

TECHNICAL  
PROPOSAL

# White Tanks FRS #3 Modification Design



Prepared for:  
**Flood Control District of  
Maricopa County**



Prepared by:  
**DAMES & MOORE**

A DAMES & MOORE GROUP COMPANY

Contract FCD 98-11

JUNE 10, 1998



Pointe Corporate Centre  
7500 North Dreamy Draw Drive  
Suite 145  
Phoenix, Arizona 85020  
602 371 1110 Tel  
602 861 7431 Fax

June 10, 1998

Ms. H.M. Birch  
Contracts Manager  
Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, Arizona 85009

Re: Technical Proposal  
White Tanks FRS #3 Modification Design  
Flood Control District of Maricopa County  
Contract No. FCD 98-11

Property of  
Flood Control District of MC Library  
Please Return to  
2801 W Durango  
Phoenix, AZ 85009

Dear Ms. Birch:

Thank you for your letter of May 19, 1998 and your invitation to submit a technical proposal for the to White Tanks Flood Retarding Structure (FRS) #3 project. We understand that the Flood Control District of Maricopa County (the District) will retain an engineering firm to perform the technical studies and engineering necessary to design and permit necessary modifications to the dam. Dames & Moore wishes to be the selected prime engineering consultant for this work. We have the staff and technical resources necessary to complete this project on schedule and to the satisfaction of the District, United States Department of Agriculture's Natural Resource Conservation Service (NRCS), and the Arizona Department of Water Resources (ADWR).

**Dames & Moore** - Our firm is one of the largest engineering and consulting firms in Maricopa County. Our Phoenix staff of approximately 135 personnel provides an unmatched resource in the areas of engineering analysis, design, geology and groundwater, and environmental permitting. Phoenix is Dames & Moore's largest office and also a center of practice for water resources and dam engineering. Sandy Gourlay, our project manager, has spent 12 of his 14 years with Dames & Moore doing geotechnical, water resources, and mining projects in Arizona. He is a dam design engineer and has the energy, project management expertise, credibility, and technical resources to deliver a sound, constructible, and economical design package to the District.

**The Project Team** - We believe that one of the biggest strengths of the Dames & Moore project team is that we have worked together on many water resources projects, communicate well, and have complementary specialties. We are able to start work immediately on FRS #3 - several key team members have recently completed the design of a flood basin and associated dam in eastern Arizona. We have augmented our Dames & Moore water resources staff with the Jon Fuller and Brian Iserman of JE Fuller/Hydrology and Geomorphology, Inc and ATL, Inc. (ATL), a Phoenix based geotechnical drilling firm. Jon Fuller's many years of the experience and successfully completed projects with the District will produce a spillway inundation study that fully meets the District's expectations. Brian Iserman will lead the Emergency Action Plan preparation process and draw on his experience with preparing similar plans for Pima County. ATL will provide drilling services as part of the geotechnical investigation and, if necessary, laboratory testing services to supplement Dames & Moore's own geotechnical testing laboratory.

**Design Issues** - The required engineering and design breaks into three major pieces:

1. Embankment regrading to retain minimum long term freeboard
2. Identification of and design of alternative emergency and principal spillways
3. Identification of extent and type of measures required for embankment crack control

Flood Control District of Maricopa County  
June 10, 1998  
Page 2

The toughest technical challenge will be to identify a spillway strategy that satisfies all the requirements of NRCS, ADWR, and the District; it will take a lot of hard work from the entire study team to identify the optimal strategy. Vertical filter drains are the most likely means of assuring that embankment cracks do not threaten the integrity of FRS #3; the major technical effort will be to identify a sound rationale for identifying those portions of the embankment that might require addition of a vertical filter drain. Finally, design of the earthwork necessary to regrade the northern embankments of FRS #3 is primarily an effort in subsidence prediction coupled with construction cost estimating and optimization.

**Partnering** - Successful completion of the studies and engineering design in accordance with the District's tight schedule (270 days) will require effective coordination with the NRCS and ADWR. During the proposal period, the Dames & Moore project team members have made a significant effort to understand the sources of information and technical direction available from each of these organizations. We think that we have the ideas, technical skills, energy, and relationships to bring together the contributing groups in a manner that will produce the high quality, cost-effective solutions to the White Tanks FRS #3 project.

**ADWR Permitting** - One of the most significant advantages of the proposed Dames & Moore project team will be its ability to work effectively and closely with ADWR's Dam Safety personnel. As documented in the proposal, the Dames & Moore project team has designed, permitted with ADWR, and constructed several projects with similar elements (retrofit of through-dam conduits, embankment spillway, and spillway alternative comparisons). Other Dames & Moore clients have benefited from the long-term professional relationships that have developed between members of the design team and key ADWR staff.

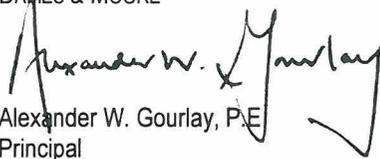
**Cost Effective Solutions** - Dames & Moore brings to the FRS #3 project a commitment to provide cost-effective engineering design services and to develop reliable cost evaluation tools for comparison of construction alternatives. We are committed to offering the District realistic effort estimates and competitive rates for the type of services required under this contract. We recognize that there is much dam/geotechnical engineering to be done in Maricopa County in upcoming years and want to be a preferred provider to the District for many years to come.



I look forward to the opportunity to present our project team to you and other members of the evaluation committee on June 16, 1998. Please call me if you have any questions in the meantime.

Sincerely,

DAMES & MOORE

  
Alexander W. Gourlay, P.E.  
Principal

# TABLE OF CONTENTS

---

**FIRM'S CAPABILITIES** 1

ADDITIONAL CAPABILITIES 2

---

**STAFF QUALIFICATIONS** 3

---

**EXPERIENCE ON SIMILAR PROJECTS** 8

---

**PROJECT UNDERSTANDING** 11

SETTLEMENT AND CRACKING OF EMBANKMENT 11

HYDROLOGIC ISSUES 12

SPILLWAY ALTERNATIVES 12

RESERVOIR CAPACITY 13

RAISING EMBANKMENT 13

PROJECT SCHEDULE 14

LABOR ESTIMATE 14

---

**PROJECT APPROACH** 16

DESIGN ISSUES REPORT 16

HYDROLOGIC DESIGN BASIS 16

SUBSIDENCE PREDICTION 17

GEOTECHNICAL INVESTIGATION 17

SPILLWAY EVALUATION 18

SPILLWAY IMPROVEMENTS DESIGN 19

SPILLWAY INUNDATION MAPPING 19

DAM BREAK ANALYSIS 20

EMERGENCY ACTION PLAN 20

DAM SAFETY INSPECTION 21

PERMITS AND APPROVALS 21

SURVEY, MAPPING, AND HIS DATA TRANSFERS 22

DELIVERABLES 22

PROJECT MANAGEMENT 22

---

**LOCATION OF WORK** 24

---

**CURRENT PRIME CONSULTANTS CONTRACTS** 24

---

**MBE/WBE PARTICIPATION** 24

---

**LIST OF FIGURES**

- 1 PROJECT TEAM
- 2 PROJECT SCHEDULE

---

**LIST OF APPENDICES**

- A STANDARD FORM 255
- B PROPOSED MBE/WBE PARTICIPATION AFFIDAVIT



## FIRM'S CAPABILITIES

Dames & Moore is a multi-national provider of comprehensive environmental, engineering and construction management services. From 136 offices in 26 countries, Dames & Moore has served as the engineering consultant of choice for over 30,000 clients because of our commitment to client satisfaction and technical excellence.

Dames & Moore has maintained a presence in Arizona continuously since 1972. The Phoenix office currently has a staff of approximately 135 professional and support personnel, while the Tucson office maintains a staff of approximately 15 individuals. Our Phoenix office has provided a full range of engineering, design, and construction management services for a diverse range of clients in the State. We have performed siting and impact studies, permitting, geotechnical investigations, engineering design and construction management for State and Local government agencies, mining companies, utility companies, industries and commercial businesses. Standard Form 255 which discusses the firm's capabilities in more detail is included in Appendix A.

The capabilities of our Phoenix personnel, which are particularly relevant to the White Tanks FRS #3 project, include:

**Water Resources Engineering:** Dames & Moore's water resources experience and expertise include the ability to evaluate and formulate strategies for water supply, flood control, water conservation, reclamation and hydropower generation. The Dames & Moore hydrologic and hydraulic staff are experienced in the areas of water resources management, river mechanics, flood control, canal and levee design, dam and spillway design, and sediment and debris flows. Dames & Moore provides water resources services for watershed hydrologic studies, planning and feasibility studies, reservoir sizing, flood sizing, flood routing, detention basin sizing, piping analysis and design, dam safety and rehabilitation assessment, and water quality studies.

**Geotechnical Engineering:** The Dames & Moore Phoenix office routinely provides geotechnical investigation and engineering services for a variety of development projects where geology, seismology and rock mechanics are critical design components. These projects include foundations for different structures, dams, tailing and other mine facilities, reservoirs, retention ponds, roads, and landfills and other waste disposal facilities. Our personnel have also been involved in projects where ground subsidence and earth fissures have been important design elements.

**Engineering Design** - Dames & Moore provides full design, bidding and construction services. Our Phoenix office includes nearly 25 design and construction engineers. The Dames & Moore staff specialize in the technical disciplines required for the investigation, design, and construction management for water resource projects including earthen and concrete dams, liner systems, and seepage drains. Our understanding of the multi-disciplinary nature of water resources projects allows us to absorb the regulatory, public and owner/operator requirements of the project and to develop creative and cost-effective designs, which address the site-specific concerns unique to each project.



**Construction Services** - The strength of the Dames & Moore construction services capability lies with the on-hands experience of our professional in design and construction management of a wide range of projects. This experience involves a balance between solid understanding of basic engineering fundamentals and the confidence to develop and realistic construction, schedule, and feasibility assessments.

**GIS Services** - Dames & Moore's Phoenix office houses the firm's strongest and deepest Geographic Information Systems (GIS) team, comprising of over ten staff experienced in the use of ArcInfo for data management. These staff regularly communicates GIS information with State and Federal agencies and have in the past, successfully interfaced with the Flood Control District of Maricopa County (the "District") personnel to transfer data to the District's Hydrologic Information System (HIS). They have reviewed the HIS data delivery specifications, and will ensure that Dames & Moore exceeds the District's expectations.

**Available Resources** - The Dames & Moore Phoenix office has qualified and experienced personnel to successfully complete this project. Completion of projects within budget and schedule are strongly emphasized. We recognize the relatively unique issues associated with this project including a rigid schedule, and interaction between multiple entities including the ADWR Dam Safety section and the NRCS. Dames & Moore is able and willing to commit the resources needed to see this project through to a successful conclusion.

#### **ADDITIONAL CAPABILITIES**

Dames & Moore has the advantage of deep and local technical resources. We can provide additional services to those currently requested by the District in the event of unforeseen needs. Three area of potential additional assistance are summarized below:

**Public Involvement** - Although the scope of work does require organization of two public meetings, there is no anticipated need for a formal public involvement process, presumably since the changes to FRS #3 are likely to be relatively minor. In the event that a more formal program becomes necessary, Dames & Moore Public Involvement staff has extensive experience in communication of flood protection issues, most recently on the Desert Greenbelt project in Scottsdale.

**Cultural Resources** - Dames & Moore currently holds cultural resources contracts with the District and MCDOT - our staff has the ability to meet any cultural resources needs of the project.

**Construction Management and Quality Assurance** - Dames & Moore's formal construction management capabilities and construction quality assurance experience may be of use to the District. It is normal for the design engineer to participate sufficiently in the construction phase to provide interpretations related to site conditions, interact with the ADWR inspector, and prepare an as-built construction report. We have provided this service on all ADWR-jurisdictional projects.



---

## STAFF QUALIFICATIONS

---

Dames & Moore will provide highly qualified engineers, scientists, and support staff for this project. We are well aware of the critical schedule for the design phase of the project, and are committed to providing the required personnel to meet the project schedule. Each of the team members is available to begin work immediately. In addition, each team member will be available at a sufficient level throughout the course of your project to ensure its timely completion. The qualifications of key members of our team are provided below. An organizational chart showing the project responsibilities of key team members is presented on Figure 1.

---

### ALEXANDER W. (SANDY) GOURLAY, P.E.

### PROJECT MANAGER

Mr. Gourlay is a Vice-President with Dames & Moore and a geotechnical design engineer with 14 years of experience in the technical and management aspects of water storage and stormwater management projects. Mr. Gourlay is a registered civil engineer in the state of Arizona. Mr. Gourlay has broad experience in managing multi-disciplinary projects, including interaction and negotiation with Arizona regulatory agencies, including ADWR Dam Safety Division and ADEQ. In the late 80s, he served as assistant project manager while Dames & Moore contracted with ADWR to perform geotechnical and hydrologic/hydraulic design of modifications to unsafe dams in northeast Arizona. He was Principal for Dames & Moore's Mineral Park Surface Water Control Project which was awarded a 1995 Technical Excellence Award by the Arizona Consulting Engineers Association. In recent years, he has managed an embankment penetration and reservoir lining project for the City of Sedona and has designed numerous surface water control dams, process ponds, and flood basins.

He will lead a team of geotechnical, civil, and water resources engineers that will identify causes of embankment settlement and cracking, study spillway alternatives, and design a new spillway and raised embankment. He will be responsible for compliance with the tight project schedule and the Districts' satisfaction with Dames & Moore's services.

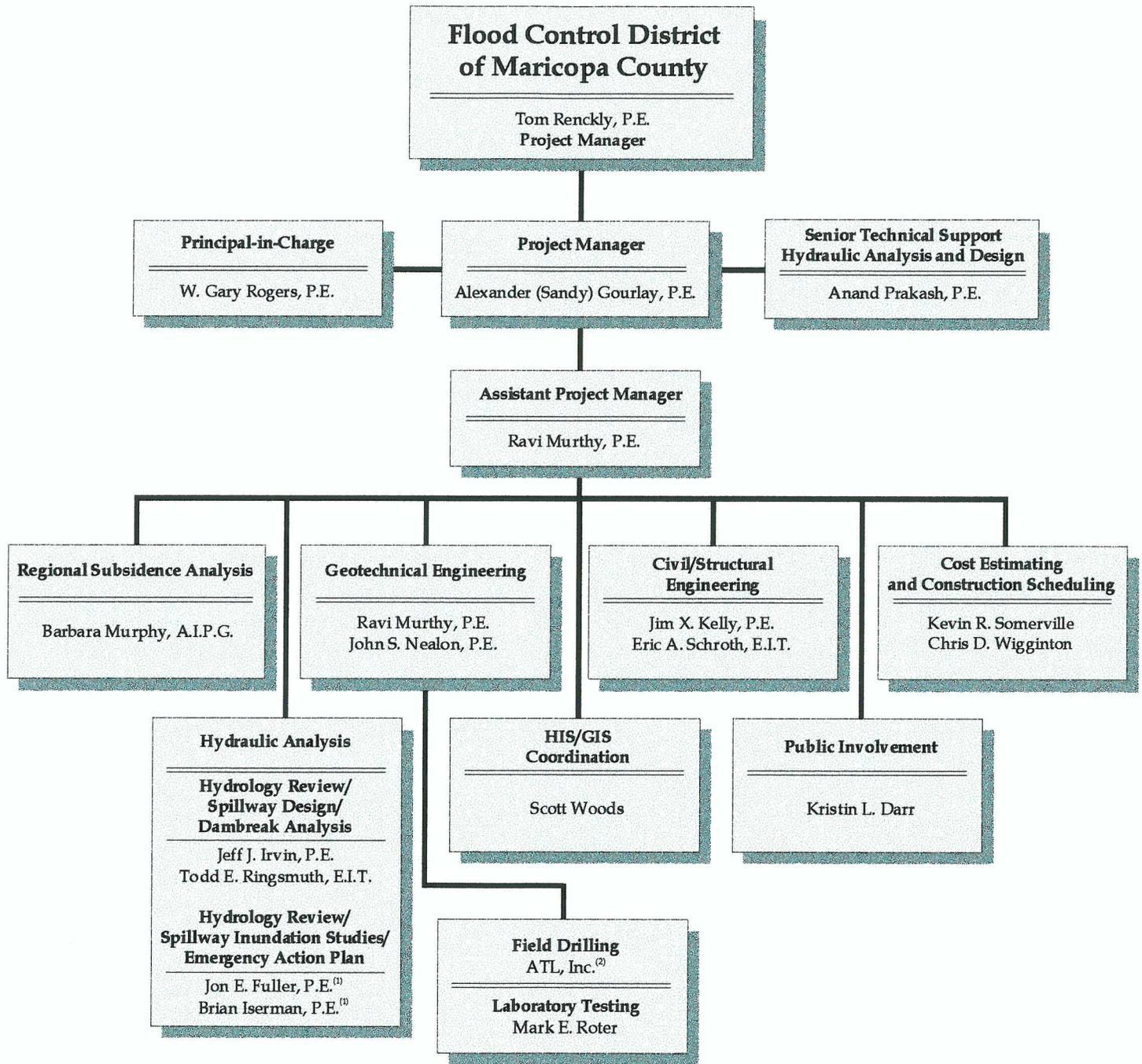
---

### W. GARY ROGERS, P.E.

### PRINCIPAL-IN-CHARGE

Mr. Rogers is a Vice-President and a Regional Manager with Dames & Moore. Located in Phoenix, Mr. Rogers has 24 years of experience in water resources, design and construction of earthworks and foundations. His responsibilities have included design studies including soil conditions and groundwater protection, site suitability studies to include geology, water rights, and surface water flow conditions. He will serve as a technical resource to the project team and will work with the Project Manager to ensure appropriate staff resources are available for the project.





Notes:

<sup>(1)</sup> J.E. Fuller / Hydrology & Geomorphology, Inc.

<sup>(2)</sup> Certified Maricopa County MBE/DBE

**PROJECT TEAM**  
*White Tanks FRS #3 Modification  
for Flood Control District of Maricopa County*

**RAVI MURTHY, P.E.****ASSISTANT PROJECT MANAGER, LEAD GEOTECHNICAL ENGINEER**

---

Mr. Murthy is a Project Engineer in the Phoenix office of Dames & Moore, and has over seven years experience on various geotechnical engineering projects in Arizona, Texas, New Mexico and Nevada. He has successfully completed several projects at sites with collapsible soils throughout the semi-arid Southwest and has a thorough understanding of the geomorphology of collapsible landforms. He is very experienced in the identification, sampling, and testing of collapsible soils, and implementing mitigation measures to minimize excessive settlement due to collapse-type settlement. Under the supervision of Mr. Gourlay, he is currently the assistant project manager for a process and stormwater process and control project at mine site in southeastern Arizona. Mr. Murthy has also served as the Dames & Moore project manager for several geotechnical investigations in Arizona.

**BARBARA H. MURPHY****GEOLOGY AND GROUND SUBSIDENCE**

---

Barbara Murphy has 20 years of experience in environmental and geotechnical investigations in Arizona and other western states. She has worked on variety of projects in the western Salt River Valley including Environmental Assessments (EAs) for Luke AFB for its Waste Water Treatment Plant and Golf Course. Both of these projects included geology, subsidence/earth fissures, surface water drainage, and groundwater issues. She also worked on a regional landfill siting and design project which required a thorough understanding of the geology, hydrology, and potential geologic hazards (i.e. earth fissures/subsidence) of the West Salt River Valley. She also assisted with an earth fissure and subsidence study for a proposed major residential development near Litchfield Park. She has completed numerous geologic, soils, groundwater, and potential geologic hazards investigations for a broad range of projects throughout Arizona. She has developed an extensive reference and resource base and is very familiar with agency resource specialists to contact for information and data.

**JEFFERSON IRVIN, P.E.****HYDRAULIC ANALYSIS**

---

Mr. Irvin is a Principal Engineer with Dames & Moore and has over 25 years of professional experience. His expertise includes surface water hydrology and hydraulics, reservoir and spillway design, and water resource investigation. He has directed and/or performed numerous water resources projects, including support of the EIS and emergency action plan for Red Butte Dam in Utah. He was an Assistant Professor at the United States Military Academy (West Point) for four years, teaching Hydrology and Hydraulic Design.

**TODD E. RINGSMUTH, E.I.T.****HYDRAULIC ANALYSIS**

---

Mr. Ringsmuth is a project engineer with extensive water resources and civil engineering experience in Arizona and the Southwestern United States. His expertise includes surface water modeling, water resources investigations, and design of hydraulic structures (including dams, spillways, pipelines, channels, and culverts). He has worked on several projects involving flood studies and mapping, erosion and sedimentation studies of natural washes, and dam break analyses.



**ANAND PRAKASH, PH.D., P.E.****CHIEF WATER RESOURCES ENGINEER**

Dr. Prakash is the Chief Water Resources Engineer for Dames & Moore. Dr. Prakash has nearly 35 years experience in the field of water resources. He is experienced in the water resources issues related to drainage, flood control, irrigation, groundwater recharge, hydropower, water supply, and community development projects. Dr. Prakash has previously worked on projects for the District, and at several other sites in Arizona. Mr. Prakash has been responsible for resolving complex design issues for numerous projects involving earthen and concrete dams, earthen and rock abutment spillways, and our embankment spillways.

**JONATHAN E. FULLER, P.E., P.H.****HYDROLOGY**

Mr. Fuller is a Principal of JE Fuller/Hydrology & Geomorphology, Inc – a subconsultant to Dames & Moore for this project. He has served as a project manager, project geomorphologist, and project engineer for studies and projects in Arizona, Nevada, California, and Utah. His areas of expertise include hydrology, drainage design, sediment transport and applied geomorphology.

**BRIAN R. ISERMAN, P.E.****HYDROLOGY**

Mr. Iserman is a hydrologist and a civil engineer for JE Fuller/Hydrology and Geomorphology, Inc., and will serve as a subconsultant to Dames & Moore for this project. He has served as a Project Engineer and hydrologist for studies and projects in Arizona, Nevada, New Mexico, and California. His experience includes sediment transport, hydrology, hydraulics, flood warning, and AutoCAD.

**JOHN S. NEALON, P.E.****GEOTECHNICAL ENGINEER**

Mr. Nealon is a Project Geotechnical Engineer with 12 years of experience in structural geology, stratigraphy, petrology, subsurface exploration, mining surveying, groundwater resource engineering, soil and rock mechanics, earth pressures and retaining structures, engineering geology, and earth dam engineering. Since 1989, Mr. Nealon has assisted in foundation design investigations for various structures in Arizona, New Mexico, and throughout the United States. Mr. Nealon worked as an Assistant Hydrologist in the Groundwater Section at the Illinois State Water Survey from 1985-1989. His experience on geotechnical projects includes project management, logging of geologic borings, engineering analysis and design and inspection of compacted structural fills, piles, and footing subgrades. Mr. Nealon is currently responsible for the design of a state-regulated concrete dam and spillway in New Mexico.

**ERIC A. SCHROTH, E.I.T.****DESIGN CIVIL ENGINEER**

Mr. Schroth is experienced in the area of civil engineering including site layouts, grading plans, earthwork balances, road alignments; piping and hydraulic design; septic design; hydrologic analysis; design of water impoundments and lining systems; design of channels, culverts and sediment control structures; preparation of design drawings and reports; erosion analysis and erosion control planning; stream restoration; AutoCAD and SOFTDESK; and numerous computer assisted engineering models.



Mr. Somerville has 8 years of combined construction and construction management experience of civil/industrial-type projects. Mr. Somerville's construction experience includes construction management and field testing for earth dams; spillways constructed in soil, rock, and concrete, mass earthwork, and geosynthetics installation. Mr. Somerville has conducted constructibility reviews, cost estimates, and construction schedules for numerous construction projects.

**SCOTT G. WOODS****GIS/HIS**

---

Mr. Woods has seven years of professional geographic information systems (GIS) with several private and local governmental agencies. He is proficient in the applications of Arc/Info and has conducted GIS project management, database management, computer mapping, and resource analysis on various interdisciplinary planning and environmental projects. Mr. Woods' current duties include overseeing GIS activities database development, data entry, program development, analysis, cartographic design, map production, and data reporting. He recently worked on portions of the Environmental Report for Maricopa County's 2020 Eye to the Future.

**KRISTIN L. DARR****PUBLIC INVOLVEMENT**

---

Ms. Darr has nearly 6 years of experience in technical communications and public involvement in the environmental engineering and planning fields. She is experienced designing and implementing public involvement programs of all sizes and she has worked for federal, state, and local agencies, as well as industry. Ms. Darr has extensive experience with the Public Involvement aspects of flood control projects through her work on Scottsdale's Desert Greenbelt project.

## EXPERIENCE ON SIMILAR PROJECTS

Dames & Moore's Phoenix office has successfully completed more than 20 dam/basin/reservoir projects in the last five years for a variety of private and public sector owners. The following paragraphs describe some key projects that highlight the team's experience with dams and other water resource projects:

### CONCEPT DESIGN PHASE LYMAN & RIVER RESERVOIR #3 DAMS, ST. JOHN'S, ARIZONA

Dames & Moore performed Phase II Dam Safety concept design studies for Lyman Dam and River Reservoir #3 Dam for the Apache County Flood Control District. Both dams are listed by the State of Arizona as unsafe and classified as high hazard. Both dams have unsafe downstream earth and rockfill slopes. Further, the spillways of both dams are not capable of passing required floods to protect the dams against failure from overtopping.

The engineering services included evaluation of existing dam stability and conceptual level design of safe embankment slopes and internal drainage. Services also included evaluation of spillway alternatives to pass various levels of the Probable Maximum Flood (PMF). This work included HEC-1, HEC-2, HEC-3 and DAMBRK computer modeling. Cost estimates of the dam construction for various dam heights and associated spillway alternatives were also prepared to select optimum cost alternatives for dam safety versus levels of the PMF. All interest groups were involved in selection of a preferred single alternative. The concept design of the preferred alternative was then refined and material quantities and cost estimates prepared for funding authorization. Sandy Gourlay and Anand Prakash of Dames & Moore played key roles in this challenging project, working with Tom Benoist who is now with ADWR.

### LOWER CHASE CREEK FLOOD CONTROL DAM, MORENCI, ARIZONA

Lower Chase Creek Dam was the seventh roller compacted concrete (RCC) dam greater than 50 feet high in the United States and the first major RCC structure in Arizona. It is a flood control and environmental protection dam built as part of a solvent extraction/ electrowinning (SX/EW) facility and drainage control project in Chase Creek in a copper mining region.

Dames & Moore developed conceptual designs in 1985 for the dam to provide cost estimates for earthfill, rockfill, concrete and RCC alternatives. Because of spillway space and reservoir constraints, a RCC dam was selected. Dames & Moore completed the design, coordinated permitting and provided construction management services. The design, including site investigation and start-up of permitting, was completed from September to December 1986. Permit and bid activities occurred in January and February 1987. Construction was completed by June 1987. The entire design through construction process was completed in nine months. The SX/EW facility and drainage control project was selected by the Arizona Society of Professional Engineers for the Outstanding Project of the Year Award for 1987. Sandy Gourlay was involved in geotechnical design of the project and has performed several subsequent dam safety inspections. Anand Prakash was responsible for spillway hydraulic design. Jeff Irvin performed the hydrology and IDF studies.



## **LINER RETROFIT AND GRAVITY DRAIN DESIGN, RESERVOIR NOS. 1 AND 2, SEDONA, ARIZONA**

---

Dames & Moore was retained by the City of Sedona to develop detailed plans and specifications to support ADWR Division of Dam Safety permitting and construction of a retro-fitted liner system and low-level conduit interconnection for two existing wastewater storage reservoirs at the City's wastewater treatment facility.

This fast-track design project was completed to satisfy a Consent Decree schedule. Detailed designs, technical specifications, and bid documents were prepared. Completion of designs requires evaluation of liner system stability on embankment slopes, puncture resistance, optimal liner crest elevation to balance seepage control requirements with construction cost, and tie-in with existing and proposed reservoir drain/fill facilities. In addition, several spillway modifications are required to ensure that the liner system is not compromised in a reservoir-to-reservoir spill event. Construction activities are, and will be, monitored by Dames & Moore engineers for compliance with the ADWR-approved construction plans and specifications.

## **SURFACE WATER CONTROL PROJECT, CYPRUS MINERAL PARK, NEAR KINGMAN, ARIZONA**

---

Dames & Moore provided conceptual design, final design, permitting, and construction oversight management services for a leachate and surface water system at an operating copper mine in Arizona. The Arizona Consulting Engineers Association awarded the project a 1995 first-place Technical Excellence Award. Early and regular reviews with the Arizona Department of Environmental Quality (ADEQ) and the Arizona Department of Water Resources (ADWR) ensured proper project focus and expedited the permitting process.

A sophisticated hydrologic model, including pumpbacks, was developed for the drainage basin to demonstrate that a major heap leach would lag peak flows sufficiently that pumps could be used to dramatically reduce the size of the required stormwater basin. As a part of the design, a field investigation was performed consisting of a test pit program, drilling program, geophysical survey, and a conductivity survey. The hydrologic modeling included HEC-1, HEC-2, and DAMBRK computer models.

## **EIS AND EAP FOR RED BUTTE DAM AND RESERVOIR, SALT LAKE CITY, UTAH**

---

Red Butte Dam is located within a residential neighborhood in Salt Lake City. It is owned and operated by the U.S. Army. Dames & Moore prepared an Emergency Action Plan (EAP) for Red Butte Dam and Reservoir, and prepared an environmental impact statement (EIS) for the transfer of the dam and reservoir from Federal ownership. Relevant scope of work for preparation of the EAP included: development of dam break inundation maps using HEC-1 and NWS DAMBRK software.

Performance of a basin sedimentation study in accordance with the USACOE manual "Sedimentation Investigations in Rivers and Reservoirs" (EM 1110-2-4000) included calculation of watershed sediment yield; calibration of USLE estimates using the above gage and measurements of sedimentation in Red Butte Reservoir; use of HEC-6 to estimate locations and extent of erosion and deposition for specific storms and specific EIS scenarios; development of water surface profiles for floods ranging from the 10-year to 500-year flood.



### **FREEMAN DIVERSION DAM, SATICOY, CALIFORNIA**

---

Dames & Moore provided preliminary and final design services and construction management services for a diversion dam and canal on the Santa Clara River. The 50-foot high, 1200-foot-long dam, and 3500-foot-long diversion canal diverts water to a groundwater recharge basin. Dames & Moore conducted all phases of the preliminary design including geotechnical investigations, geology, hydrology, groundwater studies, hydraulic design, structural design and construction cost estimating. Hydraulic designs were prepared for the erosion protection system, a relatively silt-free canal system, and a settling basin for sediment entrapment before the release of water for a groundwater recharge spreading basin. Dames & Moore provided full-time construction management and resident engineering services throughout construction of the canal and the dam.

### **LITTLEROCK DAM, ANGELES NATIONAL FOREST, CALIFORNIA**

---

Dames & Moore was the construction manager for the restoration and expansion of the Littlerock Dam and reservoir which is jointly owned by the Palmdale Water District and the Littlerock Creek Irrigation District. The Littlerock Dam, located in the Angeles National Forest, California is a 160 foot high, 720 foot long multiple-arch reinforced concrete structure. The design implemented includes a roller compacted concrete buttress on the downstream face and a 12 foot increase in reservoir elevation which will double the capacity. The project was completed in 1994.

### **DESERT GREENBELT STORMWATER MANAGEMENT PROJECT, SCOTTSDALE, ARIZONA**

---

The City of Scottsdale retained Dames & Moore to conduct an extensive public involvement program and environmental studies for the design of a \$58 million dollar regional flood control project. The project will consist of a series of drainage-control channels with multi-use recreational opportunities, such as horse trails and bicycle paths. Dames & Moore developed a dynamic, yet flexible approach based on each phase of concept development.

### **IONA WASH FLOOD INSURANCE STUDY, MARICOPA COUNTY, ARIZONA**

---

JE Fuller/Hydrology & Geomorphology, Inc. completed a FEMA floodplain and floodway delineation study was completed on an alluvial watercourse in western Maricopa County, Arizona for the District. Iona Wash includes distributary and confined channel reaches, as well as significant sheet flooding, breakout, and ponding areas. Mr. Fuller was responsible for HEC-2 modeling, preparation of the Technical Documentation Notebook and FIS Report, public and agency coordination, and floodplain/floodway maps.

### **RIO VERDE FLOODPLAIN DELINEATION STUDY**

---

JE Fuller/Hydrology & Geomorphology, Inc. prepared floodplain and floodway delineations for 7.5 miles of an ephemeral distributary wash system in northern Maricopa County using HEC-RAS. The study performed included preparation of new topographic mapping, use of HEC-1 data from the existing ADMS, and modeling of split flows, flow break outs and stock ponds.



## PROJECT UNDERSTANDING

The project must be completed during a relatively short period of 270 days. The District's Scope of Work presents an exhaustive list of the deliverables that must be completed during this period. The Dames & Moore project team has invested significant effort to develop an understanding of the real challenges of the project and to separate them from issues of primarily academic interest or routine design tasks.

### SETTLEMENT AND CRACKING OF EMBANKMENT

Based on a partial review of work by previous investigators at the site, the geotechnical and geologic setting of the site, and our previous project experience in Arizona, we have identified the following potential causes for the settlement of the crest of the dam along the northern end of FRS #3, and the formation of the cracks in the embankment:

1. **Regional Subsidence Related to Groundwater Withdrawal:** In the western Salt River Valley, land subsidence has occurred as the result of large-scale fluid withdrawal. This overdraft of groundwater resources has resulted in aquifer compaction or compression. Comparisons of water-level declines and the areas of measured land subsidence indicate that the areas of maximum subsidence correspond to those areas of maximum water-level decline. Earth fissures, or cracks, may occur in the alluvial sediments of the basins that have had large scale withdrawal of groundwater, typically where water levels have declined by 300 feet or more. Previous studies of land subsidence in the Valley have included contour maps of subsidence. These contours are oblique to the centerline of the dam and suggest that the north end of FRS #3 would have subsided more than the south end. This is generally consistent with the field observations by the District. More recent studies for Luke Air Force Base by the USGS suggest that since water levels in the area have remained stable or have gone up in the past few years, the rate of subsidence is expected to reduce with time. Similar trends can be seen from the historic survey data of subsidence monuments installed along the crest and downstream toe of FRS #3.
2. **Shrinkage of Embankment Soils Caused by Drying:** When soils with moisture contents above the shrinkage limits are allowed to dry, the reduction in moisture content of the soil is accompanied by a reduction in bulk volume of the soil, often resulting in the formation of shrinkage cracks. In our conversation with Mr. Benoist of ADWR, we discussed similar case histories at other earth dam sites in Arizona. The dam across Centennial Wash in Arizona is of particular relevance because of its similarity in setting to FRS #3. Mr. Benoist indicated that desiccation and shrinkage may have caused transverse cracking on the Centennial Wash dam, which probably lead to a dam breach. He also mentioned that the soils within the embankment appeared "cemented" and brittle. Similar "embrittlement" of the soils at FRS #3 could have made the embankment less compliant, and more susceptible to cracking due to differential settlement.
3. **"Collapse"-Type Settlement of Foundation Soils:** FRS #3 is located on the lower reaches of an alluvial fan at the base of the White Tanks Mountains. The geotechnical investigation by NRCS identified the foundation soils as predominantly silty sands, clayey sands, sandy clays and sandy silts.



Based on the site setting and geotechnical profile, we believe that collapsible soils may have played a key role in the distress manifestations noted in the embankment. It is likely that the foundation soils were relatively dry and therefore stable. As water impounded in the reservoir infiltrated into the foundation soils, the near-surface soils may have exhibited collapse-type settlement. This differential settlement, coupled with the embrittlement of the embankment soils discussed above may be a potential cause of the cracking observed in the dam. The NRCS report also indicated that the soils at the south end of the dam were contained a higher fraction of gravel and cobble-size particles. Such coarse-grained soils are typically less susceptible to collapse, perhaps resulting in little to no settlement of the embankment at the south end. RESERVOIR CAPACITY

## HYDROLOGIC ISSUES

NRCS has completed a hydrologic study and developed the inflow design flood (PMF and 100-year flood) hydrographs for use in the design analysis of FRS #3. Our project team will review the final hydrologic analysis report and submit recommendations, if any, to the District. The embankment and spillway structures must be designed to meet the more conservative criteria as set forth by the District, ADWR, and NRCS. The inflow design floods (IDFs) will be routed through the reservoir and spillway, and used for analysis of spillway alternatives and evaluation of downstream inundation.

We have performed an initial review of the NRCS hydrologic study and subsequent communications between the District, ADWR, and NRCS. One issue that is worth addressing here is the use of the NOAA Precipitation-Frequency Atlas for developing the 100-year flood design rainfall. The Atlas used in the analysis only makes use of rainfall data available prior to its 1973 publication. A new statistical analysis that incorporates an additional 25 years of rainfall data will provide a more accurate estimate of rainfall for the 100-year flood, especially for rainfall records that were significantly less than 100 years in 1973. While there is the potential that a statistical analysis incorporating new rainfall could lead to larger estimates than those provided in the 1973 NOAA Atlas, our work on other projects in Maricopa County has shown reductions in the 100-year rainfall of up to 10 percent. A similar reduction in the vicinity of FRS #3 could have a significant impact on the sizing requirements of the reservoir and principal spillway.

## SPILLWAY ALTERNATIVES

FRS #3 currently has three gated principal spillways and one emergency spillway. The principal spillways consist of one 24-inch and two 48-inch gated outlets constructed through the embankment. The emergency spillway consists of an 800-foot wide shallow excavation through the south abutment. Although the emergency spillway was originally designed to pass the half-PMF, the lowering of the top of dam due to subsidence now causes the modeled half-PMF to overtop the dam. The dam classification has also changed since its design and the structure must now pass the full PMF through the spillway without overtopping. It should be noted that some, including NRCS, may not consider the existing abutment spillway to be an emergency spillway.

The NRCS project authorization requires the reservoir impound no more than 2,500 acre-feet. NRCS has proposed a design to install a concrete chute spillway over the crest of the embankment to serve as a new principal spillway. The main factor leading NRCS to propose a new principal spillway is that the existing principal



spillway consists of gated culverts that must be manually opened. They have presented a concern that operation of the gates may not meet the TR-60 requirement for draining the reservoir in a 10 day period.

The proposed concrete chute spillway is designed with a notch at elevation 1,207.36 feet, which corresponds to a storage volume of approximately 2,500 acre-feet. The current emergency spillway elevation is approximately 1,209.7 feet. The District is currently coordinating with ADWR and NRCS concerning the design of an embankment spillway. Due to ADWR's concerns with the proposed NRCS design, the District would like further evaluation of options to modify the existing emergency spillway in lieu of constructing the concrete spillway over the embankment.

Issues involved in modification of the existing emergency spillway include:

- The potential presence of dispersive, erodible soils within the spillway; and
- The feasibility of increasing the spillway capacity (i.e., lowering and/or widening the spillway) in association with raising the embankment.

### RESERVOIR CAPACITY

The reservoir capacity is reported to be increasing relative to the original design value and the crest elevation of the spillway on the south abutment. It is likely that lowering of the ground surface in the northeast portions of the reservoir would add capacity relative to the unchanging spillway elevation, although the true safe capacity of the reservoir will have decreased due to the loss of freeboard.

Reservoir capacity will not be a major issue in the FRS #3 project because NRCS's PL-566 administrative project approval is based on only 2,500 AF storage at principal spillway crest elevation. The DTM to be provided by the District will provide a means to determine definitively the current elevation-capacity relationship.

### RAISING EMBANKMENT

The northern portions of the embankment will need to be raised to achieve adequate freeboard above the new emergency spillway crest elevation. It is unlikely that there will be much opportunity for optimization of the balance between spillway elevation/width and embankment raise due to the 2,500 AF capacity limitation (NRCS's PL-566 administrative project approval). The detailed survey of the reservoir to be provided by the District will allow establishment of the principal spillway elevation. It is unlikely that the required fill quantity will significantly deviate from that previously estimated by NRCS.

The project team's review of documentation of embankment cracking reveals that the most significant cracks have formed in the northern portions of the embankment between Stations 28+50 and 29+00. We also understand that a vertical filter drain was constructed in 1982 between Stations 57+90 and 58+40. We believe that properly constructed vertical filter drains are the most effective way of protecting an embankment with transverse cracking from internal erosion. We believe that the available crack location and other geotechnical information will allow the project team to identify portions of the structure that have most potential for cracking and require protection with a vertical filter drain.



## PROJECT SCHEDULE

The District has emphasized the importance of completing the project within 270 days, a tight schedule given the number of interim deliverables required by the Scope of Work. Dames & Moore's project manager will be responsible for all planning efforts necessary to satisfy the schedule including development of, and compliance with, the Project Schedule.

The project team have developed a draft, simplified project schedule, which is presented on the following page. The effort of developing the draft schedule was necessary for the project team to assure itself that the District's objective is achievable. Although the full detail and interconnection of tasks proved too complicated to present in this proposal due to page size limitations, the necessity of a focused schedule development effort was emphasized. We propose to develop the detailed Project Schedule during the first 14 days of the contract period by meeting with District staff to understand its critical needs for interconnection of project tasks. This effort may involve some form of brainstorming and, based on the need for exchange of technical information between specific design/study tasks, some adjustments to the intermediate deliverable schedule.

By preparing and submitting this proposal, Dames & Moore's project team affirms its commitment to achieving the 270-day Project Schedule. We understand that the schedule is real, regardless of how many obstacles are identified during performance of the work. We agree with the District's approach of incorporating time in the Schedule for performance of supplemental work tasks. Since the project can only be a success if it is completed on time, we must all look for ways to minimize the impact of obstacles by making reasonable assumptions, moving forward with intermediate tasks, minimizing the risk of having to redo work, etc.

## LABOR ESTIMATE

We have prepared an estimate of the labor effort required to meet the schedule and deliverables required by the contract. The estimate illustrates our understanding of the relative complexity of different elements of the project. The following table illustrates the breakout of the labor effort by general task.

Labor Hour Estimate								
Description	Associate	Senior Level	Project Level	Staff Level	Technician	CADD	Clerical	Task Total
Hydrologic Design Basis	10	20	100	20			10	160
Subsidence Prediction	10		80			10		100
Geotechnical Investigation <sup>(1)</sup>	20		80	100	60	20	10	290
Dam Safety Inspection	10		20				10	40
Spillway Alternative Evaluation	40	40	80	80		30	10	280
Spillway Inundation mapping		50	200	200			20	470
Dambreak Analysis		20	40	40		20		120
Emergency Action Plan		20	200	30			20	270
HIS Data Coordination		10	10	100				120
Survey and Mapping			10	30				40
Permits and Approvals	20	20	100	20		20	20	200
Spillway Improvements Design	20	20	20	100		20	10	190
Design (Plans, Specs, Costs)	30	20	100	100		200	40	490
Meetings and Coordination	80		120	30			20	250
<b>Category Total</b>	<b>240</b>	<b>220</b>	<b>1,160</b>	<b>850</b>	<b>60</b>	<b>320</b>	<b>170</b>	<b>3020</b>
<sup>(1)</sup> Does not include drilling subcontractor hours								



---

## PROJECT APPROACH

---

This section describes how the Dames & Moore team will approach some of the more important tasks described in the detailed Scope of Work provided by the District. The draft project schedule on the preceding page presents our initial understanding of the interconnection of tasks based on the specified draft and final deliverable dates and the time that can be allotted for each aspect of the project. We have not identified any major suggested modifications to the provided Scope of Work.

### DESIGN ISSUES REPORT

The Design Issues Report will be one of the most important early deliverables under this contract. As required by the scope of work, the report will contain the following components:

- Technical and regulatory design criteria list
- Summary of researched data sources
- Spillway alternatives evaluation
- Embankment and spillway modification concepts
- Dam safety inspection report
- Geotechnical investigation and testing plan

Although early identification of design criteria is important for any engineering design project, the overlapping and potentially contradictory design requirements of the District, NRCS, and ADWR make the effort essential for the FRS #3 modification project. We anticipate that the list of technical and regulatory design criteria will evolve quickly during the early weeks of the project as all the relevant data sources and interested agencies are interviewed and researched; following this early period, the list will be submitted to the District for review and approval. Any subsequent major changes will be discussed with affected parties before incorporation as formal changes to the approved design criteria.

We expect that the design criteria will have a significant effect on the spillway alternative evaluation process. We will focus our efforts during development of the Design Issues Report on eliminating alternatives that fail to satisfy the design criteria to simplify the evaluation process and, where possible, to focus the decision-making process of the District and its partners.

### HYDROLOGIC DESIGN BASIS

The Dames & Moore Team will review the FRS #3 final hydrologic analysis report developed by NRCS. The team will review the TR-20 model to verify the suitability of modeling assumptions and results for the purposes of the design process. Modeling results will be compared with the HEC-1 models previously prepared by the District for the White Tanks ADMS, the Luke Air Force Base LOMR, the Bullard Wash CLOMR, and the Dysart Drain LOMR.

The project team will review the Probable Maximum Precipitation prepared by NRCS using the procedures described in Hydrometeorological Report #49 published by NOAA. NRCS estimated the 6-hour, local PMF inflow to the reservoir to be 66,122 cfs, and outflow to be 21,985 cfs. As FRS #3 currently exists, it cannot safely pass the full PMF without overtopping the embankment. The new spillway design, in association with modifications to the embankment, will be designed to safely pass the full PMF.



Design issues related to the hydrologic analysis include:

- Reservoir storage capacity and embankment height
- Spillway design (i.e., type and location, invert elevation, flow capacity)
- Spillway flow inundation of downstream reaches

Following completion of the hydrology review and the preliminary design, the project team will evaluate the impacts of basin and spillway improvements on downstream floodplain delineations.

## SUBSIDENCE PREDICTION

Dames & Moore will conduct a review of the geology, hydrogeology, and subsidence and earth fissures in the area. We will review available information on the geology, groundwater conditions, groundwater levels, ground surface elevation, earth fissures and subsidence from references in our files from previous studies in the area and from information provided by NRCS, the District, and ADWR for this project. Dames & Moore will contact resource specialists at the USGS, Arizona Geological Survey, and other agencies to obtain other pertinent references on the geologic and hydrogeologic conditions of the project area. Also, available recent and historic aerial photographs of the project area will be reviewed for evidence of earth fissures and impacts of subsidence in the area. These photographs will be reviewed for linear features that may be earth fissures. These features will then be field checked to determine if the linear feature may actually be an earth fissure. Determination of earth fissures may require verification by trenching of the linear feature. Often linear features on the aerial photographs are drainages, animal pathways, or man-made features. Leveling data from the area and other subsidence studies will be reviewed for an evaluation of subsidence rates, both past and future estimated, that have been determined for the project area. Because of the length of the FRS and its proximity to the White Tank Mountains, amounts of subsidence along the structure vary. The subsidence data will be reviewed with other geotechnical and dam design information in the evaluation of the White Tank FRS #3.

## GEOTECHNICAL INVESTIGATION

The main objectives of the geotechnical investigation will be:

- To investigate the soils underlying the proposed spillway location in order to develop recommendations for site preparation and construction
- To investigate the soils within the embankment
- To investigate potential borrow sources for embankment re-construction
- To investigate the extent of the crack observed during the ADWR inspection in 1997

Dames & Moore has performed a preliminary review of several reports published following previous investigations at the White Tanks FRS #3. The objective of this review was to obtain a better understanding of the geologic and geotechnical setting on the site, and if possible, to identify potential causes of the cracking of the embankment. We believe that a thorough understanding of these issues will help optimize the geotechnical investigation component of the project, and will be crucial in molding future design at the site in a manner that will minimize the risk of cracking. The NRCS has performed a fairly comprehensive geotechnical investigation along FRS #3. In 1992, borings DH-1 through DH-29 were drilled along the upstream and downstream toes of the embankment.



Standard Penetration Tests were performed at selected intervals in the borings. Selected samples were analyzed for index properties. To the best of our understanding, relatively undisturbed samples were not collected during this investigation.

We believe that additional investigation will be needed to better understand the potential causes of cracking of the embankment. This will include a thorough review of available geotechnical information, and discussions with personnel from District and NRCS who are familiar with the project. In addition, a field investigation comprising of test borings and backhoe test pits will also be required. The embankment and foundation soils will be investigated through a series of borings, while the potential borrow source(s) and the crack near the upstream crest of the dam will be investigated using backhoe pits. As specified in the Request for Proposal, a detailed geotechnical investigation and testing plan will be presented to the District in the Design Issues Report.

### SPILLWAY EVALUATION

FRS #3 currently has three principal outlets and one emergency spillway. Dam safety and operational requirements are likely to mandate additional ungated principal spillway capacity and a significantly revised emergency spillway.

Of all the engineering tasks, the spillway evaluation and selection effort for FRS #3 will have the most impact on project cost, will require compromise of overlapping ADWR, NRCS, and District requirements and objectives, and will demand the most of the technical capabilities of the engineering design team. The general design challenges for FRS #3, and representative projects on which the Dames & Moore team has overcome these challenges, are listed in the following table:

Representative Projects					
Design Task	D&M Project Experience	Owner	Jurisdictional Agency	Date	Project Team Experience
Spillway Alternative Evaluation and Cost Comparison	River Reservoir No.3	ADWR/Apache Co.	ADWR	1989	Gourlay, Prakash
	Lyman Lake Dam	ADWR/Apache Co.	ADWR	1989	Gourlay, Prakash
Embankment Section Concrete Spillway	Mineral Park Flood Basin	Cyprus Amax Minerals	ADWR	1993	Gourlay, Ringsmuth, Irvin, Somerville
Dam Break Analysis	Mineral Park Flood Basin	Cyprus Amax Minerals	ADWR	1993	Gourlay, Ringsmuth, Irvin
Low-Level Conduit Retrofit	Sedona Wastewater Pond No.3	City of Sedona	ADWR	1997	Gourlay, Schroth, Somerville

Identification of suitable locations and capacity for the additional principal spillway conduits should not be major design challenge. Dames & Moore recently installed a low-level drain through the embankment of an existing, ADWR-jurisdictional wastewater storage impoundment in Sedona. We understand how to design embankment penetrations that satisfy TR-60 Amendment 1 guidelines for the size of graded filter zones and other such requirements.

Identification of alternatives for the emergency spillway will require consideration of the existing side channel spillway on the south abutment, a possible north abutment spillway, and a spillway contained within the embankment section. Design criteria and regulatory requirements may have a stronger influence on the selection



than construction cost. The NRCS project authorization requires that the reservoir impound no more than 2,500 AF at spillway invert elevation; the existing emergency spillway in the south abutment, which has not subsided, may be too high to be reconfigured cost-effectively to meet the NRCS requirement. In the event that the embankment section spillway is preferred, Dames & Moore has experience in gaining ADWR approval of such a concept and can apply additional technical resources to satisfy ADWR technical concerns.

## **SPILLWAY IMPROVEMENTS DESIGN**

Evaluation of spillway alternatives will result in a selected design for the FRS #3 spillway. The spillway design will meet the most conservative of the requirements of the District, ADWR (Safety of Dams Section), and NRCS (Technical Release No. 60).

Spillway engineering analysis and design components include the following:

- The emergency spillway must be designed to safely pass the PMF without overtopping the embankment.
- According to NRCS evaluation the current use of gated outlets as the principal spillways does not guarantee release of the 100-year flood volume within 10 days. Therefore, the reservoir must be capable of storing the runoff volume from two 100-year floods, or safely passing the second 100-year flood through an ungated "principal" spillway.
- The reservoir storage capacity must not exceed 2,500 acre-feet.
- If an abutment spillway is considered, the design must reflect the potential presence of dispersive, erodible soils.
- Structural analysis of the spillway structure.
- Seepage analysis.
- Address operation and maintenance issues.

The Dames & Moore Team will coordinate closely with ADWR and NRCS to ensure that all issues are addressed during the design process and will not hinder approval of the final spillway design.

## **SPILLWAY INUNDATION MAPPING**

The spillway inundation study will be performed using HEC-RAS to develop the inundation mapping for 1/3, 2/3, and the full PMF routed through the reservoir and spillways (principal and emergency). Our project team will make use of the PMF hydrographs developed by NRCS. Our experience on other projects in the area suggests that the full PMF will likely exceed the flow depth of 1 foot (the downstream design limit) nearly the entire distance between the reservoir and Gila River.

Key issues for the spillway inundation study include the following:

- Accuracy of topographic mapping due to new development and possible subsidence since 1989, the date of the existing mapping.



- Coordinate with the District in selection of Manning's n values and routing reaches for agricultural and urbanized areas downstream of the spillway.
- Selection of effective flow boundaries and cross section geometry to assure that one-dimensional flow assumption of HEC-RAS model is justified.
- Coordination with HEC-1 and DAMBRK models downstream of dam to simulate attenuation of peak discharges downstream of spillway. Attenuation results from floodplain storage, infiltration, and expansion of effective flow boundaries.
- Coordination with District staff regarding effectiveness of existing canals, laterals, and irrigated field to divert and store flood runoff.
- Coordination with design team regarding computation of spillway rating curve.
- Conversion of spillway inundation data to the HIS format.

### **DAM BREAK ANALYSIS**

The dambreak analysis will be performed using NWS DAMBRK, the standard software for the modeling of flood wave generation through dam breaches, which is used by most federal/state agencies in the United States for this purpose. The model uses a hydraulic computational algorithm based upon dynamic wave theory. Based on our experience using the model for the Red Butte Dam and Mineral Park Flood Basin dambreak analyses, Dames & Moore proposes to use the BOSS version of the NWS DAMBRK software to minimize the opportunity for unstable interactive search solutions.

The predicted hydrograph from the dam breach is extremely sensitive to the choice(s) for time to failure, and for the shape of the failure. Relatively minor changes to either of both of these parameters can have a very large effect on the predicted hydrograph. In general, it is best to achieve a technical consensus between engineer, client, and any reviewing agencies on the values/range of values for these parameters prior to initiation of any modeling. In the case of the proposed project, there is an approved existing dam break study (AGK Engineers, 1991) which has already selected values for these parameters for this dam, for similar failure scenarios.

Dames & Moore proposes the following approach for the dam break flood inundation study:

- The existing study, and the NWS DAMBRK input file from that study, will be reviewed in detail;
- Changed conditions (reservoir storage, spillway capacity, downstream floodplain cross-sections, etc.) will be noted and enumerated, and alternative model input data proposed for review by the District;
- A meeting will be held with the District to discuss model proposed changes/inputs;
- The model will be run for the inputs/range of inputs developed in the meeting;
- Inundation mapping will be developed from the model outputs, coupled with the project HIS mapping.

### **EMERGENCY ACTION PLAN**

The emergency action plan (EAP) will be coordinated with the spillway inundation and dambreak modeling tasks. The EAP will be included in the ADWR Dam Safety submittal. Components of the EAP include notification of key



agency personnel (i.e., Sheriff, ADEQ, etc.) and the general public, utilization of ALERT technology for flood warning; and identification of flood warning threshold levels for ponding and spillway discharge. EAP's usually include the following elements:

- Identification of key personnel and their duties
- Identification of alternative access routes
- Identification and classification of emergency supplies and materials
- Interaction with the emergency broadcast system
- Identification of critical bridge and drainage crossings
- Coordination with the District's ALERT system

In addition, ADWR requires consideration in the EAP of the following elements:

- Notification flow chart
- Specify notification procedures
- Statement of purpose
- Identify preparedness features such as supplies
- Establish levels of emergency detection and response
- Preparation of an inundation map
- Delineation areas of responsibility for each recommended action

#### **DAM SAFETY INSPECTION**

Dames & Moore senior staff have performed numerous dam safety inspections as part of federal- or state-mandated inspection programs. Based on our observations during the June 4 site visit, we do not think it likely that the inspection will reveal any major concerns beyond those already identified. It should be noted that the embankment cracking reported by ADWR in 1994 had been largely obscured by maintenance activities by the time of a follow-up inspection in 1997. During a site visit on June 4, 1998, no evidence of longitudinal or transvers cracking was identified. However, concern regarding the possibility of cracks in the embankment must remain until some evidence that they have closed is identified.

#### **PERMITS AND APPROVALS**

The tight schedule for completion of design, permitting, and authorization of construction will require an extremely active effort to submit complete permit applications that can receive timely agency approval. Dames & Moore believes that there is no alternative to close cooperation with key regulatory agencies during the design concept and final design stages of the project. Dames & Moore followed this strategy when it succeeded in getting Phelps Dodge's Lower Chase Creek Dam permitted and constructed in less than 18 months under pressure of a Consent Decree; we worked very closely with Mr. Ken Hussein, ADWR's engineer, to ensure that his engineering concerns were reflected in the design to minimize the need for negotiated revisions to the final design.

We also had the opportunity to work with ADWR when the agency acted as client on the River Reservoir No.3 and Lyman Lake dam modification projects; Jon Benoist (now with ADWR) and Sandy Gourlay were Dames & Moore's project and assistant project manager, respectively. Dr. Anand Prakash of the proposed project team established his technical credentials in hydrologic design criteria, reservoir hydrology, and spillway design with



Messrs. Jenkins and Lawrence of ADWR during this project. Dames & Moore has permitted several other dams with ADWR during the last few years. Mr. Gourlay of Dames & Moore and Mr. Jerry Cox of ADWR worked together on the completed Mineral Park Flood Basin project, which has a concrete spillway constructed on an earthfill dam, and on the completed Sedona Wastewater Reservoir No.3 project, which was reconstructed with a low-level conduit outlet.

The Dames & Moore team has the experience, credibility, and positive working relationships with ADWR, the key regulatory agency for this dam modification project, to negotiate successfully on contentious issues and to understand the detail of design necessary to make a concept permissible.

## **SURVEY, MAPPING, AND HIS DATA TRANSFERS**

**Survey** - The currently-envisaged surveying requirements of the project are relatively minor. The major survey requirements are being met by the District. Dames & Moore will identify any requirements for field survey to support structure identification or design and work with District staff to allocate the existing or additional budget accordingly.

**DTM** - Dames & Moore uses both "In Roads" and "Softdesk" for digital terrain modeling. We will use the softwares to develop a DTM of the District-provided reservoir survey information. We will use the DTM to develop elevation-capacity relationships for the existing and rebuilt dam/reservoir configurations. We will use the DTM for accurate estimation of embankment and spillway reconstruction earthwork volumes

**HIS/GIS** - Dames & Moore's Phoenix office houses the firm's strongest and deepest geographic information system (GIS) team, comprising over ten staff experienced in the use of ArcInfo for environmental data management. This staff regularly communicates GIS information with state and federal agencies throughout the country, has reviewed the District's Hydrologic Information System (HIS) data delivery specifications, and will ensure that Dames & Moore exceeds the District's HIS expectations.

## **DELIVERABLES**

The Scope of Work clearly defines the required deliverables and their contents. Rather than reiterate the detailed specification provided by the District, it is perhaps more useful to describe how the Dames & Moore team will satisfy the required schedule and deliverable content.

The tight schedule will require rapid submission of successive major deliverables, often with less than a month between successive deliverables. This format leaves little time for the project team to ramp up for a specific deliverable - we will have to be focused throughout the 270 day project schedule on deliverable production. We will prepare outlines of each deliverable early in the project and issue draft reports with outlined sections if appropriate given the schedule and completeness of work. If beneficial to reviewers, we will supply redline versions of reports so that reviewers can focus on changes relative to a previously-reviewed version.

## **PROJECT MANAGEMENT**

**Partnering** - The project team believes that the FRS #3 modification project would benefit greatly from a partnering effort to establish the needs and concerns of each of the involved parties. The project will only be



deemed a success if it meets the expectations of the District, meets NRCS design and project authorization criteria, and is authorized for construction by ADWR in a timely manner. Each of these organizations has different priorities that must be rationalized.

**Project Communications** - Subsequent to the project kickoff meeting, Dames & Moore will prepare a project contact sheet with names, addresses, telephone and fax numbers, and e-mail addresses. We will identify preferred communication means and implement an appropriate project communications strategy. We have used this procedure on similar long-term, high intensity projects with success.

**Schedule Management** - Dames & Moore uses Microsoft Project for schedule preparation and tracking. The schedule submitted with this proposal will form the basis of the project schedule to be completed within 14 days of Notice-to-Proceed. Since the schedule will be detailed and fixed, it should be relatively easy to assess progress relative to the schedule at any time. All meetings, progress reports, and billings will reference achieved progress relative to the approved schedule. In the event that there is a deviation from schedule, the project manager will develop a plan to regain the schedule - this plan may incorporate increased staffing, reassignment of priorities, adjustment of level of detail, and other such means to bring the schedule back on track.

**Budget Management** - Following negotiation and agreement regarding the labor hour allocation to different tasks, we anticipate little need for interaction with the District on budget management issues. The Scope of Work allows for the possibility of several additional tasks - work would not start on such tasks unless budgets had been agreed and authorized by the District project manager. In the event that the complexity or cost of any specific task should escalate in a manner that we believe is out of our responsibility to control, we will inform the District project manager in a timely manner and determine whether a scope and budget modification is warranted.



## LOCATION OF WORK

All work performed under this contract will be performed in Maricopa County. Dames & Moore's Phoenix office is a practice center within the firm for geotechnical engineering, hydrology, and dam design.

## CURRENT PRIME CONSULTANTS CONTRACTS

Dames & Moore is currently involved in three contracts, excluding on-call type contracts, with Maricopa County Departments/ Districts/Agencies. We have one on-call consulting contract is for cultural resource studies for Maricopa County Department of Transportation. The following table lists the current and active contracts held by Dames & Moore.

Current and Active Dames & Moore Contracts with Maricopa County Departments/Districts/Agencies			
Start Date	Client Name	Service	Estimated Remaining Contract Amount(\$)
2/98	FCDMC	Asbestos Survey 26 Residential Homes	\$5,000
4/97	MCDOT	Cultural Resources Study Street Intersection Improvement	\$14,276
4/97	MCDOT	Archaeological Data Recovery Maricopa City Transportation Facility	\$22,105
Estimated Remaining Contract Total (excluding on-call contracts)			\$41,381

## MBE/WBE PARTICIPATION

A copy of the current Dames & Moore affirmative action plan has been submitted at the same time as this proposal. For this project, we propose to team with ATL, Inc. (ATL) ATL will be responsible for selected tasks during the geotechnical investigation. As a member of this team, ATL will perform drilling for the geotechnical investigation, which we anticipate will amount to more than 5 percent of the total value of the contract. A signed and notarized copy of the "Proposed MBE/DBE Participation Affidavit" is included in Appendix B.

ATL is an engineering drilling company first established in 1967. ATL has performed geotechnical drilling projects throughout Arizona and the southwest. Their drilling equipment includes a Mobile B-56 truck-mounted drill rig, and three trailer mounted coring and augering rigs. ATL is an 8(a) minority-owned firm and is certified as a DBE/MBE with Maricopa County.





**APPENDIX A**  
**STANDARD FORM 255**



**STANDARD FORM (SF)**

**255**

**Architect-Engineer and Related Services Questionnaire for Specific Project**

1. PROJECT NAME/LOCATION FOR WHICH FIRM IS FILING:  
  
White Tanks FRS #3 Modifications for Maricopa County Flood Control District

2a. COMMERCE BUSINESS DAILY ANNOUNCEMENT DATE (if any):  
  
2b. AGENCY IDENTIFICATION NUMBER (if any):

3a. FIRM (or Joint-Venture) NAME AND ADDRESS:  
  
Dames & Moore  
7500 N. Dreamy Draw Drive, Suite 145  
Phoenix, Arizona 85020  
Tel (602)371-1110 Fax (602)861-7431  
  
DUNS #00-796-5189  
TIN #95-1686276

3b. NAME, TITLE AND TELEPHONE NUMBER OF PRINCIPAL TO CONTACT:  
  
Gary Rogers  
Desert Mountain Regional Manager  
(602) 371-1110  
  
3c. ADDRESS OF OFFICE TO PERFORM WORK, IF DIFFERENT FROM ITEM 3b:  
  
Same as Block 3

4. PERSONNEL BY DISCIPLINE: (List each person only once, by primary function.) Enter proposed consultant personnel to be utilized on this project on line (A) and in-house personnel on line (B).

(A) ___ (B) <u>2</u> Administration	(A) ___ (B) ___ Electrical Engineers	(A) ___ (B) ___ Oceanographers	(A) ___ (B) ___ Archaeologists/Historians
(A) ___ (B) ___ Architects	(A) ___ (B) <u>2</u> Estimators	(A) ___ (B) ___ Planners: Urban/Regional	(A) ___ (B) ___ Earthquake Engineers
(A) ___ (B) ___ Chemical Engineers	(A) ___ (B) <u>1</u> Geologists	(A) ___ (B) ___ Sanitary Engineers	(A) ___ (B) ___ Engineering Technicians
(A) <u>2</u> (B) <u>4</u> Civil Engineers	(A) ___ (B) <u>1</u> Hydrologists	(A) ___ (B) <u>4</u> Soils Engineers	(A) ___ (B) ___ Environmental Scientists
(A) ___ (B) ___ Construction Inspectors	(A) ___ (B) ___ Interior Designers	(A) ___ (B) ___ Specification Writers	(A) ___ (B) ___ Hazardous Waste Specialists
(A) ___ (B) <u>1</u> Draftsmen	(A) ___ (B) ___ Landscape Architects	(A) ___ (B) <u>1</u> Structural Engineers	(A) ___ (B) ___ Nuclear Engineers
(A) ___ (B) <u>2</u> Ecologists	(A) ___ (B) ___ Mechanical Engineers	(A) ___ (B) ___ Surveyors	(A) ___ (B) <u>1</u> Public Involvement Specialists
(A) ___ (B) ___ Economists	(A) ___ (B) ___ Mining Engineers	(A) ___ (B) ___ Transportation Engineers	(A) <u>2</u> (B) ___ Drillers
			(A) <u>5</u> (B) <u>17</u> Total Personnel

5a. IF SUBMITTAL IS BY JOINT-VENTURE, LIST PARTICIPATING FIRMS AND OUTLINE SPECIFIC AREAS OF RESPONSIBILITY FOR EACH FIRM:  
  
This is not a joint-venture.

5b. HAS THIS JOINT VENTURE PREVIOUSLY WORKED TOGETHER?  
 YES     NO  
 NOT APPLICABLE

6a. IF RESPONDENT IS NOT A JOINT-VENTURE, LIST OUTSIDE KEY CONSULTANTS/ASSOCIATES ANTICIPATED FOR THIS PROJECT: (attach SF 254 for consultants/associates listed if not already on file with the contracting office)  
  
JE Fuller/Hydrology and Geomorphology, Inc.  
ATL Inc.

6b. WORKED WITH PRIME  
 YES     NO     NOT APPLICABLE  
  
*Dames & Moore has not worked with JE Fuller/Hydrology and Geomorphology, Inc.*

**7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

**a. Name & Title:** Alexander W. Gourlay, P.E., Vice President

**b. Project Assignment:** Project Manager

**c. Name of Firm with which associated:** Dames & Moore

**d. Years Experience:** With This Firm 14 With Other Firms 1

**e. Education: Degree(s)/Year/Specialization**

M.S./1984/Geotechnical Engineering/University of Texas  
 B.Sc./1981/Civil Engineering, Imperial College of Science and Technology, University of London, United Kingdom

**f. Active Registration: Year First Registered/Discipline**

1989/Civil/Arizona No. 22867

**g. Other Experience and Qualifications relevant to the proposed project:**

Fourteen years of geotechnical and environmental engineering and construction, involving site investigation, engineering design, characterization of contaminated sites, remedial design, and construction. Mr. Gourlay has also been project engineer or manager for general engineering projects involving mining facilities, dams, landfills, roads, and site development. Mr. Gourlay joined Dames & Moore's Phoenix Office in 1984 and has played in role of increasing responsibility for the majority of the dam and surface water management projects performed in the office since 1984. Over the last ten years, Mr. Gourlay has had an opportunity to develop excellent working relationships with key staff of the ADWR Safety of Dams Unit.

**Civil, Geotechnical and Construction Engineering**

- **Pamo Dam, Southern California** - Proposed 260-foot high RCC dam. Borrow pit investigations for RCC aggregate. Embankment and excavation volumetrics, foundation seepage analysis and pressure relief design.
- **Lower Chase Creek Dam, Morenci, Arizona** - A 65-foot high RCC Dam. Stability analyses and civil design responsibilities. Evaluation of alternatives for cooling aggregate stockpiles during construction. Inspection and review of structural performance and integrity after major flood.
- **Lyman Dam, Arizona** - Engineering, volumetrics, cost estimates, and slope stability analyses for conceptual design of rehabilitation alternatives for an unsafe water supply dam in Apache County, Arizona. Served as assistant project manager. ADWR Dam Safety was the technical client for the work. Evaluated measures for embankment seepage control, increasing outlet works capacity, raising the dam, and increasing the capacity of the side-channel emergency spillway.
- **River Reservoir #3 Dam, Arizona** - Engineering, volumetrics, cost estimates, and slope stability analyses for conceptual design of rehabilitation alternatives for an unsafe water supply dam in Apache County, Arizona. Served as assistant project manager. ADWR Dam Safety was the technical client for the work. Evaluated measures for stabilizing over-steepened embankment slope, abandoning historic outlet works, and construction of a new side-channel emergency spillway cut in bedrock.
- **Phelps Dodge Morenci, Arizona** - Principal Investigator for engineering and BADCT demonstration required to develop an Aquifer Protection Permit (APP) for the largest copper mine in North America. In addition to BADCT issues, responsibilities include surface water control, landfill design, and development of a mine closure plan.

- **Cyprus Mineral Park, Arizona** - Project Principal and design engineer for preliminary and final design of stormwater and process water management system, including diversion and collection ditches, a double-lined leachate collection pond, and single-lined flood basin. Flood basin and dam were permitted and constructed with ADWR Dam Safety review and approval. Responsibilities included BADCT demonstration and registration. Project was awarded 1995 ACEA Technical Excellence Award.
- **Cyprus Sierrita, Arizona** - Project Principal for design of Headwalls No. 3, No. 4 and No. 5, and Amargosa Pond. Tasks included geotechnical site investigation, hydrology, diversion design, BADCT evaluation, FML and seepage cutoff design, and construction management and inspection.
- **Cyprus Bagdad, Arizona** - Project Manager for surface water control study, water balance, Stormwater Pollution Prevention Plan and fast-track stormwater management plan for Copper Creek Leach Dump.
- **Yuma Cogeneration Project, Arizona** - Final design of double-lined evaporation pond to meet BADCT requirements for support of an APP application. Responsible for engineering aspects of APP application and negotiation.
- **Pine Springs Ranch Dam, near Williams, Arizona** - Project Principal for hydraulic and structural evaluation of historic concrete gravity water supply dam. The project involved evaluation of rehabilitation alternatives and options for removing the structure from the jurisdiction of ADWR Dam Safety.
- **Red Butte Dam, Salt Lake City, Utah** - Evaluation of impacts of historic water supply dam on flood safety. Identification and preliminary costing of rehabilitation measures to meet dam safety requirements. Identification of reduction in flood protection resulting from potential permanent breaching of dam. Project performed for U.S. Army Corps of Engineers, Sacramento District.
- **Phelps Dodge Safford Inc, Safford, Arizona** - Preliminary design of 300-af flood control dam to protect discharge of mining impacted stormwater from proposed new open pit mine.

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
a. <b>Name &amp; Title:</b> Gary Rogers, Desert Mountain Regional Manager	b. <b>Project Assignment:</b> Principal-in-Charge
c. <b>Name of Firm with which associated:</b> Dames & Moore	d. <b>Years Experience:</b> With This Firm 12 With Other Firms 12
e. <b>Education: Degree(s)/Year/Specialization</b> M. Eng./1977/Civil Engineering B.A.Sc. /1972/ Geological Engineering	f. <b>Active Registration: Year First Registered/Discipline</b> Registered Professional Engineer in Alberta (#24652)
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Mr. Rogers is a Vice President and Southwest Regional Manager with Dames &amp; Moore. He is Principal-in-Charge of environmental, engineering/design, geoscience and construction management projects for the region. Located in Phoenix, Mr. Rogers has 24 years of experience in site remediation, water resources, design/construction of earthworks, foundations, and waste impoundments. Mr. Rogers' responsibilities have included design of soil and groundwater remediation projects, landfill design studies including soil conditions and groundwater protection, site suitability studies to include geology, water rights, surface water flow conditions, and linear design, and removal and treatment of contaminated waste from Superfund sites.</p> <p><b>Project Director/Project Manager (1986 - present)</b></p> <ul style="list-style-type: none"> <li>• Consultant for design and construction of two earth dams near Farmington, New Mexico, an RCC dam near Morenci, Arizona, and several other earth structures at mines in Western U.S. and Canada.</li> <li>• Principal-in-Charge for design and construction of soil excavation and groundwater treatment due to leaking USTs at vehicle service center. The scope of services included 1) site characterization; 2) design and construction of the remedial excavation; 3) groundwater extraction; and 4) <i>in situ</i> treatment.</li> <li>• Project Manager for large airline fuel tank replacement project, including soil excavation, agency liaison, and ex-situ bio-remediation of hydrocarbon-contaminated soil.</li> <li>• Design consultant on soil and ground-water remediation projects, including ground-water pumping and treatment systems, soil excavation, and vapor extraction systems.</li> <li>• Feasibility study of excavation techniques for removal and treatment of VOC contaminated waste from pits (Federal Superfund Site), including emissions modeling.</li> <li>• Director of design of 800 gpd treatment plant for a State Superfund site in Phoenix, Arizona for chlorinated hydrocarbon contaminated groundwater remediation.</li> <li>• Project Director for physical suitability study and preliminary design for a proposed solid waste landfill near Phoenix, Arizona. A fast-track analysis was conducted to determine site suitability. Analyses included geology, soil conditions, ground-water levels, water rights, surface water flow conditions, earthfill quantities balancing, and liner design.</li> <li>• Principal-in-Charge of three other landfill design studies, each involving challenging soil conditions and ground-water protection.</li> <li>• Project Director for soil remediation project in a petroleum refinery in Taiwan.</li> <li>• Lead consultant for remediation of gasoline contaminated soil using vapor extraction and treatment by thermal oxidation and catalytic combustion.</li> </ul> <ul style="list-style-type: none"> <li>• Design review for several water retention structures.</li> <li>• Consultant on channel bank stabilization project.</li> <li>• Consultant on investigations of foundations on collapsible soils.</li> <li>• Consultant for geology/geotechnical aspects for major corridor study for highway through Tonto National Forest.</li> <li>• Project Director for civil grading and drainage design for EuroDisneyland in France.</li> </ul>	

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
a. <b>Name &amp; Title:</b> Anand Prakash, Ph.D., P.E., Chief Water Resources Engineer	b. <b>Project Assignment:</b> Project Technical Support/Water Resources Engineering
c. <b>Name of Firm with which associated:</b> Dames & Moore	d. <b>Years Experience:</b> With This Firm 19 With Other Firms 15
e. <b>Education: Degree(s)/Year/Specialization</b> Ph.D. Civil Engineering, Colorado State University, Ft. Collins, Colorado, 1974 M.S. in Civil Engineering, University of Roorkee, India, 1969 B.S. in Civil Engineering, University of Roorkee, India, 1957	f. <b>Active Registration: Year First Registered/Discipline</b> 1976/Civil/Illinois Additional registration: California, Indiana, Wisconsin, Montana, and West Virginia.
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Engineering analysis for water resources-related aspects of drainage, flood control, irrigation, ground water recharge, water supply, hydropower, mining, fossil and nuclear power plants, and community development projects.</p> <ul style="list-style-type: none"> <li>• Hydrologic analyses and preparation of inundation maps for three Buck-Eye floodwater retardation structures (FRSs) for Maricopa County Flood Control District in Arizona.</li> <li>• Hydrologic/hydraulic analyses for safety evaluation of Granite and Willow Creek dams in Arizona.</li> <li>• Hydrologic/hydraulic analyses including dam break analyses for evaluation and rehabilitation of several storm water detention basins for Peabody Coal facilities at Kayenta, Arizona.</li> <li>• Hydrologic analyses, dam-break analyses and preparation of inundation maps and emergency evacuation plans, and preparation of alternative plans for rehabilitation of Red Butte Dam in Utah for U.S Army Corps of Engineers.</li> <li>• Hydraulic analyses and technical supervision of hydraulic designs and construction specifications for Sebastian-Martin Black Mesa flood water retarding dam in New Mexico for the Soil Conservation Service.</li> <li>• Design of rehabilitation measures for Las Curias Earth Dam in Puerto Rico for Puerto Rico Electric Power Authority.</li> <li>• Storm water control plan development including evaluation of the storage capacities of existing detention basin for Borden Chemicals Plant at Louisville, Kentucky.</li> <li>• Storm water analysis and design of storm water control measures including detention basins for Chevron's refinery at Richmond, California.</li> <li>• Storm water analysis and design of control measures including detention basins for Mill Creek watershed at Boeing's complex at Everett, Washington.</li> <li>• Design of sediment and storm water detention basin for Maple Meadows facility of Cannelton Industries in West Virginia using SEDIMOT-2 model.</li> <li>• Design of storm water control and contaminated sediment retention basin for Russellville plant of Rockwell International Corporation in Kentucky.</li> </ul> <ul style="list-style-type: none"> <li>• Hydrologic/hydraulic analyses and preparation of documents for Letter of Map Revision for Flood Insurance Rate Maps for Tenmile River, Cheshire, CT.</li> <li>• Hydrologic/hydraulic analyses and floodplain mapping for City of Round Rock, Texas for Cyprus Semiconductor, Inc.</li> <li>• Hydrologic/hydraulic analyses and preparation of documents for Letter of Map Revision for Flood Insurance Rate Maps for Fudges Creek, Cabell County, West Virginia.</li> <li>• Hydrologic/hydraulic analyses and preparation of documents for Letter of Map Revision for Flood Insurance Rate Maps for Higgins Creek Tributary A, Elk Grove Village, Illinois.</li> </ul>	

<b>7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.</b>	
<b>a. Name &amp; Title:</b> Ravi Murthy, P.E.	<b>b. Project Assignment:</b> Assistant Project Manager/Geotechnical Engineering
<b>c. Name of Firm with which associated:</b> Dames & Moore	<b>d. Years Experience:</b> With This Firm 2 With Other Firms 5
<b>e. Education: Degree(s)/Year/Specialization</b> B.S., Civil Engineering, University of Bombay, India, (1987) M.S., Civil Engineering, University of Texas at El Paso (1990)	<b>f. Active Registration: Year First Registered/Discipline</b>  Registered Professional Engineer - Arizona
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Mr. Murthy served as staff and project engineer to supervise field drilling and sampling activities for numerous geotechnical investigations. Drilling equipment used during these investigations included hollow stem auger rigs (CME, Mobile), pneumatic rigs (Becker, Chicago Pneumatic) and NQ Wireline rock coring systems. Mr. Murthy has experience in engineering analysis and computations to evaluate foundation settlement and heave, slope stability and pier capacity. Mr. Murthy has participated in numerous geotechnical engineering projects in Texas, New Mexico, Arizona, and Nevada.</p> <p><b>Geotechnical Engineering</b></p> <ul style="list-style-type: none"> <li>• <b>Various USPS Facilities, Arizona.</b> Mr. Murthy served as the Dames &amp; Moore project manager for 3 USPS facilities in Arizona. The projects included exploratory drilling and sampling with hollow stem auger rigs, seismic refraction surveys to evaluate rippability of the native rock, engineering analyses for foundation design, and report preparation.</li> <li>• <b>Magnet Traditional School, Phoenix, Arizona.</b> Mr. Murthy directed field investigations and prepared the project report for this proposed school in central Phoenix. Soils at the site were moisture sensitive and could show collapse type settlement if moisture contents were to increase significantly. The Dames &amp; Moore project report recommended a partial excavation and replacement of the native soils under footings and floor slabs.</li> <li>• <b>Waste Disposal Facility, Texas.</b> Mr. Murthy was the Dames &amp; Moore field representative for this exploratory study in Texas. The work scope included excavation of a 30-foot deep exploratory trench, segregation of soil for future use as low-permeability liner material, and in situ permeability testing.</li> <li>• <b>I-10/I-19 Interchange, Tucson, Arizona.</b> As project director, Mr. Murthy coordinates and oversees field investigations performed by staff personnel. The scope of work includes several hollow stem auger borings, foundation design, and pavement recommendations in accordance with ADOT specifications.</li> <li>• <b>9-Story Hotel, Tucson, Arizona.</b> Mr. Murthy was the project manager for this geotechnical investigation in Tucson. Hollow stem auger borings to depths of approximately 70 feet were drilled at the site. Engineering analyses of field and laboratory data was made. The project report included recommendations for drilled piers, shallow foundations, and site preparation.</li> <li>• <b>Avra Valley Road at the Santa Cruz River, Pima County, Arizona.</b> A geotechnical investigation was completed to provide recommendations for pavement design and soil-cement bank protection. The project recommendations were prepared in general compliance with Pima County and ADOT requirements.</li> <li>• <b>Tucson International Airport, Tucson, Arizona.</b> Served as project manager for this taxiway overlay project. The project included hollow stem auger borings, laboratory testing,</li> </ul> <p>and preparing the project report with recommended overlay sections in accordance with FAA requirements.</p> <ul style="list-style-type: none"> <li>• <b>Northwest Pump and Transmission Facilities, El Paso, Texas.</b> The project involved expansion of an existing wastewater treatment plant, and installation of nearly 25,000 lineal feet of 36-inch diameter sewer pipe. Completed field investigations for the plant expansion and sewer line to be installed in Northwest El Paso. Prepared project report providing recommendations for foundation design and construction based on soil conditions encountered.</li> <li>• <b>Eagle Peak Access Road, Van Horn, Texas.</b> Field investigations for this project included geotechnical drilling and sampling along a portion of the proposed roadway alignment, and seismic refractions studies at locations not accessible to the drilling rig. Analyzed field data and prepared a geotechnical report addressing pavement design, earthwork operations, excavatability based on results of the seismic studies, and foundation recommendations for various elements of the project.</li> </ul>	

**7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

<p><b>a. Name &amp; Title:</b> Barbara H. Murphy, Project Environmental Scientist</p>	<p><b>b. Project Assignment:</b> Geology/Subsidence Analysis</p>
<p><b>c. Name of Firm with which associated:</b> Dames &amp; Moore</p>	<p><b>d. Years Experience:</b> With This Firm 19 With Other Firms 2</p>
<p><b>e. Education: Degree(s)/Year/Specialization</b>          BA, Geology, Mount Holyoke College, South Hadley, Massachusetts          Graduate courses in geology, land use planning, and engineering (soils), Arizona State University          CEUs in Environmental Law (Federal and State of Arizona), 1993</p>	<p><b>f. Active Registration: Year First Registered/Discipline</b></p>

**g. Other Experience and Qualifications relevant to the proposed project:**

Barbara Murphy has worked on numerous environmental and engineering projects throughout the western United States. Prior to joining Dames & Moore in 1977, Ms. Murphy worked in Labrador, Canada as part of a National Science Foundation Project. She was also a member of the Volcanology Research Team at Los Alamos Scientific Laboratory in New Mexico. Ms. Murphy has worked for the U.S. Bureau of Land Management in Phoenix, Arizona. She assisted surveys of historic and current mining activity for developing Resource Management Plans.

For Dames & Moore, she has completed geology, soils and water resource design projects, bridge design projects, flood control/water storage projects, building foundation analyses, landfill siting and design projects, mineral lease/mining feasibility studies, oil and gas drilling exploration siting and design projects, gas pipeline siting studies, planned community developments, and telecommunication and electrical transmission studies. She has worked on various projects in Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, North Dakota, Ohio, South Dakota, Texas, Utah, Washington, and Wyoming. These projects have also required an understanding of the geological and hydrologic conditions of the region. Many of these projects have required an understanding of potential environmental consequences due to project actions as well as development of feasible mitigative measures. These projects have varied from local to statewide to regional and many of the projects have been multidisciplinary studies. She is very familiar with NEPA requirements as well as other federal and state regulations. She has worked on projects for the private sector and state agencies, as well as projects under the supervision of various federal agencies including Bureau of Reclamation, Army Corps of Engineers, Bureau of Indian Affairs, Bureau of Land Management, Federal Energy Regulatory Commission, Federal Highways Administration, Forest Service, U.S. Geological Survey, and U.S. Soil Conservation Service.

Ms. Murphy completed an earth fissure and subsidence study for a major development near Litchfield Park and as part of a regional landfill siting and design study. She has recently completed several environmental assessments for Luke Air Force Base in which land subsidence and earth fissures were important issues. She has completed numerous environmental studies in southern Arizona which included the evaluation of land subsidence

and earth fissures. She also assisted in the preparation of the geology, soils, land subsidence/earth fissures, faults/seismicity, and minerals/mining sites portions of the Environmental Element Report for Maricopa County's 2020 Eye to the Future.

**Flood Control/Water Storage/Water Resources**

- Ongoing analyses of groundwater quality sampling results and identification of sources of groundwater contaminants for project in central Arizona.
- Assisted with Aquifer Protection Permit application studies for major mine in eastern Arizona.
- Completed general geology and soils for Red Butte Dam Disposal EIS project (near Salt Lake City, Utah) for the U.S. Army Corps of Engineers.
- Assisted with Safety of Dams study for numerous small dams in Navajo, Apache, and Coconino counties, Arizona.
- Assisted with stormwater runoff/ground-water recharge feasibility study for Prescott AMA, Phoenix AMA, and Tucson AMA.
- Assisted with hydrologic and hydraulic analyses and general geology for various dam design projects:
  - Red Dog Dam in Alaska
  - Pamo Dam in California
  - Chase Creek Dam (Greenlee County) and Lyman Dam (Apache County) in Arizona
- Prepared sediment yield analysis for flood control study in Nogales, Arizona.
- Assisted with hydraulic analysis for bridge design and flood control project in Tucson, Arizona.
- Evaluated impacts of a proposed major flood control and water storage project on geology and soils resources in central Arizona (Central Arizona Water Control Study). Study included nine dam site location alternatives.

7. **Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

Barbara H. Murphy (Continued)

- Assisted with surface hydrology analysis of drainage plan for major residential development near Phoenix, Arizona.
- Assisted with ground-water quality and quantity analysis for proposed residential development in Apache County, Arizona.

***Geotechnical/Geology***

- Assisted with geotechnical and geologic hazards assessment of proposed building site of large structure in north Phoenix, Arizona.
- On-going assistance with groundwater and related studies for remediation project in Phoenix, Arizona.
- Assisted with geotechnical study in developing land use development plans for city of Yuma, Arizona.
- Completed geology and geologic hazards study for heavy structure design project in central Arizona.
- Conducted subsurface geology, geologic hazards, and seismicity study for underground tunnels design project for I-10 Inner Loop Project in Phoenix, Arizona.
- Assisted with geotechnical studies for Lyman Dam in eastern Arizona, Pamo Dam in California, Chase Creek Dam in Arizona, and Red Dog Dam in Alaska.
- Assisted with geotechnical study for proposed phosphate mine in Idaho.
- Assisted with geotechnical evaluation of proposed sites for disposal of hazardous waste in northern Arizona.
- Assisted with ground-water quality analysis of site in southwestern Phoenix, Arizona.
- Assisted in geotechnical study for fly-ash project in Ohio.

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
<b>a. Name &amp; Title:</b> Jefferson J. Irvin, P.E., Principal Engineer	<b>b. Project Assignment:</b> Hydraulic Analysis/Water Resources Engineering
<b>c. Name of Firm with which associated:</b> Dames & Moore	<b>d. Years Experience:</b> With This Firm 13 With Other Firms 13
<b>e. Education: Degree(s)/Year/Specialization</b> B.S., United States Military Academy (1972) M.S.C.E., Water Resources Engineering, Stanford University (1981) M.S.C.E., Geotechnical Engineering, Stanford University (1981)	<b>f. Active Registration: Year First Registered/Discipline</b> 1984/Civil Engineering/Utah Additional registration: Louisiana
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p><b>Hydrology/Hydraulics</b></p> <p>Dames &amp; Moore, Inc., Associate</p> <ul style="list-style-type: none"> <li>• Directed hydrologic studies for the Cyprus Bagdad copper mine, Cyprus Mineral Park, Cyprus Sierrita, and Magma Pinto Valley copper mines in Arizona, providing alternatives for new stormwater collection reservoirs and other surface water controls for mine dump seepage and runoff during extreme precipitation events.</li> <li>• Directed the preparation for a heap leach system water balance model for a major copper mine near Salt Lake City Utah;</li> <li>• Directed water balance study for a major Arizona mine, for all facilities.</li> <li>• Directed a surface water management study for the Phelps Dodge Morenci copper mine in Arizona, as part of the preparation of a state Aquifer Protection Permit.</li> <li>• Directed water resources evaluation for a pipeline integrity study in western Montana: study involved characterization of stream reaches according to the Rosgen channel morphology classification, and estimation of reach sensitivity to watershed change.</li> <li>• Directed water resources investigations for the EIS for Red Butte Dam (Salt Lake City): hydrologic, sediment transport, and floodplain modeling, and geomorphic studies.</li> <li>• Performed independent review of hydrologic design of channels and retention structures at a mine in eastern Idaho, for an industrial client partially responsible for mine remediation.</li> <li>• Directed inundation map preparation for the Emergency Action Plan for the Red Butte Dam near Salt Lake City, for the SF Phosphates Tailings Dam near Vernal, Utah, and for the Ivins Bench Dam near St. George, UT.</li> <li>• Performed hydrologic studies for copper mine near Salt Lake City: permitting for new flood control dam construction and leachate collection system expansion, dam break analysis for an Emergency Action Plan.</li> <li>• Directed hydrologic study for the reclamation of Cyprus Mineral Park mine in northwest Arizona: developed surface water management options and conceptual designs for post-closure stormwater diversion.</li> </ul> <ul style="list-style-type: none"> <li>• Currently directs the preparation of a reclamation framework plan for a series of gravel/rock mining operations near Salt Lake City.</li> <li>• Currently directs hydrologic/ sediment study of the region in the vicinity of Safford, Arizona, in preparation of design of hannels, floodwater and sediment retention structures for a new copper mine in the region.</li> <li>• Directed hydrologic study for the design of a flood control basin at the Chino mine, NM.</li> <li>• Performed hydrologic studies for the MSHA permitting of over 60 sedimentation ponds (with and without spillways) and a major diversion channel at the Peabody Coal open pit mine near Kayenta, Arizona.</li> <li>• Performed hydrologic studies for sizing of a dam spillway in eastern Arizona in accordance with MSHA requirements.</li> <li>• Assisted in conceptual design for the headworks, spillway, and diversion for a major surface water diversion structure on the Santa Clara River in California.</li> <li>• Performed a hydraulic/hydrologic study for the construction of a municipal landfill within a floodplain in Harris County, Texas. The study was performed in accordance with FEMA guidance.</li> <li>• Performed a surface water study/conceptual drainage designs for a number of major facilities, including the Maricopa County Northwest Landfill (Phoenix), for major freeways in Phoenix, and for a Harris County municipal landfill.</li> <li>• Performed studies that delineated or evaluated 100-year floodplains for rivers and streams near San Marcos (TX), Phoenix (AZ), Houston (TX), Baton Rouge (LA), and Monroe (LA).</li> <li>• Performed snow volume/ snowmelt estimations for the 1997 melt season for a series of clients to include: Davis County (UT), Denver Water Board, City of Logan (UT), and PacificCorp (Bear River).</li> </ul> <p><b>Water Resources Environmental Assessments</b></p> <ul style="list-style-type: none"> <li>• Performed EISs for water resources impacts of oil and gas development in Dixie National Forest in Utah for expansion of the north Tailings Impoundment for Kennecott (Magma), and for expansion of a copper mine in western New Mexico.</li> </ul>	

- Currently directing EIS for water resources impacts of gold mine expansion (pits, stockpiles, haul roads) near Trenton Canyon, Nevada.
- Performed an environmental assessment (IAW World Bank guidelines) of surface water related environmental impacts for a proposed copper mine in Southern Peru.
- Performed an environmental assessment (IAW USAID guidelines) for the construction of a municipal sewage treatment plant along the Suez Canal in Ismailia, Egypt.
- Performed flood hazard and soil stability mapping for a transmission line routing study for the City of Austin, Electric Utility Department.
- For Hill AFB (Ogden, UT): developed a Spill Prevention, Control, and Countermeasures Plan for the Utah Testing and Training Range; developed a Stormwater Pollution Prevention Plan, and directed sampling IAW with UPDES (NPDES).

***Expert Witness/ Litigation Support***

- Performed a major study of Chase Creek in eastern Arizona for Phelps-Dodge Corporation in defense of a challenged dam permit. A model was used to predict daily flows in the watershed for the full available period of the rainfall and evaporation record. Successfully defended the model in a contested water rights hearing.
- Performed hydrologic study of a major flood on a mine in eastern Arizona, as part of litigation support for assessing reclaimable damages from insurance;
- Directed a hydrologic study on a river in Arizona, estimating effects of planned diversions on existing water rights and in-stream uses. This study was used in litigation support over water rights;
- Directed water resources-related design for the preparation of a reclamation plan for a uranium tailings pile in eastern Wyoming: channel and slope designs for prevention against long-term water and wind erosion. This study was presented to the NRC in Washington DC, as part of negotiations over legal reclamation requirements; and
- Provided litigation support in lawsuit over reclaimable costs due to failure to divert unimpacted waters which were collected, stored, and treated for excessive costs.

<b>7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.</b>	
<b>a. Name &amp; Title:</b> Todd E. Ringsmuth	<b>b. Project Assignment:</b> Hydraulic Analysis
<b>c. Name of Firm with which associated:</b> Dames & Moore	<b>d. Years Experience:</b> With This Firm 4 With Other Firms .5
<b>e. Education: Degree(s)/Year/Specialization</b> B.S., (1993), Civil Engineering, San Diego State University, San Diego, California	<b>f. Active Registration: Year First Registered/Discipline</b> State of California, Engineer-in-Training (1993)
<b>g. Other Experience and Qualifications relevant to the proposed project:</b>	
<p>Todd E. Ringsmuth is a staff engineer who has three years of water resources, geotechnical site investigation, and civil engineering experience. He has worked on projects for several copper mines in Arizona and New Mexico that included the modeling of complex storm water and leachate systems. He has experience with the sizing of dams, spillways, and culverts for required design storms. Mr. Ringsmuth has worked extensively with the hydrologic and hydraulic modeling programs HEC-1 and HEC-2.</p> <p><b>Hydraulic Design</b></p> <ul style="list-style-type: none"> <li>Developed hydraulic design criteria for an ADWR regulated flood control basin at Cyprus Mineral Park copper mine in Kingman, Arizona. Included the design of large diversion channels, HDPE-lined basin, and outlet works. Included a complex evaluation of outlet flow characteristics from collection basins into the diversion channels.</li> <li>Currently designing large stormwater diversions and a flood retention structure at a planned eastern Arizona copper mine. The design includes earthen channels with erosion protection along their length and at the outlets, an ADWR regulated flood retention dam with a storage volume of 300 acre-feet, and a side-channel spillway design to pass the half-PMF. The project also required the evaluation of 100-year flood plains and the impact of mine development in support of the environmental impact statement and 404 permitting.</li> <li>Evaluated the hydraulics and structural stability of an ADWR regulated concrete gravity dam near Flagstaff, Arizona. Included development of runoff hydrographs, spillway sizing, and dam stability analysis.</li> <li>Conducted hydrologic and hydraulic analyses for the sizing of a concrete dam and overflow pond at the Phelps Dodge Chino mine in New Mexico. Included impoundment and spillway sizing, and diversion ditches and pipeline design for stormwater control.</li> <li>Performed a HEC-2 analysis on the Jordan River in Utah to simulate a dam break scenario for a Utah Copper mine. The development of the HEC-2 model included creating river cross-sections, addition of bridges, and encroachment due to construction along the river banks. Portions of the model involved updating an existing FEMA HEC-2 model to account for similar changes along the river. The model results were used to delineate the floodplain for the estimated peak flow in the Jordan River.</li> <li>Performed HEC-2 (AutoCAD) modeling to determine the extent of the 100-year floodplain, within a 2-mile long wash, for an Arizona copper mine. The model consisted</li> </ul>	<p>of bridges, culverts, and flow over roadways. Responsibilities included the development of the HEC-2 model and the resulting floodplain map.</p> <ul style="list-style-type: none"> <li>Developed Best Available Demonstrated Control Technology (BADCT) demonstrations for facilities at the Phelps Dodge Morenci mining district as part of their Aquifer Protection Permit application. Preliminary designs were developed for facilities that include ore leach stockpiles, tailing dams, PLS ponds, SX/EW plants, and future facilities.</li> <li>Designed pipelines, diversion channels, and sedimentation basins to control storm water runoff at BHP Miami copper mine. Included the estimation of storm water runoff volumes, peak flow rates, hydraulic sizing of the pipelines, channels, and basins.</li> <li>Conducted hydraulic analysis for the design of an 80-mile long, high pressure water pipeline for a confidential client in Arizona. Responsibilities included the analysis of pipe flow, selection of pumps, and the design of two small reservoirs. The project also required the development of an order of magnitude cost estimate for the construction of the pipeline and all components.</li> </ul> <p><b>Water Resources</b></p> <ul style="list-style-type: none"> <li>Performed HEC-1 computer modeling of complex stormwater and leachate management systems for several open pit copper mines. The models incorporated and determined the interactions between the various components of the management systems including drainage basins, collection ponds and reservoirs, leach stockpiles, and diversion pumps. The models were used to determine sizing of new detention basins and the design of spillways. Computer spreadsheets were used for the manipulation of pumping capacities in selecting best scenarios for several design storms.</li> <li>Conducted a hydrologic analysis of the watersheds to evaluate dam locations and sizes for an eastern Arizona copper mine. Watershed runoff characteristics were developed for use in surface water modeling (HEC-1) to develop capacities of reservoirs, pipelines, and pumping systems. Historical data of basins in the vicinity of the mine were evaluated to refine the characteristics of the modeled watersheds.</li> <li>Performed HEC-1 computer modeling of a large tailing stormwater retention dam system at an Arizona copper mine. Included an on-site inventory of retention structures and an analysis existing stormwater models. New HEC-1 models were developed to evaluate storage capacities, spillway flows, and pump capacities.</li> </ul>

- Conducted a hydrologic and stream flow analysis of an eastern Arizona river. Included the examination of stream flow gage data, the effect of historic diversions, and an estimate of potential demands from the historic data.
- Performed statistical analysis of daily rainfall data to develop a better estimate of predicted extreme rainfall events for a copper mine in Arizona. Required the collection of rainfall data for several rain gages and weather stations in the mine area and conducting an extreme probability analysis to estimate the maximum rainfall events for storms of varied durations and return periods.
- Performed a forensic hydrologic investigation to evaluate the results of a 1993 flood at a confidential Arizona copper mine. The project involved evaluation of NWS rainfall gages, NRCS Sno-tel gages, and mine rain gages. An attempt was made to correlate runoff volumes to rainfall and snowmelt.
- Developed surface water hydrology designs for BADCT (Best Available Demonstrated Control Technology) demonstrations and closure plans of the Aquifer Protection Permit application for two Arizona copper mines. Included review of existing facility designs and conceptual design of proposed facilities to meet surface water requirements of the permit.

***Geotechnical Investigations***

- Field engineer for a geotechnical site characterization study for a proposed radioactive waste disposal facility site. Responsibilities included preparation of boring logs and piezometer installation logs, permeability testing through the piezometers, and maintenance of a field log.
- Field engineer for geotechnical investigation of a Tailing Dam for a copper mine in Arizona. Responsibilities included preparation of boring logs and installation of piezometers for use as groundwater monitor wells.
- Field engineer for geotechnical investigation for a ground-water flow intercept site. Responsibilities included preparation and maintenance of field logs, coring and sampling of bedrock, and Packer permeability testing.
- Field engineer for the installation of piezometers in a tailing dam for the Cyprus Miami copper mine. Included preparation of boring logs, soil sampling and analysis, and development of a final report.
- Conducted a preliminary geotechnical investigation for a potential housing development in Arizona. Included preparation of boring logs, soil sampling and analysis, and development of a final report.

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.									
a. <b>Name &amp; Title:</b> Jonathan E. Fuller, P.E., P.H.	b. <b>Project Assignment:</b> Project Hydraulic Engineer/Hydrologist								
c. <b>Name of Firm with which associated:</b> JE Fuller/ Hydrology & Geomorphology, Inc.	d. <b>Years Experience: With This Firm</b> 4 <b>With Other Firms</b> 8								
e. <b>Education: Degree(s)/Year/Specialization</b> M.S., Quaternary and Environmental Geology (Geomorphology), Univ. of Arizona, 1986 B.S., Geology, Calvin College, Grand Rapids, Michigan, 1983	f. <b>Active Registration: Year First Registered/Discipline</b> Professional Engineer (Civil), Arizona #26846 Professional Hydrologist - #93-H-1024, American Institute of Hydrology Geologist-in-Training, Arizona #06763								
g. <b>Other Experience and Qualifications relevant to the proposed project:</b>									
<p><b>Professional Experience</b></p> <table border="0"> <tr> <td>Principal. JE Fuller/ Hydrology &amp; Geomorphology, Inc</td> <td>August 1994 - Present</td> </tr> <tr> <td>Engineer. CH2M HILL, Inc.</td> <td>May 1990 - August 1994</td> </tr> <tr> <td>Principal Hydrologist. Pima Co. Flood Control District</td> <td>August 1986 - April 1990</td> </tr> <tr> <td>Research Assistant. University of Arizona Geosciences</td> <td>August 1984 - August 1986</td> </tr> </table> <p>Jon Fuller is Principal and Owner of JE Fuller/ Hydrology &amp; Geomorphology, Inc. He has served as a project manager, project geomorphologist, and project engineer for studies and projects in Arizona, Nevada, California, and Utah. His experience includes:</p> <ul style="list-style-type: none"> <li>• Applied Geomorphology</li> <li>• Sediment Transport</li> <li>• Erosion Hazard Analysis</li> <li>• Hydrology</li> <li>• Drainage Design</li> <li>• Flood Insurance Studies</li> <li>• Bridge Hydraulics</li> <li>• Subdivision Drainage and Improvement Plan Review</li> <li>• Alluvial Fan Modeling</li> </ul> <p>Mr. Fuller has extensive experience using HEC-1, HEC-2, HEC-RAS, HEC-6, FLUVIAL-12, WSPRO, TR-20, TR-55, HY-8, PSRM, and RAINFLO computer models.</p> <p><b>Flood Control Master Planning</b> <b>Floodplain Management</b> <b>Flood Insurance Studies</b></p> <ul style="list-style-type: none"> <li>• For the Wagon Wheel Master Drainage Study, prepared for the Navajo County Department of Public Works and Flood Control District, Mr. Fuller completed a drainage investigation and HEC-1 hydrologic modeling study of a watershed near Pinetop-Lakeside, Arizona. Project tasks included field investigation, HEC-1 modeling, HY-8 culvert ratings, and hydraulic rating of irrigation canals for minor</li> </ul>		Principal. JE Fuller/ Hydrology & Geomorphology, Inc	August 1994 - Present	Engineer. CH2M HILL, Inc.	May 1990 - August 1994	Principal Hydrologist. Pima Co. Flood Control District	August 1986 - April 1990	Research Assistant. University of Arizona Geosciences	August 1984 - August 1986
Principal. JE Fuller/ Hydrology & Geomorphology, Inc	August 1994 - Present								
Engineer. CH2M HILL, Inc.	May 1990 - August 1994								
Principal Hydrologist. Pima Co. Flood Control District	August 1986 - April 1990								
Research Assistant. University of Arizona Geosciences	August 1984 - August 1986								
<ul style="list-style-type: none"> <li>and major watersheds impacting residential and commercial areas in the watershed.</li> <li>• For the Clarkdale Area Master Drainage Study, prepared for the Yavapai County Flood Control District, Mr. Fuller was project manager and hydrologist for drainage master plan for the Townsite of Clarkdale, Arizona. Project tasks included coordinating public involvement and participation, HEC-1 modeling of regional and on-site watersheds, floodplain mapping based on HEC-2 modeling, development of conceptual drainage solution alternatives. Drainage solutions designed for the AMDS included sizing roadway drainage crossings, designing grade control structures, and preparing drainage plans for subdivisions affected by sheet flow flooding, failed detention basins, and earthen and lined channel alternatives. A partnering approach to developing drainage solutions was used to accelerate the project schedule, and eliminate lengthy review periods. The AMDS was completed within 14 weeks of notice to proceed, including presentation of the completed plan to the Clarkdale Town Council.</li> <li>• For the Sinclair Wash Letter of Map Revision Projects, prepared for private developers in the City of Flagstaff, Arizona, Mr. Fuller prepared HEC-2 floodplain analyses of two adjacent reaches of Sinclair Wash. Project tasks included cross section alignment, survey, HEC-2 modeling, HY-8 culvert hydraulics, floodplain and floodway delineation, map preparation, and report preparation.</li> <li>• For the Iona Wash Flood Insurance Study, Mr. Fuller was project manager and project engineer for floodplain and floodway delineations on an alluvial watercourse in western Maricopa County, Arizona. Iona Wash includes tributary and confined channel reaches, as well as significant sheet flooding, breakout, and ponding areas. The study was accepted by FEMA and the District, and was completed on schedule and within budget.</li> <li>• For the Tropicana Wash Flood Insurance Study, Mr. Fuller was project hydrologist for a floodplain and floodway delineation study on an inactive alluvial fan near Las Vegas, Nevada for the Clark County Regional Flood Control District. The Tropicana Wash study included 14 bridges, several large breakouts, and unconfined flooding in urban areas. Channelized reaches were modeled using HEC-2, culvert hydraulics were modeled with HY-8, and unconfined breakout flows were modeled using HEC-2 split flow routines and a simplified procedure developed for the Tropicana Study. Hydrologic analysis was completed by modifying an existing HEC-1 model, and by developing a regional methodology for upland watersheds not considered in the HEC-1 model.</li> </ul>									

## 7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.

Approximate floodplain mapping procedures were used to delineate smaller upland watercourses with smaller 100-year discharges.

- For the City of Avenal, California, Mr. Fuller prepared a Conditional Letter of Map Revision for a city-owned parcel in a sheet flooding floodplain. Discharge estimates were determined from statistical analyses of nearby stream gages, regional methods, and comparison with historical accounts of flooding. Water surface elevations were computed using HEC-2 for three alternative site development plans for a proposed barrel recycling plant and industrial center. Cost estimates for the flood protection alternatives were also prepared.
- For the Arizona Department of Water Resources, Mr. Fuller developed the State Standard for Floodplain Management in Sheet Flooding Areas. Mr. Fuller served as project manager and project engineer for the ADWR study, which has been adopted by the state of Arizona. For this project, Mr. Fuller developed definitions of types of sheet flooding experienced in Arizona, and developed criteria for protecting new development in each type of sheet flow area, and recommended hydrologic and hydraulic modeling criteria. These definitions and regulatory standards are used to regulate flood hazards throughout Arizona.
- For the Arizona Department of Water Resources, Mr. Fuller developed the State Standard for Estimating Peak Discharges on Ungaged Watersheds in Arizona. Mr. Fuller served as project manager and project engineer for the ADWR study, which has been accepted by the State Standards Work Group. For this project, Mr. Fuller developed researched and recommended methodologies for estimating and calibrating peak discharges for rural and urban watersheds in Arizona. The recommended procedures will be used to help regulate floodplain development throughout Arizona, and were used to update previously adopted state standards for floodplain management.

### *Hydrologic Modeling*

- Mr. Fuller has performed and reviewed hundreds of hydrologic modeling studies in Arizona, California, and Nevada using HEC-1, TR-20, TR-55, and PSRM computer models, the ADOT Hydrology Manual, the Pima County Hydrology Methodology, statistical procedures, and local methodologies. Some of Mr. Fuller hydrologic modeling studies included: Town Wash Detention Basin Preliminary Design (HEC-1, Mesquite, Nevada); Clarkdale Area Master Drainage Study (HEC-1, Clarkdale, Arizona); Sky-Hi Retreat Subdivision Drainage Alternatives Study (HEC-1, Pinetop, Arizona); Holiday Inn Express Development Plan (HEC-1 & Regional Methods, Tusayan, Arizona); Avenal CLOMR (Statistical Procedures, Avenal, California); Eastern Transportation Corridor Roadway Drainage (Rational Method, El Toro, California); and Casandro Wash Detention Basin Design (HEC-1, Wickenburg, Arizona).

- While at Pima County Flood Control District, Mr. Fuller performed HEC-1, TR-20, and TR-55 models studies on Lee Moore Wash, Sutherland Wash, and the Sahuarita Road Alignment watersheds for floodplain mapping, erosion setback studies, and roadway drainage. Mr. Fuller also prepared hydrologic studies using the Pima County Hydrology Methodology for numerous washes to determine regulatory discharges that since have been formally adopted in the Pima County Floodplain Management Ordinance. A few of the watersheds modeled with the Pima County Method include Craycroft Wash, Tanuri Hills Wash, Ferreo Wash, Hughes Wash, Demetrie Wash, Millstone Manor Wash, and Woodland Wash.
- Mr. Fuller has also been involved in studies to develop new HEC-1 hydrologic modeling procedures for Alameda County in California, and Pima County in Arizona.

### *Detention Basin Design*

#### *Hydraulic Design of Dams*

- Mr. Fuller was project manager and project hydrologist for the Rawhide Wash Detention Dam Feasibility Study and Preliminary Design. This project, conducted for an intergovernmental committee with members from the City of Scottsdale, the City of Phoenix, the Arizona State Land Department, and the Home Builders Association of Central Arizona, assessed the feasibility of constructing a detention basin to remove alluvial fan flooding hazards from a rapidly developing area in north Scottsdale, Arizona. The Rawhide Wash Detention Basin concept was proposed by public agencies and private interests as an alternative to the Scottsdale's Desert Greenbelt project along Rawhide Wash. Specific project tasks included HEC-1 hydrologic analysis of the watershed and reservoir, hydraulic modeling of outlet structures, sediment yield estimation, probable maximum flood estimation, geotechnical evaluation, civil design, design of earthen embankments, cost analyses, environmental permitting assistance, and interagency coordination.
- For the Rawhide Wash Detention Basin Preliminary Design, Mr. Fuller will be responsible for sedimentation analyses, geomorphic assessments, review of hydrologic modeling, and preparation of the CLOMR for the alluvial fan floodplains downstream of the proposed detention basin.
- For the Town Wash Regional Detention Basin Project in Mesquite, Nevada, Mr. Fuller was project hydrologist for preliminary design of an RCC dam for the Clark County Regional Flood Control District. Specific project tasks included HEC-1 modeling of Town Wash, sizing the reservoir impoundment and outlet structures, estimating sediment yield, analyzing channel stability downstream of the dam, and preparing a Conditional Letter of Map Revision for the watercourse downstream of the dam. Because existing SCS soils maps showed the sandy soils in the watershed as hydrologic soils group "D," Mr. Fuller prepared new soils maps using field data, percolation test results, and his own geomorphic soils mapping. The resulting soils

## 7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.

maps, when used in a HEC-1 model, resulted in a 50% reduction in previously estimated 100-year discharges. The hydrologic report submitted in support of the CLOMR was approved by FEMA without comment. Sedimentation yield was estimated using the PSIAC, BUREC, and MUSLE methods, with bed load estimated using the Colby and Einstein equations.

- Mr. Fuller also provided quantities estimates, cost analyses, reservoir siting, and geomorphic analysis for three dam sites along the Bear River in northern Utah.

### ***Professional Memberships***

Arizona Floodplain Managers' Association:

Current Chair of Technical Advisory Review Committee (1996-present)

Past Vice-President (1993-1996)

Technical Advisory Review Committee Member (1988-present)

Board Member: Central Arizona Representative (1992-1993)

Board Member: Associate Member-at-Large (1990-1992)

Past Chair, Education/Public Information Committee (1986-1990)

Association of State Floodplain Managers:

Arid West Committee (1986-present)

Alluvial Fan Task Force (1988-present)

American Society of Civil Engineers

American Institute of Hydrology

### ***Continuing Education***

HEC-RAS Training Seminar, 1996, AFMA

HEC-2 Training Seminar, 1987, Univ. of Calif.-Davis

HEC-1 Training Seminar, 1988, Univ. of Calif.-Davis

Floodproofing Workshop, 1988, Corps of Engineers

HY-8, Culvert Hydraulics, 1988, FHWA

TR-20/TR-55 Training Seminar, 1988, Soil Conservation Service

Computer Programs for Sediment Transport, 1988, Univ. of Ariz.

Stream Stability and Scour at Highway Structures, 1991, FHWA

ALERT Hardware Training, 1991, NovaLynx Corporation

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
a. <b>Name &amp; Title:</b> Brian R. Iserman, P.E./ Hydrologist	b. <b>Project Assignment:</b> Hydraulic Engineer/ Hydrologist
c. <b>Name of Firm with which associated:</b> JE Fuller/ Hydrology & Geomorphology, Inc	d. <b>Years Experience: With This Firm</b> 2 <b>With Other Firms</b> 11
e. <b>Education: Degree(s)/Year/Specialization</b> B.S. 1986 Hydrology - University of Arizona	f. <b>Active Registration: Year First Registered/Discipline</b> 1993 Professional Engineer (Civil, Arizona #29325)
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Brian Iserman is a hydrologist and civil engineer for JE Fuller/ Hydrology &amp; Geomorphology, Inc. He has served as a project engineer and hydrologist for studies and projects in Arizona, Nevada, and California. His experience includes:</p> <ul style="list-style-type: none"> <li>• Hydrology and Hydraulics</li> <li>• Flood Insurance Studies</li> <li>• ALERT System Design, Operation and Maintenance</li> <li>• Flood Warning</li> <li>• Drainage Design</li> <li>• Sediment Transport</li> <li>• Automated Stormwater Sampling</li> <li>• AutoCAD</li> </ul> <p>Mr. Iserman has extensive experience using HEC-1, HEC-2, HEC-RAS and HY-8 computer models, in a wide variety of environments including distributary flow systems.</p> <p><b>Floodplain Studies</b></p> <ul style="list-style-type: none"> <li>• Rio Verde Floodplain Delineation Study (Maricopa County, Arizona)</li> <li>• Tolleson Area Floodplain Delineation Study (Maricopa County, Arizona)</li> <li>• Pinal Creek Floodplain Delineation (Gila County, Arizona)</li> <li>• Idle Hour Wash LOMR (Pima County, Arizona)</li> <li>• Black Wash Floodplain Delineation Study (Pima County, Arizona)</li> <li>• Christopher Creek Floodplain/ Floodway Analysis (Gila County, Arizona)</li> <li>• Rittenhouse Wash Floodplain Analysis (Queen Creek, Arizona)</li> <li>• Wet Beaver Creek Preliminary Floodway Delineation (Yavapai County, Arizona)</li> <li>• Unnamed Wash Floodplain Delineation (Sedona, Arizona)</li> <li>• Walnut Springs Floodplain Delineation (Punkin Center, Arizona)</li> <li>• Wickenburg High School Wash Floodplain Delineation (Wickenburg, Arizona)</li> <li>• Santa Fe Pacific Gas Pipeline Flood Hazard Study (Arizona, California, New Mexico, Texas)</li> <li>• Post Flood Investigations (Pima County, Arizona)</li> <li>• LOMR for selected drainages in the Tortolita Mountains (Pima County, Arizona)</li> <li>• Envirotech Facility Flood Hazard Certification (Tucson, Arizona)</li> </ul> <p><b>ALERT Systems/ Gauging</b></p> <ul style="list-style-type: none"> <li>• Arizona Statewide ALERT System (Corps of Engineers, Arizona)</li> <li>• Arizona Dept. of Water Resources As-Needed ALERT Maintenance (State of Arizona)</li> <li>• Yavapai County ALERT System Training &amp; Maintenance (Yavapai County, Arizona)</li> <li>• City of Tucson NPDES Automated Stormwater Sampling Project (Tucson, AZ)</li> <li>• CALTRANS Automated Streamflow Sampling Project (District 7, California)</li> <li>• Rillito Recharge Project Dam Operations Plan (Tucson, Arizona)</li> <li>• Pima County ALERT Operations and Maintenance (Pima County, Arizona)</li> <li>• Pantano Wash Stream Gauge Rating Curve (Pima County, Arizona)</li> </ul> <p><b>Site Drainage</b></p> <ul style="list-style-type: none"> <li>• DASH Mining Project (Elko County, Nevada)</li> <li>• Miraval Place Hydraulic Study (Pima County, Arizona)</li> <li>• Racetrack Wash Hydraulic Analysis (Pima County, Arizona)</li> <li>• Pegler Wash Hydraulic Analysis (Pima County, Arizona)</li> <li>• Mountain Lakes Apartments Drainage Design (Tucson, Arizona)</li> <li>• Casa Maria Apartments Drainage Design (Tucson, Arizona)</li> <li>• Cost Analysis for development of a Reclaimed Water Distribution System, (Tucson Arizona)</li> <li>• Sunset Shadows Subdivision Drainage Design Analysis, (Pima County, Arizona)</li> </ul> <p><b>River Studies/ Fluvial Geomorphology</b></p> <ul style="list-style-type: none"> <li>• Lower Salt River Navigability Study (Maricopa County, Arizona)</li> <li>• Upper Gila River Navigability Study (Graham/Greenlee Counties, Arizona)</li> <li>• San Francisco River Navigability Study (Graham County, Arizona)</li> <li>• Cactus Pit Mining Project (Gila/Pinal Counties, Arizona)</li> <li>• Erosion Hazard Setback Analysis on Tanque Verde Creek (Pima County, Arizona)</li> <li>• Electrical Conduit Crossing Scour Analysis (Pima County, Arizona)</li> <li>• Erosion Hazard Setback Analysis, Unnamed Wash (Pima County, Arizona)</li> <li>• Wet Beaver Creek Stability Study (Lake Montezuma, Arizona)</li> <li>• Tatum Wash Sedimentation Study (Phoenix, Arizona)</li> <li>• Walker River Restoration Project (Schurz, Nevada)</li> </ul>	

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
a. <b>Name &amp; Title:</b> John S. Nealon, P.E., Geotechnical Engineer	b. <b>Project Assignment:</b> Geotechnical Engineering
c. <b>Name of Firm with which associated:</b> Dames & Moore	d. <b>Years Experience:</b> With This Firm 1.5 With Other Firms 12
e. <b>Education: Degree(s)/Year/Specialization</b> M.S., Civil Engineering (with emphasis in Geotechnical Engineering), 1989, University of Illinois at Urbana-Champaign B.S., Geological Engineering, 1984, University of Missouri at Rolla A A S., Life Sciences, 1982, St. Louis Community College	f. <b>Active Registration: Year First Registered/Discipline</b> Nebraska (Civil, E-7518) Utah (Civil, 93-259498-2202) Arizona (Civil, 31482; Geological, 32172)
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Mr. Nealon's academic studies have included course work in structural geology, stratigraphy, petrology, subsurface exploration, mining surveying, groundwater resource engineering, soil and rock mechanics, earth pressures and retaining structures, engineering geology, and earth dam engineering.</p> <p><b>Geotechnical Investigations</b></p> <ul style="list-style-type: none"> <li>Completed a final soil and foundation investigation for the Lakeview Dam in Riverside County, California; assisted in a reservoir expansion study for the San Joaquin Reservoir in Los Angeles, California; and assisted in design of a detention dam project in Madison, South Dakota. Presently involved in a feasibility and conceptual design study for a creek diversion project at an open-pit mine, which will eventually include at least one new dam and possibly a large-diameter, hard-rock tunnel.</li> <li>Geotechnical computer experience includes slope stability studies (using the STABL program) and reduction of survey data for the Getty Center project in Brentwood, California; slope stability studies (also using STABL) for structures in the Omaha area, for two earth dams in the Los Angeles, California area, for a proposed RCC dam in Madison, South Dakota, and an existing bottom ash fan in Joseph City, Arizona; and lateral load analysis of drilled shafts for structures in Omaha using the PILE program.</li> <li>Other soil and foundation investigations not mentioned above include a four-phase retirement complex in Chamberlain, South Dakota; a site development project at a National Guard facility in Lincoln, Nebraska which included a KC-135 fuel systems maintenance hangar; a large retreat facility at a monastery in Schuyler, Nebraska; a major water treatment facility in Omaha which included a wellfield, several miles of large-diameter pipelines, two river pipeline crossings, and water treatment facilities; an underground parking garage at The Getty Center in Brentwood, California; a new Federal Building and U.S. Courthouse in Omaha, which will include demolition of several existing structures and support of major streets adjacent to cuts up to 34 feet deep; an 8-story parking garage in Omaha; a major expansion of a soybean processing facility in Sergeant Bluff Iowa; a 5-million-gallon water storage reservoir in Fremont, Nebraska; and a water reclamation facility in Prescott, Arizona.</li> <li>Supervised subsurface investigations and logged borings for numerous projects in the midwestern and southwestern United States. Projects have included structures supported on cast-in-place augered piles, belled piers, straight-shaft friction piers, driven piles, and shallow footings bearing on natural soils and engineered fills.</li> </ul> <ul style="list-style-type: none"> <li>Completed or assisted in soil and foundation investigations for distressed structures including a bowling alley and a total energy plant building in Council Bluffs, Iowa; a school building in Corning, Iowa; pavements at a school in Omaha, Nebraska; and a school building in Phoenix, Arizona.</li> <li>Completed or assisted in soil and foundation investigations for medical facilities including a seven-story medical office building, parking garage, health plaza facility, off campus medical office building, and additions to existing facilities at the Immanuel Medical Center in Omaha, Nebraska; eye clinics at Clarkson Hospital and at the University of Nebraska Medical Center in Omaha; an ICU/Step-Down addition and a day-care center at Mercy Hospital in Council Bluffs, Iowa; medical office buildings at the Norfolk Lutheran Community Hospital in Norfolk, Nebraska, at Bergan Mercy Hospital in Omaha, and at Lawrence Memorial Hospital in Lawrence, Kansas; a multi-story addition to the Douglas County Hospital in Omaha; an addition to Samaritan Medical Center in San Clemente, California; and a large addition to the Turtle Mountain Hospital in Belcourt, North Dakota.</li> <li>Completed or assisted in soil and foundation investigations for schools including a high school addition in Chamberlain South Dakota; a new middle school in Excelsior Springs, Missouri; and numerous new school buildings and additions in Nebraska and Iowa.</li> </ul> <p><b>Environmental Projects</b></p> <ul style="list-style-type: none"> <li>As a technical consultant to the Illinois Environmental Protection Agency, reviewed permit applications submitted by industries for underground injection of hazardous wastes via Class I wells regulated by the Underground Injection Control (UIC) program, and witnessed Class I well workovers and mechanical integrity tests.</li> <li>Was a member of the Underground Injection Practices Council's (UIPC) National Class V Task Force. Participated in peer review of the United States EPA's report to Congress on their nationwide inventory and assessment of Class V injection wells.</li> <li>Was a drilling rig geologist for a remedial investigation at the former Army Ammunition Plant in Mead, Nebraska. Responsibilities included geologic logging, soil sampling, water sampling with a HydroPunch II sampler, and monitoring well installation.</li> <li>Prepared a work plan and was a drilling rig geologist for a remedial investigation for Building 301 at Offutt Air Force Base in Bellevue, Nebraska. Responsibilities included geologic logging, soil sampling, water sampling, and monitoring well installation.</li> <li>Was involved in an environmental site assessment at the site of a KC-135 fuel systems maintenance hangar at the Nebraska Air National Guard's Lincoln, Nebraska facility, where contamination was encountered during drilling for a geotechnical investigation.</li> </ul>	

- Participated in a worker health and safety evaluation at a bank construction site where contamination from a former gas station was encountered during site grading.

***Groundwater Resource Evaluation***

- Participated in Illinois' feasibility studies for the Superconducting Super Collider (SSC). Developed a database for storage and manipulation of data relating to municipal, industrial, and domestic wells potentially impacted at the proposed SSC site.
- Conducted local groundwater resource evaluations for individuals and municipalities seeking information on ground water supplies in Illinois. Collected and evaluated local well-, aquifer-, and step-drawdown test data and made recommendations to municipalities concerning optimum pumping rates, well yields, long-term drawdowns and interferences, and production well spacings.
- Assisted the Battelle Memorial Institute in developing specifications for aquifer- and step-drawdown testing for a proposed low-level radioactive waste storage facility in Illinois.
- Assisted consulting firm with understanding and interpretation of requirements of Illinois' Wellhead Protection Program regulations.
- Prepared and presented a short course on groundwater resource evaluation to graduate students at the University of Illinois at Urbana-Champaign.

***Deposition and Expert Testimony***

- County of Kendall vs. Aurora Bank and Trust, Kendall County, Illinois. Case involved availability of ground water for sod farm operation. Presented oral deposition to attorneys and expert testimony to the Court to the effect that the defendant's proposal to construct a 10-acre lake for a 2.7 MGD irrigation supply was rendered infeasible.

<b>7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.</b>	
<b>a. Name &amp; Title:</b> James X. Kelly, P.E.	<b>b. Project Assignment:</b> Structural Engineering
<b>c. Name of Firm with which associated:</b> Dames & Moore	<b>d. Years Experience:</b> With This Firm 7 With Other Firms 1
<b>e. Education: Degree(s)/Year/Specialization</b> B.S./1990/Civil Engineer/University of the Pacific, Stockton, CA B.S./1990/Engineering Management/University of the Pacific, Stockton, CA M.S./1998/ Hydrology & Structural Engineering, University of Colorado, Denver, CO	<b>f. Active Registration: Year First Registered/Discipline</b> Professional Engineer: Colorado, 1995, No. 30257; California, 1996, No. C 055729 OSHA
<b>g. Other Experience and Qualifications relevant to the proposed project:</b>	
<ul style="list-style-type: none"> <li>• <b>Big Thompson Siphon Evaluation, Longmont, CO</b> - Performed a structural condition assessment on the Big Thompson Siphon, a 9'-0" diameter tunnel lining and concrete pipe that conveys water across Highway 34 and the Big Thompson river. The non-destructive testing included visual inspection, Impact Echo (IE) testing, and Spectral Analysis of Surface Waves (SASW). Petrographic evaluation of selected concrete cores was performed as part of the destructive testing program. Based on the siphon inspection program, a rehabilitation plan was drafted that included recommended repairs needed for the siphon to have an additional 50-year operating life.</li> <li>• <b>Chesapeake-Orchid Abutment Wall and Slab-on-grade, Flagstaff, AZ</b> - Performed a structural analysis on three types of abutment walls and a concrete slab-on-grade that was designed by the Dames &amp; Moore Phoenix office. The abutment walls were evaluated for impact resistance per AASHTO criteria and the slab-on-grade was analyzed for H20 and CS3 vehicle loads per ACI SCM-25.</li> <li>• <b>Concrete Products Silo Foundation Design, Salt Lake City, UT</b> - Performed structural analysis and design of a foundation system for twin 400 kip asphalt silos. Design included seismic analysis and dynamic loading. Also included a redesign of the silo steel support legs to accommodate seismic loading.</li> <li>• <b>Rocky Flats Decon Pad Upgrades, Golden, CO</b> - Project Engineer for the structural and civil design of the Rocky Flats Decon Pad Upgrades. Tasks performed during this project included analysis and design of two spread footing and wall footing foundation systems for pre-engineered metal buildings, performed finite element analysis and design of a combination secondary containment area and building foundation, design of structural slab on grade and site civil design.</li> <li>• <b>Rocky Flats Sewage Treatment Plant Upgrades, Golden, CO</b> - Project Engineer for the Rocky Flats STP Upgrades. Tasks included analysis and design of two drilled caisson foundation systems, analysis and design of elevated structural slabs, structural analysis and design of two reinforced concrete and masonry building expansions, analysis of site hydrology and design of drainage system and design of the Plant access roads, parking lot and asphaltic pavement thickness.</li> <li>• <b>Pacific Gas &amp; Electric Timber Pile Evaluation, San Francisco, CA</b> - Located and designed the excavation of two pits to evaluate spread footing timber piles in two occupied San Francisco buildings. This project included analysis of shoring details and excavation dewatering.</li> <li>• <b>Phelps Dodge Morenci, Inc. Aquifer Protection Permit, Morenci, AZ</b> - Temporarily relocated to Morenci, AZ to visually inspect and analyze over 150 discharging units at the PDMI Mine for compliance with the Arizona Department of Environmental Quality (ADEQ) aquifer protection plan for Best Available Discharge Control Technology (BADCT). This was a newer version of BADCT and was in the developmental stages as the BADCT investigation was ongoing. Qualifying discharge reduction technologies, per ADEQ, required structural, hydrological and geotechnical analysis on each of the 150 discharging units. Following the analysis, a BADCT demonstration report was written for each discharging unit and included with PDMI's Aquifer Protection Permit application.</li> <li>• <b>Eagle Mine Runoff Channel Hydraulic Analysis/Design, Minturn, CO</b> - Used Hec-2 to analyze the Eagle Mine Runoff Channel for the 25 year PMF. Channel geometry was altered and channel composition modified as necessary to control flow. Also sized and designed two parallel CMP culverts to convey 25 year flow beneath a site access road.</li> <li>• <b>Ivins Bench Dam, Salt Lake City, UT</b> - Performed preliminary and final hydraulic analysis and structural design for the Ivins Reservoir outlet tower structure and stilling basin. Structural analysis included investigation of seismically induced hydrodynamic forces. A permit package containing the preliminary design drawings and supporting hydraulic calculations was forwarded to the State of Utah for approval. A final design package including construction drawings and technical specifications was completed after receiving state approval.</li> <li>• <b>Boeing Wetland and Stream Enhancement, Everett, WA</b> - Participated in the design and grading of a two-acre wetland in Everett, Washington to naturally treat stormwater runoff from the nearby Boeing plant. Included with this project was overall site grading, design of surface and subsurface drainage system, hydraulic analysis and layout of the wetlands and discharge stream enhancement. The stream, into which the wetlands discharged, was enhanced with natural looking log bank stabilization, log weirs, log retaining walls, cobbled banks and fish habitat root wads.</li> <li>• <b>Manenggon Hills/Leo Palace Resort, Yona, Guam</b> - Prepared scheduling and cost estimates for various phases of design. Stall Engineer on the design of a man-made lake</li> </ul>	

(Lake Yona), including aeration analysis/design, hydraulic layout, lake grading and analysis of liner system. Performed runoff analysis to determine flow duration curves and unit hydrographs for streams and rivers located near or on the property. Assisted in design of a hydraulic energy dissipating system (flip bucket and plunge pool) for a 100-foot-high dam. Assisted with design of an irrigation system involving six subsurface, 400,000-gallon storage vaults and line flows in excess of 3,000 gpm. Used HEC-3 analysis to compute reclaimed water discharge location and aided with preparation of EPA NPDES discharge permit. Worked on the design of the primary access road drainage structures, curb and gutter, alignment, and grading.

- **AT&T Tanguission Point Earth Station, Guam** - Performed a feasibility study for the in place closure of two concrete encased 16,000 gallon underground storage tanks (USTs) and for the replacement of two 500 KA transformers. The UST Feasibility Study included tank tightness testing and angular soil borings for the collection of soil samples. The transformer replacement feasibility study involved inspection of the switch gear, disposal of PCB contaminated oil and design of a new transformer station.
- **AT&T Cable Facility, Tumon, Guam** - Performed a destructive and non-destructive building assessment after the Guam 8.1 earthquake of 1994. After the total damage and building condition were evaluated, a building strengthening plan was designed and implemented.
- **AT&T Cable Facility, Tumon, Guam** - Project manager for the design and construction a 1,900-square-foot concrete battery building. The client requested this project be performed on a fast track schedule, total time from Notice-to-Proceed to Final Walk-through was 4? months.
- **Environmental Site Assessment and Remediation, Tumon, Guam** - Performed a Phase I Site Assessment on a former old construction yard for Kmart Corporation. In addition to the Phase I assessment, groundwater monitoring wells were installed and near surface soil remediation activities were performed.
- **Shell Agat Terminal, Agat, Guam** - Geologically logged and installed 12 monitoring wells for a preliminary Solid Waste Management Unit (SWMU) investigation report. Both soil and water samples were collected from each of the 12 locations and analyzed per USEPA methods.
- **Roseville Flood Improvement, Roseville, CA** - Performed HEC-2 analysis and modeling for the Roseville Flood Improvement project. Identified water surface profile elevations, located sections of critical flow and designed a 120-foot-wide flexible gabion step weir to control the flow at a critical section.

**7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

<p><b>a. Name &amp; Title:</b> Eric A. Schroth</p>	<p><b>b. Project Assignment:</b> Civil Design</p>
<p><b>c. Name of Firm with which associated:</b> Dames &amp; Moore</p>	<p><b>d. Years Experience:</b> With This Firm &lt;1 With Other Firms 3.5</p>
<p><b>e. Education: Degree(s)/Year/Specialization</b>          B.S. in Civil Engineering, California State University, Chico, 1994          B.A. in Business/Economics with Accounting Emphasis, University of California, Santa Barbara 1985</p>	<p><b>f. Active Registration: Year First Registered/Discipline</b>          Engineering-Intern registered in California</p>

**g. Other Experience and Qualifications relevant to the proposed project:**

Mr. Schroth is experienced in the area of civil engineering including site layouts, grading plans, earthwork balances, road alignments; piping and hydraulic design; septic design; hydrologic analysis; design of channels, culverts and sediment control structures; preparation of design drawings and reports; erosion analysis and erosion control planning; stream restoration; AutoCAD and SOFTDESK; and numerous computer assisted engineering models.

**Site Civil Engineering**

- **City of Sedona:** Designed a liner system retrofit for several wastewater treatment ponds. Design included grading plans, GCL and HDPE liner design, piping system, design drawings, technical specifications, design report, and project management. Digitally modeled terrain using SOFTDESK.
- **Phelps Dodge Morenci, Inc.:** Designed a solution collection channel liner and piping system for a leaching system. Design included alignment plans, liner design, solution collection system design, design drawings, technical specifications, design report, project management, and construction management. Digitally modeled terrain using SOFTDESK.
- **City of Battle Mountain Landfill:** Designed layout and grading of storage cells and roads using AutoCAD. Designed culverts, diversion channels, and sediment control basin based on hydrologic analysis. Digitally modeled terrain and calculated earthwork balances using SOFTDESK.
- **Battle Mountain Gold Company:** Performed a geotechnical field investigation and designed a heap leach facility expansion for a mining operation. Design included grading plans, liner design, solution collection system design, earthwork balances, design drawings, technical specifications, design report, and as-built report. Digitally modeled terrain using SOFTDESK.
- **Mineral Ridge Resources, Inc.:** Performed a geotechnical field investigation and assisted in the design of a heap leach facility for a mining operation. Designed solution collection system, event pond, calculated earthwork balances, prepared technical specifications. Digitally modeled terrain using SOFTDESK.

- **Lander County Landfill:** Designed layout and grading of storage cells and roads using AutoCAD. Designed culverts, diversion channels, and sediment control basin based on hydrologic analysis. Digitally modeled terrain and calculated earthwork balances using SOFTDESK.
- **LAC Minerals (U.S.A.):** Designed a reclamation plan for mining facilities. Prepared construction drawings, technical specifications, cost estimate and report. Designs included hydrologic analysis, grading of roads, diversion channels, culverts, sediment control basin and reclaimed facilities. Digitally modeled terrain using SOFTDESK.
- **LAC Minerals (U.S.A.):** Designed grading plans for a solution processing facility. Designs included hydrologic analysis, layout of roads, sizing of solution collection ponds, diversion channels and culverts. Used SOFTDESK to calculate earthwork volumes, provide survey points, and label road construction drawings.
- **Erdenet, Inc.:** Prepared plan and profile design drawings for a solution processing facility. Design included civil earthworks and hydraulic design.

**Hydrology/Hydraulic Design**

- Performed analysis and design of storm water diversion channels and retention ponds using hydrologic and hydraulic analysis. Projects utilized civil earthworks, small dam design, and culvert design. Selected clients include:
  - **Santa Fe Pacific Gold Corporation, Twin Creeks Mine**
  - **LAC Minerals (USA) Inc., Cunningham Hill Mine**
  - **Mineral Ridge Resources Inc., Mary Drinkwater Mine**
  - **LAC Minerals (USA) Inc., Carache Canyon**
  - **Lander County, Nevada**
  - **Battle Mountain Gold Company, Copper Canyon**
  - **Battle Mountain Gold Company, Copper Basin**
  - **City of Battle Mountain, Nevada**
  - **Eureka County, Nevada**

***Erosion Analysis***

- Used hydrologic and sedimentologic computer modeling techniques to analyze and design sediment control structures to meet standards established by the Storm Water Pollution Prevention Plan. Extensive use of SEDCAD3, StormSHED, TR-55, and TR-20. Selected clients include:
  - ***Santa Fe Pacific Gold Corporation, Twin Creeks Mine***
  - ***Barrick Goldstrike Mines, Inc.***
  - ***Round Mountain Gold Corporation, Manhattan Mine***
  - ***LAC Minerals (USA) Inc., Carache Canyon***
  - ***Round Mountain Gold Corporation, Round Mountain Mine***
  - ***Santa Fe Pacific Gold Corporation, LoneTree Mine***
  - ***Mineral Ridge Resources, Inc., Mary Drinkwater Mine***

<b>7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.</b>	
<b>a. Name &amp; Title:</b> Kevin R. Somerville	<b>b. Project Assignment:</b> Cost Estimating
<b>c. Name of Firm with which associated:</b> Dames & Moore	<b>d. Years Experience:</b> With This Firm 7 With Other Firms 1
<b>e. Education: Degree(s)/Year/Specialization</b> B.S., May 1990, Construction, Arizona State University A.A.S., December 1982, Construction Inspection, Scottsdale Community College	<b>f. Active Registration: Year First Registered/Discipline</b>
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Performs various construction management and remediation activities including project oversight, resident inspection, contractor administration. Develops and maintains project schedules using Primavera and Primavision software. Prepares remediation work plans, specifications, and cost estimates for underground storage tanks (USTs), soil contamination, mine related structures, holding ponds, concrete structures, general earthwork, earth dams, pipeline and other related construction activities.</p> <ul style="list-style-type: none"> <li>Performs project scheduling and cost control for numerous construction and remediation projects. Develops office and field activity relationships for remedial investigations, remediation actions and construction. Provide graphical network diagrams and schedule reports for Dames &amp; Moore/client meetings. Produces man-hour resource reports for the project manager that correspond to the schedule activities. Tracks and controls man-hours, budgets, and costs incurred throughout the job using Primavera, Microsoft Project, and an in-house cost reporting system. Provides detailed cost reports for work activity expenditures, budget forecasting, and total cost variances.</li> <li>Providing construction management for a 400,000 square feet of lining with HDPE of an existing effluent storage pond at a municipal waste water treatment plant in central Arizona. The project is currently ongoing, and consists of constructability reviews of the design, negotiation of the contractor final lump sum price, and overseeing the contractor's construction activities onsite to ensure conformance to the design specifications and the requests of ADEQ and ADWR are carried out.</li> <li>Performed construction estimating, specification writing, constructability reviews, and construction management for a 15 acre-foot HDPE lined reservoir, integrated seepage interception trench, and ancillaries for a copper mine in southwestern Arizona. Construction monitoring included inspection of field work for specification conformance, QA/QC soil and concrete testing, and liaison and documentation activities. Witnessed and inspected QC testing performed by the liner contractor. The copper mine is currently applying for their APP.</li> <li>Performed construction estimating for a 9 acre-foot earthen dam with HDPE liner on the upstream face for a copper mine in southwestern Arizona. Conducted construction management in the field to ensure conformity with the plans and specifications. Performed QA/QC testing for the earthwork. The copper mine is currently applying for their APP.</li> <li>Prepared design drawings and specifications and performed detailed cost and soil balance estimating for a municipal waste landfill expansion including a clay lining layer, HDPE lining, storm water detention basins, soil capping layers, and ancillaries for a municipality in metropolitan Phoenix. The design and cost estimate was used as part of their APP application and competitive bidding for construction.</li> <li>Assisted with the preparation of construction specifications and cost estimates for Phase I, II, and III of an HDPE and compacted clay lined channel constructed to convey leachate from a heap leach waste dump expansion at an eastern copper mine. The lined channel is approximately 375,000 square feet in area.</li> <li>Prepared conceptual level and detailed cost estimates for demolition of existing structures, construction of a soil treatment facility (STF), and remediation of 60,000 cubic yards of contaminated soil. Developed design drawings and technical specifications for demolition and STF construction activities. The design objective is to remediate the site of a former wood treating facility with 3 years using bioremediation techniques.</li> <li>Prepared a detailed cost estimate for a Feasibility Study for the development of a new mine in Arizona. The mine facilities included in the estimate included 15,000,000 square feet of composite liner leach pad, drainage pipes and ditches, stormwater channels and storage ponds, overliner materials, and earthen headwalls. The composite liner consisted of compacted clay liner overlain by HDPE. Multiple feasibility evaluations and cost analysis were conducted for alternative liner systems, crushing and screening gradations, and installation methods for clay soils.</li> <li>Prepared design drawings and specifications and performed detailed cost estimating for an integrated storm water control system including a 48 acre-foot HDPE lined reservoir, a 5 acre-foot pond, seepage interception trench, diversion channels, and ancillaries for a copper mine in northern Arizona. Prepared as-built drawings, an O&amp;M manual, and the final construction report.</li> <li>Performed construction monitoring for a 5.4 acre HDPE lined soil treatment facility and soil sampling, cost estimating of 35 various activities outlined in a work plan, change order negotiation, reporting to ADEQ, soil quantity verification, site health and safety monitoring, and documentation for soil remediation activities at a large company in eastern Arizona. Several activities associated with the cleanup of leaking ASTs were completed as part of a</li> </ul>	

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.

Kevin R. Somerville (Continued)

work plan, including removal and bioremediation of 25,000 cubic yards of petroleum contaminated soil.

- Performed planning and investigation activities for bunker oil in the ground at a site in Winslow, Arizona. Currently performing design and preparing specification services to collect and recover the oil. Performed the design and providing construction monitoring of trench collection systems to recovery diesel released from an AST and buried fuel pipes. The collection systems are currently being installed.
- Prepared conceptual drawings and performed detailed quantity and cost estimating for a construction debris landfill closure including waste transfer, soil capping layers, and ancillaries for a private owner in metropolitan Phoenix. The drawings and cost estimate were used for litigation settlement.
- Prepared design drawings and specifications and performed detailed cost estimating for a 45 acre-foot HDPE lined reservoir, integrated seepage interception trench, 1,000 lined channel and ancillaries for a copper mine in southern Arizona. Performed remediation of mine-impacted soils prior to the construction of the pond and intercept. The copper mine is currently applying for their APP.
- Prepared a detailed cost estimate for a turnout structure of the CAP canal and 100 feet of RCP pipe for a future recharge site north of Phoenix.
- Performed construction management services for a soil vapor extraction (SVE) system at a semiconductor manufacturer in Phoenix, Arizona. The system was comprised of wells, conveyance piping, blower unit, and instrumentation. Services included: bid and contract document preparation; cost estimating; and construction oversight.
- Prepared detailed construction cost estimates, technical specifications, and drawings for the construction of soil bioventing systems at three Phoenix-area sites for a municipality in the metropolitan Phoenix area. Construction is complete and the system is currently operating. The biovent systems include a blower and equipment pad, well vaults, and conveyance piping.
- Prepared detailed cost estimates for several remediation options of contaminated soil at a manufacturing facility in Phoenix, Arizona. The soils were contaminated with heavy metals. The estimates included in situ remediation using an SVE system and excavation and offsite disposal.
- Performed conceptual drawings and cost estimates for a land treatment facility to landfarm petroleum contaminated soil for an industrial facility in northern Arizona. The treatment facility being evaluated was over 6 acres in size. The drawing and cost information was used for permit and public review.
- Prepared detailed cost estimates for deep collection trenches for perched contaminated water containment and recovery at a major industrial facility in northeast Arizona. The trenches required bio-slurry construction to allow excavation in sandy soils without cave-

ins. Several detailed estimate options were evaluated at three areas of the site at varying depths.

<b>7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.</b>	
<b>a. Name &amp; Title:</b> Mark E. Roter	<b>b. Project Assignment:</b> Senior Engineering Technician
<b>c. Name of Firm with which associated:</b> Dames & Moore	<b>d. Years Experience:</b> With This Firm 2 With Other Firms 10
<b>e. Education: Degree(s)/Year/Specialization</b> Construction Engineering, Iowa State University (60+ credit hours)	<b>f. Active Registration: Year First Registered/Discipline</b> National Institute for Certification of Engineering Technicians (NICET) NICET Level IV: Construction Materials Testing, Asphalt, Soils, Concrete NICET Level II: Underground Utilities ACI Level I: Concrete ICBO: Certified Special Inspector, Reinforced Concrete, No. 1031780-88 OSHA: 40 hour Health & Safety, HAZWOPER
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Mr. Roter is a Senior Engineering Technician with over 18 years of experience in Construction Management, Materials Testing and Quality Control. Mr. Roter has been involved in all aspects of construction monitoring and testing including concrete, asphalt, soils and steel. His experience includes field and laboratory assignments in both the performance of tests and management of these areas. Mr. Roter has worked on a full range of projects involving low and high rise buildings, roads, bridges, and dams. A select list of projects is provided below:</p> <ul style="list-style-type: none"> <li>• Construction inspection and testing at Mayo Hospital in Phoenix, Arizona. This project consisted of a 7-story steel structure with power plant. Responsibilities included special inspection of over 400 concrete piers, grade beams, welds, fireproofing, and all concrete and masonry structural elements.</li> <li>• Construction inspection and testing of Phoenix City Hall. This project was a high-rise project in downtown Phoenix featuring many facets of building construction. This project is notable as the largest continuous concrete pour in Arizona history. A mobile lab with complete concrete and soils testing capabilities was utilized.</li> <li>• Construction inspection and testing for Arrowhead Mall in Glendale, Arizona. This project involved all aspects of construction materials and methods, including concrete piers, grade beams, pad foundations, steel and concrete structural elements and composite floor systems.</li> <li>• Construction management, inspection, and testing of University of Iowa Law Building in Iowa City, Iowa. This project included providing inspection and testing on an 8-story steel frame structure from foundations through roofing.</li> <li>• Construction management of 140 miles of fiber optic cable installation for Williams Bro. Pipelines from Indianola, IA to Omaha, NE. Responsibilities included utility contact, city and state liaison, weekly subcontractor meetings and scheduling, progress reports, and project oversight.</li> </ul> <ul style="list-style-type: none"> <li>• Construction inspection and testing of Student Center for LORAS college in Dubuque, Iowa. This project included inspection and testing of a 6-story steel frame structure including visual weld inspection and bolted connection testing.</li> <li>• Construction management of a world class track and field facility for University of Iowa, Dubuque. This project was built and certified for NCAA and Olympic competition. In addition, the original project was scheduled to required 9 to 12 months for construction. The project was completed in 4 months to meet client scheduling.</li> <li>• Construction inspection and testing for Des Moines Center in Des Moines, Iowa. This project included inspection and testing of a 12-story multi-building retail-office complex. This project featured a 50 ft x 50 ft x 150 ft tubular steel truss supporting six hanging walkways. This project required continuous monitoring from foundations through concrete completion.</li> <li>• Construction inspection and testing of the Albertson's Distribution Center in Tolleson, Arizona. The project was a single-story, 750,000 sf, tilt-up structure. A mobile lab with complete concrete and soils testing capabilities was utilized.</li> <li>• Contractor Quality Control Testing on the Squaw Peak Parkway from Glendale to Northern and Northern to Shea. These projects involved on-site testing of bridges and pavements. A mobile asphalt, soils and concrete lab was utilized.</li> <li>• Over 15 additional projects involving multi-story structural steel frame inspection and testing, including visual weld inspection and bolted connection.</li> <li>• Over 20 projects involving single-story steel joist frame inspection and testing including visual weld inspection and bolted connection.</li> <li>• Over 50 projects involving multi-story concrete frame inspection and testing, including pier and pad foundations, cast-in-place and precast structural and architectural elements and slab-on-grade floor slabs.</li> <li>• Over 25 projects involving pavement construction and reconstruction inspection and testing. Experience in this area ranges from multi-span bridges to soil-cement stabilization to standard paving materials and methods.</li> </ul>	

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
a. <b>Name &amp; Title:</b> Scott G. Woods	b. <b>Project Assignment:</b> GIS Coordinator/Senior Analyst
c. <b>Name of Firm with which associated:</b> Dames & Moore	d. <b>Years Experience:</b> With This Firm 4.5 With Other Firms 4.5
e. <b>Education: Degree(s)/Year/Specialization</b>  BS, 1991, Geography, Urban/Environmental Planning	f. <b>Active Registration: Year First Registered/Discipline</b>
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Mr. Woods has seven years of professional geographic information systems (GIS) with several private and local governmental agencies. He is proficient in the applications of Arc/Info and has conducted GIS project management, database management, computer mapping, and resource analysis on various interdisciplinary planning and environmental projects. Mr. Woods' current duties include overseeing GIS activities database development, data entry, program development, analysis, cartographic design, map production, and data reporting.</p> <ul style="list-style-type: none"> <li>• GIS project management for the City of North Las Vegas Master Plan. Developed GIS databases to support planning and public process.</li> <li>• GIS project management for County of Los Alamos Comprehensive Plan Update. Developed variety of thematic data to support plan update and alternative plan development.</li> <li>• GIS lead analyst on the Maricopa County 2020 Environmental Plan. Developed and managed county-wide databases. Databases included, land use, wildlife, habitat, cultural, wetlands, and other environmental information.</li> <li>• GIS data management and corridor mapping, impact analysis, and alternative route analysis for the Navajo Transmission Project; regional environmental feasibility study and environmental impact statement (EIS) for a proposed 500kV transmission line across Navajo Indian Reservation lands. This study includes over 2,000 linear miles of alternative corridors through New Mexico, Arizona, Utah, and Nevada.</li> <li>• GIS database development, analysis, programming, and cartographic design for the Southern Intertie Proposed Anchorage to Kenai Peninsula Transmission Line Project.</li> <li>• GIS database development, analysis, application development, and mapping for the proposed Phoenix Federal Building and U.S. Courthouse Project. GIS was utilized to facilitate the risk assessment for the site and to provide an Arc/View based application for management decision making. This project incorporated Arc/Info databases, AutoCAD drawings, present and historical aerial imagery, and a variety of laboratory chemical databases into an application designed to query, analyze, display, and map data.</li> <li>• GIS database development, application design, and programming for a major utility company's risk assessment of their facilities/utilities in Hawaii. GIS provided a tool to develop databases of human and ecological resources for risk assessment. A variety of GIS tools were used to develop an Arc/View based application which incorporated Dynamic Segmentation, GPS, digital imagery, digital quads, parcel databases, and laboratory data. The application provided overlay analysis, mapping, and allowed traditional GIS users a tool to develop additional data, report information, and perform custom queries. The development of a web browser for display and query of the data developed for the project was designed to facilitate the dissemination of data internally for the client.</li> <li>• GIS database development, project coordination, application development, and programming for a major industrial client in the greater Phoenix area. An Arc/View base application was developed to organize a variety of chemical laboratory databases, incorporate current and historical imagery, custom data queries, along with providing custom mapping and display capabilities.</li> <li>• GIS project management, database design, programming, and mapping for the Phelps Dodge Safford Mine Project. GIS was used to convert a variety of AutoCAD drawing files and assorted external databases into an Arc/Info application designed to analyze some 400 well sites. Spatial data analysis of chemical concentrations was performed and additional surface and ground water characteristics were developed to provide environmental analysis and report preparation.</li> <li>• GIS project management, database design, programming, and mapping for the Texas Utility 138kV Transmission Line Project. Performed linear corridor analysis on over 40 miles of alternatives. AML programming, Dynamic Segmentation, and visibility analysis were performed to provide environmental planners and engineers information for the EIS.</li> <li>• GIS data management, coordination, analysis, cartographic design, menu programming for the RS 16 Salt River Project Transmission Line Project. Involved development of a menu driven interface for developing detailed land use, visual, cultural resource inventories using registered aerial photographs.</li> <li>• GIS data management, cartographic production, and analysis for Little Rock Mine EIS in Tyrone, New Mexico for Phelps Dodge Mining Company and BLM.</li> </ul>	

**7. Brief resume of key persons, specialists, and individual consultants anticipated for this project. (Continued)**

- GIS data management, analysis, modeling, and mapping for the multi-species sub-area habitat plan for the Naval Air Station Miramar. This study involves grid based modeling of sensitive habitats including threatened and endangered plant and animal species in order to develop areas of future development for the military base.
- GIS data management, analysis, and cartographic production, land use planning, for the City and County of Yuma Joint Land Use Compatibility in Yuma, Arizona. Developed database of current land use and then developed proposed future land use alternatives for analysis to determine which alternatives would be the most compatible with the proposed expansion of the Yuma Marine Corp Station

**Past Experience**

Prior to joining Dames & Moore, he conducted GIS project management, program development, training and analysis with the Arizona Game & Fish Department on various land use, wildlife, and habitat assessment projects. Additionally he was involved in projects that promoted wildlife and recreational area conservation. Mr. Woods also provided GIS consulting services to several private firms in which he was responsible for training, analysis, program development, and cartographic design on various urban and environmental planning projects.

7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.	
a. <b>Name &amp; Title:</b> Kristin Darr, Public Involvement Specialist	b. <b>Project Assignment:</b> Public Involvement
c. <b>Name of Firm with which associated:</b> Dames & Moore	d. <b>Years Experience:</b> With This Firm 2.5      With Other Firms 4
e. <b>Education: Degree(s)/Year/Specialization</b> BA, 1991, Political Science/Journalism, Metropolitan State College, Denver	f. <b>Active Registration: Year First Registered/Discipline</b>
<p><b>g. Other Experience and Qualifications relevant to the proposed project:</b></p> <p>Ms. Darr has more than 6 years of public involvement and technical communication experience in the environmental engineering and planning fields. She has served as the public involvement specialist for a variety of clients including federal, state, and local governmental agencies, as well as private sector clients from a variety of disciplines (e.g., microelectronics, manufacturing, utilities, and telecommunications). For these clients she has designed and implemented public involvement programs ranging in size from small information campaigns to large, highly-visible campaigns with extensive public involvement and interest.</p> <p>Ms. Darr also serves as project coordinator for various environmental planning and permitting projects, has written and edited technical reports and proposals ranging from small work plans to environmental assessments (EAs) and environmental impact statements (EISs) for a variety of projects, and has written and edited remedial investigations and feasibility studies and risk assessments at high-profile Superfund sites. In addition, she has coordinated multi-million dollar federal government projects, and has worked on numerous controversial projects in sensitive environments, and with Indian reservations. She was employed formerly by RUST Environment &amp; Infrastructure and EBASCO Environmental, both in Denver.</p> <ul style="list-style-type: none"> <li>Public involvement specialist on behalf of the City of Scottsdale for their highly controversial Indian School Road and McDonald Drive Concept Design Study. The two streets, both densely populated with residential and commercial properties, are planned as interchanges on the new Pima freeway. The city is soliciting public input to be incorporated with traffic data to determine what type of improvements are needed, if any, to accommodate anticipated increases in traffic. The public involvement program includes answering inquiries and providing information on a telephone hotline; creation and maintenance of a project mailing list of more than 6,000; writing, producing, and distributing numerous newsletters and fact sheets; planning and attending public open houses and smaller neighborhood meetings; submitting project information to local officials and publications; and summarizing input to be incorporated with technical data.</li> <li>Public involvement specialist on behalf of the City of Scottsdale responsible for design and implementation of a program to familiarize the citizens of Scottsdale with the Desert Greenbelt project, a regional flood control project that will use the natural terrain and state-of-the-art engineering to contain stormwater flow within three primary channels and a series of detention basins. Public involvement has been a key element of the project since it began in 1992, including continuous contact with neighbors in the project area. The primary goal of the new program is to educate the greater Scottsdale community about the project's purpose and need, and to update the public about ongoing and future design and construction activities. A secondary goal is to encourage a sense of community pride in this important and state-of-the-art project. To do this, we are designing a new and updated project newsletter to be distributed quarterly, and updating the project video.</li> <li>Public involvement specialist on behalf of the City of Scottsdale Water Campus project. The Water Campus will include a state-of-the-art eight million gallon per day water reclamation plant, an advanced treatment facility that will purify reclaimed wastewater to drinking water standards, a ground water recharge and recovery system that will use infiltration injection wells, and an improved wastewater collection system. The scope of work includes a project team communications protocol, a media relations program, development of a mailing list, newsletters, utility bill inserts, and other presentations and briefings, all designed to inform the public about the project and highlight the City's efforts to optimize water resources and conserve ground water supplies.</li> <li>Public involvement specialist on behalf of the City of Scottsdale's Central Arizona Project (CAP) Water Treatment Plant (WTP) Expansion project. The CAP WTP serves more than 20,000 homes and businesses, and the public outreach program is designed to inform these customers about the expansion and highlight the state-of-the-art system being implemented by the city to provide a safe and reliable domestic water supply. The outreach program will also inform those who may be impacted by construction activities. The scope of work includes developing the mailing list, which will include at least 20,000 records, as well as writing, designing, and producing two newsletters for mailing, answering telephone inquiries, and submitting articles for publication in the city's utility bill insert.</li> <li>Manager of a public information program to support the City of Scottsdale's CAP Zone 2 Pipeline and Reservoir Alignment and Siting Project, being conducted to serve an area in north Scottsdale with more water from the Central Arizona Project (CAP) Water Treatment Plant, which is expanding to more than double its capacity to treat and deliver enough water to meet Scottsdale's current and future water demands. City planners and engineers are evaluating alternative routes along existing roadways for a 36-inch pipeline, as well as siting locations for a 4 million gallon reservoir. Dames &amp; Moore is responsible for sharing information about the siting process and seeking public input to help decide how the reservoir will blend with its chosen location.</li> </ul>	

7. **Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

Kristin Darr (Continued)

- Project coordinator and public involvement specialist representing El Paso Electric (EPE) for their East El Paso County Facility Location Study. Dames & Moore has been retained by EPE to assist with the siting of approximately 70 miles of 115kV transmission lines and as many as six distribution substations or switching stations in the easternmost portion of El Paso County. The new facilities will provide additional load-serving capability and system reliability to meet anticipated growth in demand. The study area is a combination of residential, commercial, agricultural, industrial, and open space, and is largely undeveloped. Dames & Moore is assisting EPE in siting these facilities and preparing an environmental report which EPE will use to develop their application to the Public Utility Commission of Texas of Electric Utility for a Certificate of Convenience and Necessity (CCN) for Proposed Transmission Lines and Associated Substations. Components of the study include land use and visual investigations, as well as inventories and assessment of impacts on biological and cultural resources. An important element contributing to the study will be input from the public, which for this study will consist largely of developers who have plans for the as of yet largely undeveloped area.
- Project coordinator and public involvement specialist working with the City of Phoenix and the Bureau of Reclamation to develop a recreation master plan for an area of open space in northern Phoenix known as Reach 11. The project also will be subject to NEPA. Ms. Darr is coordinating activities of the multidisciplinary team that includes landscape architects, park designers, environmental planners, biologists, and archaeologists. She also is designing and implementing a public involvement process that satisfies the requirements of NEPA while providing important input from stakeholders as to the final design. The surrounding area encompasses stakeholders with a wide variety of recreational interests including recreational use, soccer, and golf, as well as the watchful eye of natural preservationists.
- Public involvement specialist on behalf of Southern California Edison for environmental investigation and remediation activities at their Long Beach I former manufactured gas plant site. The State of California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), is the agency overseeing the activities associated with the site, where soils contaminated with polycyclic aromatic hydrocarbons, or PAHs, are present. Public involvement activities have been designed to focus on the area within a 1/4-mile radius of the site, particularly an apartment complex immediately adjacent to the site. Activities include development of a mailing list, submittal of a public participation plan for DTSC approval, fact sheets describing investigation results and plans for cleanup, and coordination and facilitation of a public hearing as well as small community meetings prior to fieldwork.
- Community Involvement coordinator for the Vulture Mill Site remedial investigation/feasibility. The site, just north of just north of Wickenburg, Arizona, formerly contained a gold-ore milling facility and stockpiled mine tailings. The site is being investigated by the Arizona Department of Environmental Quality (ADEQ) in response to health risk concerns raised by a former adjacent property owner who owned livestock that grazed in and on the area of the tailings deposits. Investigations have indicated that levels of contaminants exceeding established health-based guidance levels exist at the Site. Ms. Darr is responsible for conducting community interviews, developing a Community Involvement Plan, distributing information regarding the project to the community at key project milestones, and conducting public meetings. Discussions with the community have indicated a general tone of skepticism regarding the purpose and need for the project. The level of knowledge in the community about potential contamination at the Vulture Mill Site is low, although citizens have expressed some concern for contamination in groundwater and interest in seeing that any problems found are mitigated. Other issues of concern, as mentioned, include doubt as to the real need for the project and expenditure of taxpayer monies. Citizens have, however, consistently requested that they remain informed throughout the project.
- Public involvement specialist on behalf of General Electric's apparatus service shop in Anaheim, California where a routine inspection for renewal of a RCRA permit to store PCBs uncovered some PCB contaminated soils. The facility is one of the first to be accepted into California EPA's new Expedited Remedial Action Program (ERAP), which requires certain public participation efforts in support of the remedial action planning process. Ms. Darr is working closely with State representatives to interpret the new legislation and meet its requirements. In addition, she has conducted community interviews to identify issues and is developing a public participation plan for the site. Plan implementation will include further community outreach as well as official public notices and hearings.
- Project assistant and writer/editor for an EA prepared on behalf of IXC Carrier Group for a fiber optic line that will replace the static line on federal-owned transmission line structures from Las Vegas to Phoenix. Western Area Power Administration is the lead federal agency for preparation of the EA. Also involved were BOR and BLM. The project was precedent setting in light of new federal regulations surrounding the telecommunications industry, and called into question the public/private partnership encouraged by the federal government. Ms. Darr wrote and edited the EA, is assisting with permit applications for right-of-way grants, and is coordinating the biological and cultural field monitoring work.
- Public involvement consultant to the Florida Department of Transportation, responsible for developing a public information plan to support the opening of new HOV lanes in the metropolitan Miami area. HOV facilities are relatively new to commuters in the area and have not been particularly well received in the recent past. Ms. Darr developed the plan on an aggressive schedule, which required issues identification and assessment within a very short time frame. The plan, which focused largely on outreach with media, elected officials, and community leaders, was well received by the Department. Ms. Darr prepared the scope of work for local implementation of the plan as well.

**7. Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

Kristin Darr (Continued)

- Technical writer for the 1996 Arizona Governor's Air Quality Strategies Task Force. Worked closely with the 22-member task force and the Arizona Department of Environmental Quality to develop a final report that presented stakeholder recommendations for specific measures to improve air quality in the Phoenix metropolitan area. The area is in danger of being reclassified by the Environmental Protection Agency to "serious" for certain pollutants, which potentially carries grave ramifications for the state and Maricopa County. Stakeholders included oil companies, environmentalists, medical interests, and other business and social concerns.
- Writer, editor, and public involvement assistant for the Navajo Transmission Project EIS. The EIS addresses a proposed 500kV transmission line from northwestern New Mexico, across northern Arizona, and terminating in southern Nevada. The line would cross lands administered by the U.S. Forest Service; BLM; National Park Service; state and private lands; and Navajo, Hualapai, and Hopi Indian reservations. Public meetings have been held across the project area, including several on the Navajo Nation.
- Project coordinator and technical writer for the Topock Substation and Transmission Line Project environmental assessment, a proposed new transmission line corridor 10 miles north of Topock, Arizona, which would connect to the existing Davis-Parker No. 1 and 2 230 kilovolt (kV) transmission lines. The proposed transmission line(s) would extend westward from a point on the existing Davis-Parker Nos. 1 and 2 230kV transmission lines where a substation would be developed. The right-of-way (ROW) requested by the project proponent would accommodate transmission lines for one of two alternative transmission delivery systems. The project area is on the western edge of the Bureau of Land Management (BLM) Kingman Resource Area and adjacent to the developed lands in Fort Mohave Valley. The BLM is the lead federal agency for NEPA compliance, and Western Area Power Administration is a cooperating agency.
- Community relations specialist on behalf of Salt River Project, the plant manager for the Navajo Generating Station, in support of the Navajo Scrubber Project. Scrubbers are being installed to remove sulfur dioxide from the gases emitted through the plant's three stacks. The reagent being used for the process, limestone, must be transported from Nevada across northern Arizona and southern Utah. The trucks carrying the limestone will pass by or through several small communities, and the community relations effort under this contract focuses on providing information to local officials and citizens in these communities about the project and issues such as safety.
- Served as technical editor and document production coordinator for an Aquifer Protection Permit application that was submitted to the Arizona Department of Environmental Quality on behalf of the Phelps Dodge Corporation for its Morenci District mining operation.
- Technical editor for the Salt River Project RS 16 siting study and application for a Certificate of Environmental Compatibility. Project included a transmission line and receiving station in a heavily populated community in a suburban area east of Phoenix.
- Public involvement assistant for Project WATERS, a facility siting study (wastewater reclamation plant and aquifer recharge ponds) in Glendale, Arizona that placed a priority on public input. Assisted with planning a public meeting and writing a summary of the public involvement process.



**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:</p> <p>Liner Retrofit and Gravity Drain Design Reservoir Nos. 1 and 2 Sedona, Arizona</p>	<p>c. OWNER'S NAME AND ADDRESS:</p> <p>City of Sedona P.O. Box 30002 Sedona, AZ 86339 Attention: David Logan, P.E. Acting Public Works Director/City Engineer</p>	<p>d. COMPLETION DATE (Actual or Estimated)</p> <p>1997 (ongoing)</p>	<p>e. ESTIMATED COST (In Thousands)</p>	
			<p>Entire Project</p>	<p>Firm Responsibility</p>
			<p>\$900</p>	<p>\$90</p>

b. NATURE OF FIRM'S RESPONSIBILITY:

Dames & Moore was retained by the City of Sedona to develop detailed plans and specifications to support ADWR Division of Dam Safety permitting and construction of a retro-fitted liner system for two existing wastewater storage reservoirs at the City's wastewater treatment facility.

In 1996, the City of Sedona entered into a consent agreement with Arizona Department of Environmental Quality (ADEQ) that required the installation of impermeable liners in three recently-completed wastewater storage reservoirs. The existing reservoirs were of sufficient size to be within the jurisdiction of the Arizona Department of Water Resources (ADWR) and, therefore, the modifications require review and approval by ADWR prior to construction. Construction activities are, and will be, monitored by Dames & Moore engineers for compliance with the ADWR-approved construction plans and specifications.

Detailed designs, technical specifications, and bid documents are being prepared for two liner retrofit options: (1) HDPE geomembrane; and (2) geosynthetic clay liner (GCL). Completion of designs requires evaluation of liner system stability on embankment slopes, puncture resistance, optimal liner crest elevation to balance seepage control requirements with construction cost, and tie-in with existing and proposed reservoir drain/fill facilities. In addition, several spillway modifications are required to ensure that the liner system is not compromised in a reservoir-to-reservoir spill event.

1. In addition to the liner retrofits, Dames & Moore has also designed two gravity drains to allow transfer of water between reservoirs. Installation of the drains requires trenching through existing, permitted embankments, installation of drain lines and controls, and reconstruction of the embankments. Dames & Moore has completed permitting of the first gravity drain, which is under construction, is currently providing construction management services for the gravity drain and lining of a third reservoir, and will provide construction management for the remaining facilities later in 1997.

The gravity drain design task involved comparison of pipe-jacked and trenched solutions for installation of a new gravity drain pipe without compromising the integrity and safety of the existing zoned earthfill embankment. Following selection of a trenched solution, detailed designs were prepared which allowed for compliance with ADWR requirements for conduit installation, including concrete encasement, seepage filters, and excavation of the trench in a manner that allows adequate segregation of fill types, and replacement and compaction of the zoned earthfill.



**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

a. PROJECT NAME AND LOCATION:	c. OWNER'S NAME AND ADDRESS:	d. COMPLETION DATE (Actual or Estimated)	e. ESTIMATED COST (In Thousands)	
			Entire Project	Firm Responsibility
Leachate and Surface Water Management System Near Kingman, Arizona	Cyprus Mineral Park Corporation Rana P. Medhi (Retired) 1002 E. Shadow Ridge Drive Casa Grande, AZ 85222 (520) 929-4482	1994	\$3,000	\$250

**b. NATURE OF FIRM'S RESPONSIBILITY:**

Dames & Moore provided conceptual design, final design, permitting, and construction oversight management services for a leachate and surface water system at an operating copper mine in Arizona. The Arizona Consulting Engineers Association awarded the project a 1995 first-place Technical Excellence Award.

The overall design had to be compatible with the regulatory requirements for an eventual Aquifer Protection Permit (APP) application. Therefore, the Best Available Demonstrated Control Technology (BADCT) guidelines were the basis for the design, including the 100-year, 24-hour storm event, lined ditches and stormwater, impoundments, and a double-lined process pond.

The leachate management system consists of a series of lined ditches, lined leachate collection ponds at the toe of leach dumps, seepage intercept structures, and extraction well fields. The surface water management system consists of a series of diversion channels around the mine to limit the amount of runoff, a lined flood basin with a seepage intercept structure and underdrain, and general site grading. The aspects of each management system are tied into one overall system to provide a cost-effective immediate solution compatible with eventual closure of the facility.

A sophisticated hydrologic model, including pumpbacks, was developed for the drainage basin to demonstrate that a major heap leach would lag peak flows sufficiently that pumps could be used to dramatically reduce the size of the required stormwater basin. As a part of the design, a field investigation was performed consisting of a test pit program, drilling program, geophysical survey, and a conductivity survey. The hydrologic modeling included HEC-1, HEC-2, and DAMBRK computer models.

Early and regular reviews with the Arizona Department of Environmental Quality (ADEQ) and the Arizona Department of Water Resources (ADWR) ensured proper project focus and expedited the permitting process.

**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:</p> <p>Lower Chase Creek Flood Control Dam Morenci, Arizona</p>	<p>c. OWNER'S NAME AND ADDRESS:</p> <p>Phelps Dodge Corporation Rick Mohr 4521 US HWY 191 Morenci, AZ 85540 (520) 865-4521</p>	<p>d. COMPLETION DATE (Actual or Estimated)</p> <p>1988</p>	<p>e. ESTIMATED COST (In Thousands)</p>	
			<p>Entire Project</p>	<p>Firm Responsibility</p>
			<p>\$2,500</p>	<p>\$500</p>

b. NATURE OF FIRM'S RESPONSIBILITY:

Lower Chase Creek Dam is the seventh roller compacted concrete (RCC) dam greater than 50 feet high in the United States and the first major RCC structure in Arizona. It is a flood control and environmental protection dam built as part of a solvent extraction/ electrowinning (SX/EW) facility and drainage control project in Chase Creek in a copper mining region. The creek is generally dry and drains a watershed containing active and inactive open pit mines and waste dumps.

Dames & Moore developed conceptual designs in 1985 for the dam to provide cost estimates for earthfill, rockfill, concrete and RCC alternatives. Because of spillway space and reservoir constraints, a RCC dam was selected. Dames & Moore completed the design, coordinated permitting and provided construction management services. The design, including site investigation and start-up of permitting, was completed from September to December 1986. Permit and bid activities occurred in January and February 1987. Construction was completed by June 1987. The entire design through construction process was completed in nine months.

The dam is 64 feet high and provides 330 acre feet of storage including 100-year, 24-hour storm runoff. It is on an 8,000 cubic yard RCC foundation mat, contains 18,000 cubic yards of RCC, and consists of a 400-foot long crest, vertical upstream face, 0.7 horizontal to 1 vertical downstream face, and 200-foot wide and 5-foot high stepped spillway. A unique feature of the dam is the foundation mat that enables the dam to be firmly seated on conglomerate that underlies the creek alluvium and provides a seepage cut off. A geotechnical challenge during construction was distinguishing between the alluvium and the underlying non-cemented conglomerate.

The SX/EW facility and drainage control project was selected by the Arizona Society of Professional Engineers for the Outstanding Project of the Year Award for 1987. Dames & Moore was named as a major participant. Dames & Moore was awarded a Technical Excellence Prize in Civil Engineering for the dam by the Arizona Consulting Engineers Association and achieved national finalist status in the Engineering Excellence Awards competition of the American Consulting Engineer's Council.

**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:</p> <p>EIS and EAP for Red Butte Dam and Reservoir Salt Lake City, Utah</p>	<p>c. OWNER'S NAME AND ADDRESS:</p> <p>US Army Corps of Engineers Sacramento District Mark Cowan 1325 J. Street Sacramento, CA 95814-2922 (916) 557-6721</p>	<p>d. COMPLETION DATE (Actual or Estimated)</p> <p>1995</p>	<p>e. ESTIMATED COST (In Thousands)</p> <table border="1"> <tr> <td data-bbox="1390 272 1675 380">Entire Project</td> <td data-bbox="1675 272 1986 380">Firm Responsibility</td> </tr> <tr> <td data-bbox="1390 380 1675 461">\$217</td> <td data-bbox="1675 380 1986 461">\$217</td> </tr> </table>		Entire Project	Firm Responsibility	\$217	\$217
Entire Project	Firm Responsibility							
\$217	\$217							

b. NATURE OF FIRM'S RESPONSIBILITY:

Dames & Moore prepared an Emergency Action Plan (EAP) for Red Butte Dam and Reservoir, and prepared an environmental impact statement (EIS) for the transfer of the dam and reservoir from Federal ownership.

Relevant scope of work for preparation of the EAP included: development of dam break inundation maps using HEC-1 and NWS DAMBRK software.

Relevant scope of work for preparation of the EIS included:

- Discharge frequency analysis, as part of an evaluation of the potential water supply capability of the reservoir.
- Hydraulic design, and cost estimation, of alternative dam scenarios (dam removal, dam breach, partial dam breach, and dam renovation), to include conceptual design of spillways and outlet works for each scenario.
- Development of 10-year through 500-year and PMP rainfall depths;
- Estimation of 10-year through 500-year runoff. This task was unusually complex because of the large dichotomy between flood levels predicted using the fitting of USGS gage data to an extreme probability distribution (Log Pearson Type III), using regional USGS empirical flood frequency relations, and using extreme rainfall-derived floods (HEC-1).
- Performance of a basin sedimentation study in accordance with the USACOE manual "Sedimentation Investigations in Rivers and Reservoirs" (EM 1110-2-4000), to include:
  - Calculation of watershed sediment yield using direct measurements from a USGS water quality gage;
  - Calibration of USLE estimates using the above gage and measurements of sedimentation in Red Butte Reservoir, extrapolation to include estimates of sediment increase from watershed changes to include brush fires;
  - Performance of a field reconnaissance, to include sediment sampling and testing;
  - Estimates of gully and streambank erosion using geomorphic principles; and
  - Use of HEC-6 to estimate locations and extent of erosion and deposition for specific storms and specific EIS scenarios.
- Development of water surface profiles for floods ranging from the 10-year to 500-year flood. The creek watershed studied extended from a steep mountain valley out across an alluvial fan, terminating in a low capacity desert channel. Modeling required the following:

- Use of FLOW2D (a two-dimensional finite element surface water model) to estimate water surface profiles of the flows split off from the channel and flowing radially outwards on the alluvial fan.
- Use of HEC-2 to estimate water surface profiles within the creek channel and to split flows at locations where structures (culverts, bridges) restricted channel capacity and diverted flows out of the watershed;
- Use of FLOW2D (a two-dimensional finite element surface water model) to estimate water surface profiles of the flows split off from the channel and flowing radially outwards on the alluvial fan.

The above profiles were developed for scenarios involving dam removal, dam breach, partial dam breach, and dam renovation.

- To assist in assessing the feasibility of alternatives, an evaluation of the embankment stability was performed. The scope of work included the following:
  - Drilling and sampling of seven borings within the embankment and installation of 10 piezometers;
  - Performing an embankment shear wave survey to determine and delineate the distribution of shear wave velocities in the embankment;
  - Researching existing geologic maps and performing site reconnaissance to assess geologic hazards;
  - Identifying potential seismic sources and magnitudes. Performing probabilistic hazard analyses and deterministic analyses to assess the Operating Basis Earthquake (OBE) and the Maximum Credible Earthquake (MCE);
  - Completing extensive laboratory tests to characterize embankment and foundation soils;
  - Performing static and pseudo-static stability analyses to evaluate embankment stability. Seepage analysis were also performed;
  - Completing deformation analyses to assess the magnitude of potential deformation due to strong earth ground motion; and
  - Assessing options for stability upgrade, breach, or removal.

**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES  
CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:  Freeman Diversion Dam Saticoy, California</p>	<p>c. OWNER'S NAME AND ADDRESS:  United Water Conservation District P.O. Box 432 Santa Paula, CA 93061</p>	<p>d. COMPLETION DATE (Actual or Estimated)  1990</p>	<p>e. ESTIMATED COST (In Thousands)</p>	
			<p>Entire Project</p>	<p>Firm Responsibility</p>
			<p>\$1,094</p>	<p>\$934</p>

b. NATURE OF FIRM'S RESPONSIBILITY:

Dames & Moore provided preliminary and final design services and construction management services for a diversion dam and canal on the Santa Clara River. The 50-foot high, 1200-foot-long dam, and 3500-foot-long diversion canal diverts water to a groundwater recharge basin.

Hydrologic and hydraulic analyses were conducted to estimate the sedimentation and erosion potential of the Santa Clara River during storms of different recurrence intervals under existing conditions and after construction using the HEC-6 model of the U.S. Army Corps of Engineers and supplemental hand calculations. Hydraulic modeling tests were conducted to verify the results and develop suitable designs of appurtenances of the dam, headworks for the canal, and sluicing arrangements for sediment.

The preliminary design included evaluating three alternative sites for the diversion and several structural alternatives. Roller compacted concrete (RCC), concrete diaphragm walls and conventional concrete were considered. Dames & Moore conducted all phases of the preliminary design including geotechnical investigations, geology, hydrology, groundwater studies, hydraulic design, structural design and construction cost estimating. Hydraulic designs were prepared for the erosion protection system, a relatively silt-free canal system, and a settling basin for sediment entrapment before the release of water for a groundwater recharge spreading basin.

The final design, and preparation of plans, specifications, cost estimates, and bid and contract documents were conducted in two phases. The final design included a RCC gravity dam, a concrete lined diversion canal, sediment flushing facilities, a fish ladder, a fish screen and fish bypass system, and a sedimentation basin. The design criteria were developed by Dames & Moore and approved by the Bureau of Reclamation, U.S. Army Corps of Engineers, and state and federal resource agencies.

Dames & Moore prepared bid documents and assisted with the bid and contractor selection process for Phase I and Phase II construction. Dames & Moore provided full-time construction management and resident engineering services throughout construction of the canal in 1988 and the dam in 1990.

**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:</p> <p>Rowena Reservoir Design Study Los Angeles, California</p>	<p>c. OWNER'S NAME AND ADDRESS:</p> <p>Los Angeles Department of Water and Power 111 N. Hope Street Los Angeles, CA 90051</p>	<p>d. COMPLETION DATE (Actual or Estimated)</p> <p>1993</p>	<p>e. ESTIMATED COST (In Thousands)</p>	
			<p>Entire Project</p>	<p>Firm Responsibility</p>
			<p>\$250</p>	<p>\$250</p>

b. NATURE OF FIRM'S RESPONSIBILITY:

Dames & Moore provided engineering, landscape architecture, urban design, and community involvement services for the redesign of Rowena Reservoir, a 10-acre site containing 10 million gallons of potable water storage. Dames & Moore engineers and landscape architects designed alternative concepts for the water storage facility. Site grading concepts and preliminary cost estimates were also developed.

Aesthetic design issues included landscape treatment and restoration, site visibility analysis, location and design of an amenity water feature, perimeter pedestrian circulation, and overall compatibility with the historic neighborhood context. Dames & Moore designers conducted an all-day brainstorming/charette workshop and series of interactive meetings attended by community residents and LADWP staff. High resolution visual simulations were prepared to facilitate better understanding of conceptual design alternatives and consensus about a preferred design concept. The final concept included a buried potable water tank with a double-lined aesthetic pond on the top, connected by a waterfall to an adjacent lower aesthetic pond.

**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES  
CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:  Iona Wash Flood Insurance Study Maricopa County, Arizona</p>	<p>c. OWNER'S NAME AND ADDRESS:  Flood Control District of Maricopa County 2801 W. Durango Phoenix, AZ 85009 PM: Sandy Story 602-506-1501</p>	<p>d. COMPLETION DATE (Actual or Estimated)  October 1994</p>	<p>e. ESTIMATED COST (In Thousands)</p>	
			<p>Entire Project</p>	<p>Firm Responsibility</p>
			<p>129</p>	<p>129 (IE)</p>

b. NATURE OF FIRM'S RESPONSIBILITY:

FEMA floodplain and floodway delineation study on an alluvial watercourse in western Maricopa County, Arizona. Iona Wash includes distributary and confined channel reaches, as well as significant sheet flooding, breakout, and ponding areas. Mr. Fuller was responsible for HEC-2 modeling, preparation of the Technical Documentation Notebook and FIS Report, public and agency coordination, and floodplain/floodway maps.



**8. WORK BY FIRMS OR JOINT-VENTURE MEMBERS WHICH BEST ILLUSTRATES CURRENT QUALIFICATIONS RELEVANT TO THIS PROJECT**

(LIST NOT MORE THAN 10 PROJECTS)

<p>a. PROJECT NAME AND LOCATION:</p> <p>Desert Greenbelt Stormwater Management Project Scottsdale, Arizona</p>	<p>c. OWNER'S NAME AND ADDRESS:</p> <p>City of Scottsdale Transportation Department 7447 E. Indian School Road #205 Scottsdale, AZ 85251</p>	<p>d. COMPLETION DATE (Actual or Estimated)</p> <p>Ongoing</p>	<p>e. ESTIMATED COST (In Thousands)</p> <table border="1"> <thead> <tr> <th data-bbox="1421 277 1704 348">Entire Project</th> <th data-bbox="1704 277 2006 348">Firm Responsibility</th> </tr> </thead> <tbody> <tr> <td data-bbox="1421 348 1704 442">\$58,000</td> <td data-bbox="1704 348 2006 442">\$215</td> </tr> </tbody> </table>		Entire Project	Firm Responsibility	\$58,000	\$215
Entire Project	Firm Responsibility							
\$58,000	\$215							

b. NATURE OF FIRM'S RESPONSIBILITY:

The City of Scottsdale retained Dames & Moore to conduct an extensive public involvement program and environmental studies for the design of a \$58 million dollar regional flood control project. The project will consist of a series of drainage-control channels with multi-use recreational opportunities, such as horse trails and bicycle paths. Dames & Moore developed a dynamic, yet flexible approach based on each phase of concept development.

The project is highly visible and of concern to a multitude of stakeholders—all with different information needs and agendas. For example, we have worked closely with one group of residents and property owners located adjacent to one of the channel corridors. These people are concerned that part of their lot will now be used for drainage control, and that the channel will include public access through the area. Dames & Moore has conducted small-group workshops to provide residents the opportunity to review and provide input into the preliminary design plans prior to the plans "going public." This approach has been successful. The project team is able to mitigate potential impacts to residents and the residents feel more confident that the City is making a sincere attempt to address their concerns.

Other stakeholders include elected and appointed officials, city, county, state, and environmental regulatory agencies, City of Scottsdale employees, bike and horse trails user groups, area realtors, environmental groups, homebuilders, developers, and the media. Dames & Moore's challenge has been to identify the information and participation needs of each stakeholder and to design communication and outreach packages to meet those needs.

Public outreach and participation techniques have included community interviews; newsletters and fact sheets mailed to a study area of more than 6,000 residents and property owners; small-group workshops with those residents most directly impacted by a channel's design and location; press releases, newspaper feature articles, public service announcements on a local cable television station; public open houses; consensus building exercises and intensive working sessions; intra-agency coordination and meeting facilitation; the facilitation of citizen's sounding boards; and the development of videos, photo simulations, and presentation boards.

Dames & Moore also conducted the environmental studies which include analysis of potential impacts to mitigation measures for cultural, biological, and visual resources.

9. All Work by Firm or Joint Venture Members Currently being Performed Directly for Federal Agencies. \* Maricopa County

a. Project Name and Location	b. Nature of Firm's Responsibility	c. Agency (Responsible Office) Name and Address and Project Manager's Name and Phone Number	Percent Complete	d. Estimated Cost (in thousands)	
				Entire Project	Work for Which Firm Was/Is Responsible
Asbestos Survey Maryvale, Arizona	Asbestos Surveys for 26 Residential Homes	Maricopa County Flood Control District 2801 W. Durango St. Phoenix, AZ 85009 Michelle Gonzales (602) 506-1501	5	\$18	\$13
Cultural Resources Study Mesa, Arizona	Data Recovery for Street Intersection Improvement	Maricopa County Department of Transportation 2801 W. Durango St. Phoenix, AZ 85009 Brian Kenny (602) 506-1501	44	\$58	\$29
Archaeological Data Recovery Phoenix, Arizona	Data Recovery for Maricopa City Transportation Facility	Maricopa County Department of Transportation 2801 W. Durango St. Phoenix, AZ 85009 Brian Kenny (602) 506-1501	71	\$46	\$31

**USE THIS PAGE TO PROVIDE ANY ADDITIONAL INFORMATION OR DESCRIPTION OF  
RESOURCES SUPPORTING YOUR FIRM'S QUALIFICATIONS FOR THE PROPOSED PROJECT**

❖ **INTRODUCTION**

Dames and Moore is pleased to submit this Standard Form 255 qualification document to the Flood Control District Maricopa County (FCDMC) with the Letter of Interest (LOI) Request Notice for Contract No. FCD 98-11, White Tanks FRS #3 Modifications. In this Block 10 we demonstrate that the Dames & Moore team is strongly qualified to meet and exceed FCDMC's expectations for this project.

We are presenting a project team with specialized experience performing similar projects. Our team has extensive engineering and public involvement experience that will allow for successful completion of the primary tasks outlined by FCDMC for this project. Dames & Moore has provided geotechnical, civil, and structural engineering; hydrology and hydraulic analysis; public involvement support; geologic analysis; cost estimating; and project management support to over 25,000 public and private clients.

The following sections of this Block 10 will detail Dames & Moore's experience and qualifications, and our ability to complete this project to the full satisfaction of the FCDMC.

❖ **RESPONSE TO EVALUATION CRITERIA**

This section demonstrates Dames and Moore's ability to meet the following Engineering Consultant evaluation criteria:

- Capacity of the firm to accomplish the work
- Professional qualifications necessary for satisfactory performance of required services
- Previous experience on similar projects
- Location of offices where work will be performed
- MBE/WBE project requirements
- Current and active contracts with Maricopa County

❖ **CAPACITY OF THE FIRM TO ACCOMPLISH THE WORK**

Dames & Moore is a multi-disciplinary consulting firm providing quality planning, engineering, and environmental services since 1938. The company's reputation is built on a long-standing policy of providing technically sound and cost effective professional services to meet the individual needs of each project. Dames & Moore's Phoenix office was established in 1972 and employs approximately 135 personnel with over 3,400 personnel worldwide. Within Maricopa County, D&M Group companies have over 200 staff.

We are absolutely committed to client satisfaction and recognize that this consists of strong project management, effective communication, excellent deliverables on time and within budget, and good follow-up consultation. All project work will be performed under the direct supervision of a professional engineer registered in Arizona and experienced in dam safety and related civil engineering technology. Each member of the Dames & Moore team assembled for this project is readily available for commitment to this project. In addition to the team presented, there is a wide array of personnel in our Phoenix office that can be drawn upon to assist on this project.

❖ **PROFESSIONAL QUALIFICATIONS NECESSARY FOR SATISFACTORY PERFORMANCE OF THE REQUIRED SERVICES**

Dames & Moore's project team work together on a regular basis on similar projects and are highly qualified professionals capable of exceeding FCDMC's expectations. Dames & Moore has a strong history of providing engineering and environmental services in support of flood control and surface water storage projects in Arizona; in the early 1980s, the firm's Earth Structures Design Group was started in Phoenix.

The team is fully qualified to provide the engineering services listed in the LOI request. Our staff experience includes dam design and rehabilitation, investigations, site surveys, field inspections, preparation and submittal of engineering studies and design reports, 401 and 404 permitting, Arizona Department of Water Resources (ADWR) dam safety permitting, design analysis, reports, cost estimates, final designs and specifications, mapping, and public involvement support, as well as many other services which may be required to successfully complete this contract.

**10. USE THIS PAGE TO PROVIDE ANY ADDITIONAL INFORMATION OR DESCRIPTION OF RESOURCES SUPPORTING YOUR FIRM'S QUALIFICATIONS FOR THE PROPOSED PROJECT (Continued)**

The following section, Project Organization, describes how we have structured our project team to maximize its effectiveness in the performance of this contract.

**Project Organization**

Our project team members and inter-relationship of management and various team components are presented in our proposed organization chart in Figure 10-1. We have structured our organization to assure clear and direct lines of communication and accountability to FCDMC and to provide a highly qualified project manager and technical expertise to accomplish the work in a professional and timely manner. The relevant experience, special training, certifications, and level of education of the proposed key staff members are presented in Block 7.

The following is a list of Dames & Moore's project team members and a description of the role of each:

- Project Manager
- Principal-in-Charge
- Senior Technical Support
- Technical Staff

**Project Manager** - Dames & Moore's Project Manager, Alexander Gourlay, P.E., will be responsible for a professional relationship between Dames & Moore and FCDMC. He will report to the FCDMC project manager and **has full contract authority, as well as ultimate responsibility, for the technical excellence, Quality Assurance/Quality Control, timeliness, and cost of all project tasks.** He has extensive knowledge and authority to resolve issues which may arise during the project duration, give technical guidance in problem solving, monitor project performance, and direct all members of the team. Mr. Gourlay is a registered civil engineer in Arizona and has over 14 years of experience. He has performed as the project manager or lead engineer for numerous projects involving dam design, rehabilitation, construction, and permitting.

**Principal-in-Charge** - Mr. Gary Rogers, the Principal-in-Charge for this project, will be responsible for your complete satisfaction. **If at any time you are not 100% satisfied with the Dames & Moore team's performance on this project, contact Mr. Rogers, and he will implement any change necessary to assure your complete satisfaction.** In addition, Mr. Rogers' extensive experience in dam design and construction will provide valuable support to our project manager.

**Senior Technical Support** - Dr. Anand Prakash is a senior water resources engineer with Dames & Moore, with over 15 years experience in engineering analysis of flood control, drainage, irrigation, groundwater recharge, hydropower, mining, fossil and nuclear power plants, and community development projects. He has worked on several projects in Arizona related to hydrologic and hydraulic design of flood detention structures, dam safety analysis, and flood studies. He has a strong working relationship with key ADWR staff and has been hired by ADWR to consult directly on important hydrologic and hydraulic design issues. He was national Chairman of the ASCE Surface Water Hydrology Committee from 1993 to 1994 and from 1996 to 1997. He is currently Chairman of the ASCE Committee to draft the Runoff, Streamflow, and Reservoir Routing chapter for the ASCE Hydrology Handbook.

**Technical Staff** - The project team assembled in this LOI represents a group of individuals that has broad experience on similar projects. The members of this team can provide the full range of services required to successfully complete this project involving geotechnical/geologic engineering, hydraulic analysis, civil and structural design, permitting, and public involvement activities.

*Barbara Murphy* has a diverse background in research and practical application in geology and soils engineering. She has over 20 years of experience working with government agencies, which include: Bureau of Land Management, Natural Resource Conservation Service (NRCS), Army Corps of Engineers, Forest Service, and U.S. Geological Survey. She assisted in the preparation of the geology, soils, land subsidence/earth fissures, faults/seismicity, and minerals/mining sites portions of the Environmental Element Report for Maricopa County's 2020 Eye to the Future. She has also completed numerous environmental studies in southern Arizona which included the evaluation of land subsidence and earth fissures. Ms. Murphy's work on environmental projects has included involvement in the 401/404 permit process.

*Jeff Irvin* and *Todd Ringsmuth* have combined talents on numerous projects involving dam/spillway design, dam break analysis, and flood mapping. They have developed the hydraulic design for ADWR regulated dams throughout Arizona and dams in New Mexico and Utah. Their expertise includes hydraulic modeling, sedimentation analysis, runoff and snowmelt modeling, and design of surface water control structures. They have worked on several projects involving cooperating agencies, including the Bureau of Land Management and U.S. Army Corps of Engineers.

10. USE THIS PAGE TO PROVIDE ANY ADDITIONAL INFORMATION OR DESCRIPTION OF RESOURCES SUPPORTING YOUR FIRM'S QUALIFICATIONS FOR THE PROPOSED PROJECT (Continued)

*Jon Fuller, P.E.* and *Brian Iserman* are the Principal and hydrologist, respectively, of JE Fuller/Hydrology and Geomorphology, Inc. They bring to the project team additional expertise in the areas of hydrology, hydraulics, applied geomorphology, and flood warning. Messers. Fuller and Iserman bring to the team several years of experience and successfully completed projects and will generate a product that will meet or exceed the District's expectations. Both individuals have been previously employed by Pima County, and have served as consultants to the District.

The combined experience of *Ravi Murthy* and *John Nealon* in the areas of geotechnical and geologic engineering will provide excellent support for design of the dam. This team combines geotechnical experience on dam stability and design projects with a familiarity of issues relevant to Arizona and Maricopa County.

*Jim Kelly* and *Eric Schroth* have extensive experience in related civil and structural design projects. Mr. Kelly has worked on a variety of large structural design projects throughout the United States. Mr. Schroth has a broad background in civil design projects, and most recently completed a reservoir upgrade for the City of Sedona in support of the ADWR Division of Dam Safety.

*Kevin Somerville* develops construction cost estimates and technical specifications, as well as provides construction scheduling and oversight for a range of large projects throughout Arizona. He has been involved in numerous earthen and concrete dam, and surface water control structures, design projects.

*Scott Woods* has seven years of professional geographic information systems (GIS) with several private and local government agencies. He has conducted GIS project management, database management, computer mapping, and resource analysis on various interdisciplinary planning and environmental projects. He was involved in coordinating GIS aspects of the Environmental Element Report for Maricopa County's 2020 Eye to the Future.

*Kristin Darr* has successfully worked as a Public Involvement Specialist for Arizona local and state governments, and private companies. She has been involved in a wide range of environmental assessments (EAs) and environmental impact statements (EISs). She is currently managing the public involvement program for the City of Scottsdale's Desert Greenbelt project, which involves public communication regarding a series of washes and basins designed by Scottsdale and FCDMC.

❖ PREVIOUS EXPERIENCE ON SIMILAR PROJECTS

The project team has significant experience providing the services outlined as the Primary Tasks in the Request Notice. Dames & Moore's record of producing quality dam design is built upon a commitment to achieving excellence and surpassing client expectations wherever possible. A selection of projects performed by the Dames & Moore team that are comparable to the work described for this project are presented in Block 8.

These project descriptions represent the experience of Dames & Moore on projects directly related to dam design, permitting, and public involvement. Our capability to complete similar projects on time and within budget is well represented by these projects. As will become evident in your review of our personnel and project experience presented in Blocks 7 and 8, Dames & Moore has shown the capability to meet the requirements needed to successfully complete this project. The components of a successful dam design project are listed below and found in the projects in Block 8.

- Geologic and regional subsidence analysis
- Hydraulic, civil, and structural engineering analysis and design
- Engineering analysis for design of dams and related hydraulic structures
- Understanding and application of ADWR dam permitting requirements
- Dam breach and flood inundation mapping
- Development of final plans and construction specifications
- Preparation of detailed cost estimates, including construction and maintenance costs
- Minimizing impacts to the environment and aesthetics
- Providing support for public involvement activities
- Experience working with cooperating agencies, including BLM, NRCS, Army Corps of Engineers, U.S. Geological Survey

**10. USE THIS PAGE TO PROVIDE ANY ADDITIONAL INFORMATION OR DESCRIPTION OF RESOURCES SUPPORTING YOUR FIRM'S QUALIFICATIONS FOR THE PROPOSED PROJECT (Continued)**

❖ **LOCATION OF OFFICES WHERE WORK WILL BE PERFORMED**

Dames & Moore is capable and dedicated to performing the required work outlined in the LOI entirely within our Phoenix, Arizona office.

❖ **MBE/WBE PROJECT REQUIREMENTS**

Dames & Moore will use ATL, Inc. (a Minority/woman-owned Business Enterprise) to perform drilling for the geotechnical investigation, which we anticipate will account for more than 5 percent of the total contract. This will be accomplished through the involvement of subcontractors to be hired for selected project tasks. At this early stage in the process, we have not identified specific subcontractors, but will do so during the final proposal stage. The MBE/WBE Assurances Affidavit is included at the end of the Block 10.

❖ **CURRENT AND ACTIVE CONTRACTS WITH MARICOPA COUNTY**

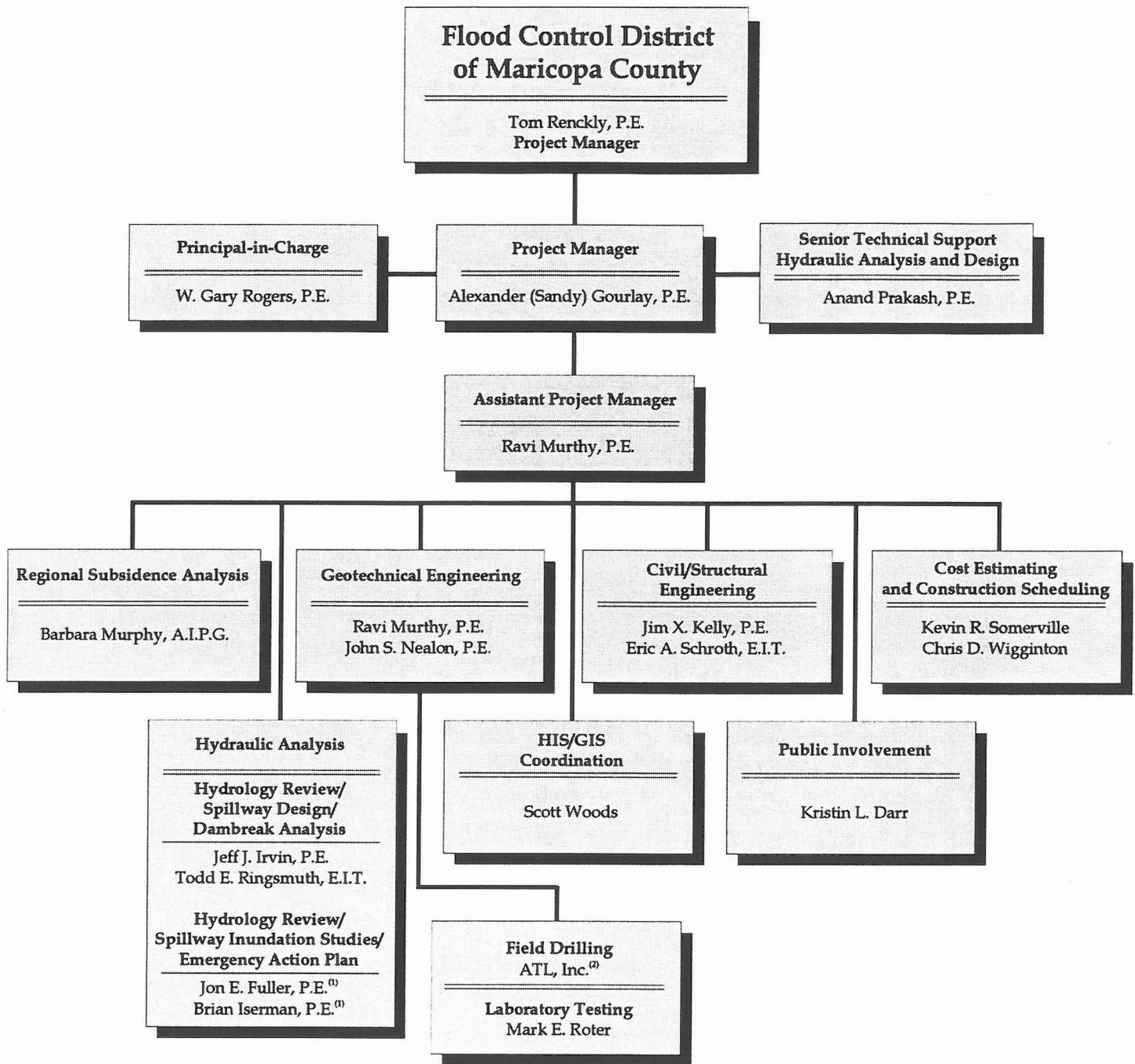
Dames & Moore is currently involved in three contracts, excluding on-call type contracts, with Maricopa County Departments/ Districts/Agencies with a cumulative contract total of \$41,381. The on-call consulting contract is for cultural resource studies for Maricopa County Department of Transportation and has a contract total of \$96,569. The following table lists the current and active contracts held by Dames & Moore.

Current and Active Dames & Moore Contracts with Maricopa County Departments/Districts/Agencies			
Start Date	Client Name	Service	Estimated Remaining Contract Amount (\$)
2/98	Maricopa County Flood Control District	Asbestos Survey 26 Residential Homes	\$5,000
4/97	Maricopa County Department of Transportation	Cultural Resources Study Street Intersection Improvement	\$14,276
4/97	Maricopa County Department of Transportation	Archaeological Data Recovery Maricopa City Transportation Facility	\$22,106
Estimated Remaining Contract Total (excluding on-call contracts)			\$41,381
12/96	Maricopa County Department of Transportation	On-Call Consulting- Cultural Resources Studies Maricopa County Transportation Facility	\$96,569

11. The foregoing is a statement of facts.

Signature: Alexander W. Gourlay  
Date: June 10, 1998

Typed Name and Title: Alexander W. Gourlay, Vice-President



Notes:

<sup>(1)</sup> J.E. Fuller / Hydrology & Geomorphology, Inc.

<sup>(2)</sup> Certified Maricopa County MBE/DBE

**PROJECT TEAM**

*White Tanks FRS #3 Modification  
for Flood Control District of Maricopa County*

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
MINORITY/WOMEN OWNED BUSINESS ENTERPRISE PROGRAM**

**PROPOSED MBE/WBE PARTICIPATION AFFIDAVIT\***

(NOTE: FAILURE TO COMPLETE AND SUBMIT THE AFFIDAVIT WITH THE TECHNICAL PROPOSAL SUBMITTAL MAY BE CAUSE FOR REJECTION OF THE TECHNICAL PROPOSAL)

Dames & Moore  
Name of Prime Consultant

Alexander (Sandy) Gourlay

Contact Person

7500 North Dreamy Draw Drive, #145

Street No.

Phoenix, AZ 85020

City State Zip

Project/Contract Number FCD 98-11  
Contract M/WBE Goal: 5%

Contract Amount Not Determined

The prime consultant must specify the MBE/WBE participation on this affidavit, or be able to provide documentation of their good faith efforts

<u>Minority/Women Owned Firm</u>	<u>Principal</u>	<u>Address</u>	<u>Type of Work</u>	<u>Proposed Contract Percentage</u>
<u>ATL, Inc.</u>	<u>David P. Hayes</u>	<u>2912 W. Clarendon Phoenix, AZ 85017</u>	<u>Drilling</u>	<u>5%</u>

TOTALS (Dollars/Percentage) 5% (Dollar amount not determined)

The undersigned has entered into a formal agreement with the MBE/WBE subconsultants/subcontractors/suppliers listed above, in the execution of this contract with Maricopa County.

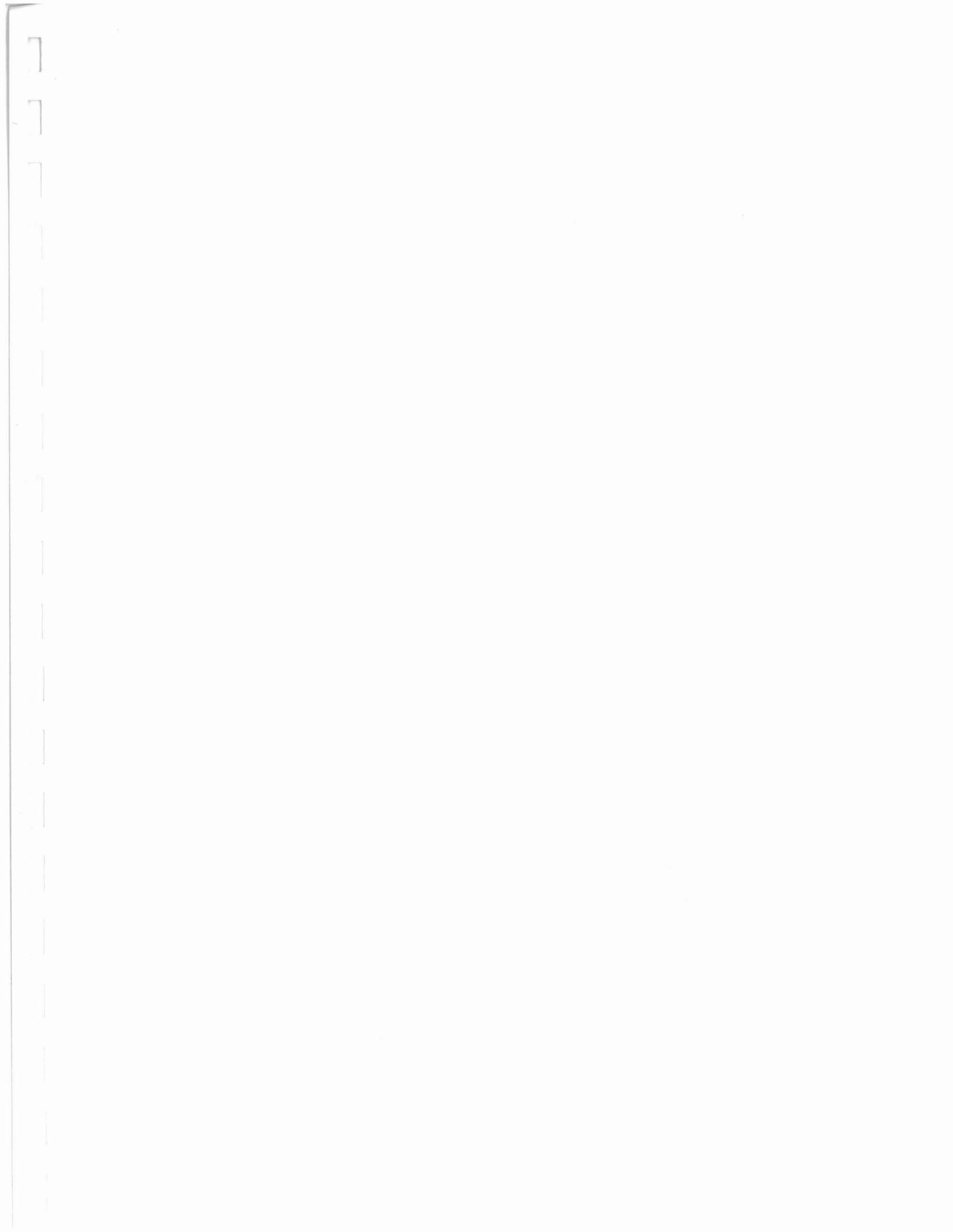
Alexander M. Gourlay  
Signature  
Vice President  
Title  
June 10, 1998  
Date

STATE OF ARIZONA )  
County of Maricopa )

Subscribed and sworn to before me this 10th day of June by Shirley Livingston

My commission Expires: May 23, 2000





**APPENDIX B**  
**PROPOSED MBE/WBE PARTICIPATION AFFIDAVIT**



**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
MINORITY/WOMEN OWNED BUSINESS ENTERPRISE PROGRAM**

**PROPOSED MBE/WBE PARTICIPATION AFFIDAVIT\***

(NOTE: FAILURE TO COMPLETE AND SUBMIT THE AFFIDAVIT WITH THE TECHNICAL PROPOSAL  
SUBMITTAL MAY BE CAUSE FOR REJECTION OF THE TECHNICAL PROPOSAL)

Dames & Moore

**Name of Prime Consultant**

Alexander (Sandy) Gourlay

**Contact Person**

7500 North Dreamy Draw Drive, #145

**Street No.**

Phoenix, AZ 85020

**City State Zip**

**Project/Contract Number** FCD 98-11

**Contract Amount** Not Determined

**Contract M/WBE Goal:** 5%

The prime consultant must specify the MBE/WBE participation on this affidavit, or be able to provide documentation of their good faith efforts

<u>Minority/Women Owned Firm</u>	<u>Principal</u>	<u>Address</u>	<u>Type of Work</u>	<u>Proposed Contract Percentage</u>
<u>ATI, Inc.</u>	<u>David P. Hayes</u>	<u>2912 W. Clarendon Phoenix, AZ 85017</u>	<u>Drilling</u>	<u>5%</u>

**TOTALS (Dollars/Percentage)** 5% (Dollar amount not determined)

The undersigned has entered into a formal agreement with the MBE/WBE subconsultants/subcontractors /suppliers listed above, in the execution of this contract with Maricopa County.

Alexander W. Gourlay  
Signature  
Vice President  
Title  
June 10, 1998  
Date

STATE OF ARIZONA )

County of Maricopa )

Subscribed and sworn to before me this 10th day of June by David P. Hayes

My commission Expires: May 23, 2000

