-11	$65,326	$1,020,406	$1,065,037	$45,801	2.4		
Nov-11	$62,923	$1,083,329	$1,132,673	$67,636	3.6		
Dec-11	$49,101	$1,132,430	$1,183,733	$51,060	2.7	$177,350	$164,497
Jan-12	$58,716	$1,191,146	$1,230,334	$46,601	2.5		
Feb-12	$58,715	$1,249,862	$1,286,125	$55,791	3.0		
Mar-12	$58,715	$1,308,577	$1,340,951	$54,825	2.9	$176,147	$157,217
Apr-12	$58,715	$1,367,292	$1,340,951	$0	0.0		
May-12	$58,716	$1,426,009	$1,340,951	$0	0.0		
Jun-12	$57,831	$1,483,840	$1,340,951	$0	0.0	$175,263	$0
Jul-12	$58,716	$1,542,555	$1,340,951	$0	0.0		
Aug-12	$67,622	$1,610,177	$1,340,951	$0	0.0		
Sep-12	$79,964	$1,690,141	$1,340,951	$0	0.0	$206,301	$0
Oct-12	$66,821	$1,756,962	$1,340,951	$0	0.0		
Nov-12	$53,237	$1,810,200	$1,340,951	$0	0.0		
Dec-12	$45,254	$1,855,454	$1,340,951	$0	0.0	$165,313	$0
Jan-13	$22,537	$1,877,991	$1,340,951	$0	0.0		
Feb-13	$0	$1,877,991	$1,340,951	$0	0.0	$22,537	$0
*TOTAL	$1,877,990.80			$1,340,950.52	71.4		

*NOTE: 1. Total equals fee authorized under contract award

5.5. Exhibit 4 - Professional Services Evaluation Forms

5.5.1. Exhibit 4a - Evaluation form of Consultant by FCD

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DEPARTMENT EVALUATION FORM

To be fill out by FCD

Date: _____

Consultant Name _____ Project Name _____

Project Description _____

Project Manager _____ Contract No. _____

Type of Review: Final

This form is to be used for design and study contracts.

Rate each of the following using a scale 1 through 5. Mark categories that do not apply N/A (Not Applicable). Use this form as the final review. Write comments, if any, in the space provided. Sign and date completed form and return to the Contracts Branch.

1	2	3	4	5
Needs Improvement		**Satisfactory**		**Superior**

	RATING
TIMELINESS	1 2 3 4 5
1. Timeliness of scoping and negotiations leading to contract award.	☐ ☐ ☐ ☐ ☐
2. Meeting interim milestones.	☐ ☐ ☐ ☐ ☐
3. Consultant's timely response to Department comments or questions.	☐ ☐ ☐ ☐ ☐
4. Timely billings or billing questions resolved.	☐ ☐ ☐ ☐ ☐
KNOWLEDGE	1 2 3 4 5
5. Understanding of project objectives/scope of work.	☐ ☐ ☐ ☐ ☐

Revised 02/00

Page 1 of 4

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DEPARTMENT EVALUATION FORM

To be fill out by FCD

	1	2	3	4	5
6. Value Engineering submittals. (i.e., savings, cost, design)	☐	☐	☐	☐	☐
7. Coordination to resolve issues beyond the scope of work.	☐	☐	☐	☐	☐
8. Coordination of subconsultants' work and submittals.	☐	☐	☐	☐	☐

COOPERATION/COMMUNICATIONS

	1	2	3	4	5
9. Working relationship between Department staff and Consultant.	☐	☐	☐	☐	☐
10. Prompt notification of problems.	☐	☐	☐	☐	☐
11. Initiative and proactive solutions.	☐	☐	☐	☐	☐
12. Compliance with contractual obligations.	☐	☐	☐	☐	☐

QUALITY

	1	2	3	4	5
13. Deliverables/submittals in accordance with the scope.	☐	☐	☐	☐	☐

Revised 02/00

Page 2 of 4

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DEPARTMENT EVALUATION FORM

To be fill out by FCD

14. Per Department's standards, Consultant produced clear, complete, and accurate:

	1	2	3	4	5
a. Plans	☐	☐	☐	☐	☐
b. Specifications	☐	☐	☐	☐	☐
c. Calculations	☐	☐	☐	☐	☐
d. Quantity calculations	☐	☐	☐	☐	☐
e. Reports	☐	☐	☐	☐	☐

15. Maintained adequate and qualified personnel throughout the project. 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

16. Performed quality control on project submittals. 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

17. Complete documentation. 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

CONSTRUCTABILITY (if applicable)

18. Plans and plan content are clear, concise, and accurate. 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

19. Quantity summary totals are accurate and reflect quantities for each plan sheet. 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

20. Survey information is accurate. 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DEPARTMENT EVALUATION FORM

To be fill out by FCD

	1	2	3	4	5
21. References to MAG specs, ASHTO, ACI, ADOT Drawings, etc., are correct.	☐	☐	☐	☐	☐
22. All necessary dimensions and references are clearly shown.	☐	☐	☐	☐	☐
23. All known utilities are clearly/accurately shown.	☐	☐	☐	☐	☐
24. Compliance with Public Information Office Guidelines.	☐	☐	☐	☐	☐

How well are we doing? How can we improve?

COMMENTS:

Project Manager Date

Revised 02/00

Page 4 of 4

5.5.2. Exhibit 4b - Evaluation Form of FCD by Consultant

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CONSULTANT EVALUATION FORM

To be filled out by Consultant

Date: _____

Consultant Name _____ Project Name _____

Project Description _____

Project Manager _____ Contract Number _____

Type of Review: Final

This form is to be used for design and study contracts.

Rate each of the following using a scale 1 through 5. Mark categories that do not apply N/A (Not Applicable). Use this form as the final review. Write comments, if any, in the space provided. Sign and date completed form and return to the Contracts Branch of the Flood Controld District of Maricopa County.

1	2	3	4	5
Needs Improvement		**Satisfactory**		**Superior**

	RATING
TIMELINESS	1 2 3 4 5
1. Timeliness of scoping and negotiations leading to contract award.	☐ ☐ ☐ ☐ ☐
2. Materials furnished to Consultant in a timely fashion.	☐ ☐ ☐ ☐ ☐
3. Department's timely response to Consultant questions.	☐ ☐ ☐ ☐ ☐
4. Department's timely reviews in accordance with the schedule.	☐ ☐ ☐ ☐ ☐
5. Timely payment of billings, billing questions resolved.	☐ ☐ ☐ ☐ ☐

Revised 02/00

Page 1 of 3

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CONSULTANT EVALUATION FORM

To be filled out by Consultant

KNOWLEDGE

	1	2	3	4	5
6. Understanding of project objectives/scope of work.	☐	☐	☐	☐	☐
7. Coordination to resolve issues beyond the scope of work.	☐	☐	☐	☐	☐
8. Guidance by Department's project manager.	☐	☐	☐	☐	☐
9. Acceptance of Value Engineering submittals.	☐	☐	☐	☐	☐

COOPERATION/COMMUNICATIONS

	1	2	3	4	5
10. Working relationship between Consultant and Department.	☐	☐	☐	☐	☐
11. Clarity of decisions or instructions from Department.	☐	☐	☐	☐	☐
12. Recognition and resolution of unusual or critical problems.	☐	☐	☐	☐	☐
13. Compliance with contractual obligations.	☐	☐	☐	☐	☐

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CONSULTANT EVALUATION FORM

To be filled out by Consultant

QUALITY

14. Clarity of contract scope of work. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

15. Clarity of Department standards/expectations for drawings and specifications (if applicable for construction). 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

16. Clarity of review comments. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

17. Appropriateness or relevancy of review comments for level of submittal. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

18. Maintained adequate and qualified management and review personnel throughout the project. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

19. Compliance with Public Information Office Guidelines. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

How well are we doing? How can we improve?

COMMENTS:

Consultant Date

Revised 02/00

Page 3 of 3

5.6. Exhibit 5 - Optional Authorization Letter(s)

5.6.1. Exhibit 5a - Standard Authorization Letter

THIS LETTER TO BE USED FOR AUTHORIZING AND, AS NECESSARY, REALLOCATING OPTIONAL TASK FUNDS FOR LUMP SUM CONTRACTS. WHEN REALLOCATING FUNDS IS NOT NECESSARY, DELETE THOSE RELATED PARAGRAGPHS.

Date

Project Manager Name
Consultant Name
Consultant Address
Consultant Address

Subject: Optional Task Authorization
Contract/Project Name, FCD Contract Number, PCN Number
Optional Task Number(s) _____

Dear _____:

This letter is in response to your letter *(or meeting, or agreement discussed)* dated _____, requesting authorization to proceed with *(description of services for the task)* _____ in accordance with the Contract provisions. The Flood Control District of Maricopa County has evaluated your request and authorizes you to proceed with this optional task. *(Add any further details or clarification here if necessary)*

The fee outlined in your letter in the amount of $_____ for Task [No. ___ & Name] is approved. Please itemize on your invoices, the costs of the optional fees as they are incurred.

Funds in the amount of $_____ are to be reallocated from Optional Task [No. ___ & Name] to Optional Task [No. ___ & Name].
{Use/repeat this sentence as appropriate and then clarify the change in funding as presented below}

Original base fee per contract: *(without optional tasks dollars)*	$_____
Change Orders authorized to date:	$_____
Previously authorized Optional Task fees:	$_____
Optional Task fee herein approved:	$_____
Revised total Contract fee authorized to date:	$_____
Contract Optional Tasks fee remaining:	$_____
Funds reallocated FROM Optional Task [No. & Name]	
Not-to-exceed Optional Task amount:	$_____
(Less) Optional Task fee previously authorized to date	$_____
(Less) Optional Task funds to be reallocated	$_____
Optional Task fee remaining:	$_____
Funds reallocated TO Optional Task [No. & Name]	
Original Optional Task amount:	$_____
(Plus) Optional Task reallocated funds	$_____
Revised Optional Task amount:	$_____

{Use/ repeat as necessary for multiple reallocated Optional Task funds or delete.}

Optional Task [No. & Name]	
Not-to-exceed Optional Task fee amount:	$_____
(Less) Optional Task fee herein approved:	$_____
(Less) Optional Task fee previously authorized to date	$_____
Optional Task fee remaining:	$_____

{Repeat as necessary for multiple Optional Task funds being authorized or delete.}

If you have further questions, please call me at 602-_____.

Sincerely,

Project Manager's Name
Project Manager

5.6.2. Exhibit 5b - Re-Allocation of Optional Funds

THIS LETTER TO BE USED FOR AUTHORIZING AND, AS NECESSARY, REALLOCATING OPTIONAL TASK FUNDS FOR ON-CALL CONTRACTS. WHEN REALLOCATING FUNDS IS NOT NECESSARY, DELETE THOSE RELATED PARAGRAGPHS.

Date

Project Manager Name
Consultant Name
Consultant Address
Consultant Address

Subject: Optional Task Authorization
Contract/Project Name, FCD Contract Number, PCN Number
Optional Task Number(s) _____

Dear _____:

This letter is in response to your letter *(or meeting, or agreement discussed)* dated _____, requesting authorization to proceed with *(description of services for the task)* _____ in accordance with the Contract provisions. The Flood Control District of Maricopa County has evaluated your request and authorizes you to proceed with this optional task. *(Add any further details or clarification here if necessary)*

The fee outlined in your letter in the amount of $_____ for Task [No. ___ & Name] is approved. Please itemize on your invoices, the costs of the optional fees as they are incurred.

Funds in the amount of $_____ are to be reallocated from Optional Task [No. ___ & Name] to Optional Task [No. ___ & Name].
{Use/repeat this sentence as appropriate and then clarify the change in funding as presented below}

Original Work Assignment base fee:	$_____
(without optional tasks dollars)	
Amendments authorized to date:	$_____
(without optional tasks dollars)	
Previously authorized Optional Task fees:	$_____
Optional Task fee herein approved:	$_____
Revised total Work Assignment fee authorized to date:	$_____
Work Assignment Optional Tasks Fee Remaining:	$_____
Funds reallocated FROM Optional Task [No. & Name]	
Not-to-exceed Optional Task amount:	$_____
(Less) Optional Task fee previously authorized to date	$_____
(Less) Optional Task funds to be reallocated	$_____
Optional Task fee remaining:	$_____
Funds reallocated TO Optional Task [No. & Name]	
Original Optional Task amount:	$_____

(Plus) Optional Task reallocated funds	$_____
Revised Optional Task amount:	$_____

{Use / repeat as necessary for multiple reallocated Optional Task funds or delete.}

Optional Task [No. & Name]	
Not-to-exceed Optional Task fee amount:	$_____
(Less) Optional Task fee herein approved:	$_____
(Less) Optional Task fee previously authorized to date	$_____
Optional Task fee remaining:	$_____

{Repeat as necessary for multiple Optional Task funds being authorized or delete.}

If you have further questions, please call me at 602-_____.

Sincerely,

Project Manager's Name
Project Manager

Cc: Contracts Branch Manager
Central File
Finance Department
Branch Manager

5.7. Exhibit 6 - Work Assignment - Letter of Time Extension

Firm
Address

Re: Contract Name and Number
Subject: Extension of Completion Date for Work Assignment # X

Due to ….. reason for time extension, weather, permitting issues, site conditions…. , the date for completion of Work Assignment # X has been extended by XX calendar days for a new completion date of XXXXX.

Original Scope of Work:

All other terms and conditions of the Work Assignment remain the same.

Sincerely,

Project Manager

cc: Finance Department – FCDMC
Central File (Contract No.)

<page break>

COORD: Supervisor, Branch Manager, Contracts Branch, anyone else that has an interest in project.

5.8. Exhibit 7- Bid Schedule

BID SCHEDULE - Contract FCD 2004CXXX, CONTRACT TITLE XXXXXXXXXX					
ITEM No.	DESCRIPTION	UNIT	PROJECT QUANTITY	UNIT COST NUMBERS	EXTENDED AMOUNT
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					
-					

TOTAL BID AMOUNT IN WRITTEN NUMBERS:

TOTAL BID AMOUNT IN WRITTEN WORDS

SUBMITTING FIRM (Please print):

Flood Control District of Maricopa County

Page 1 of 1