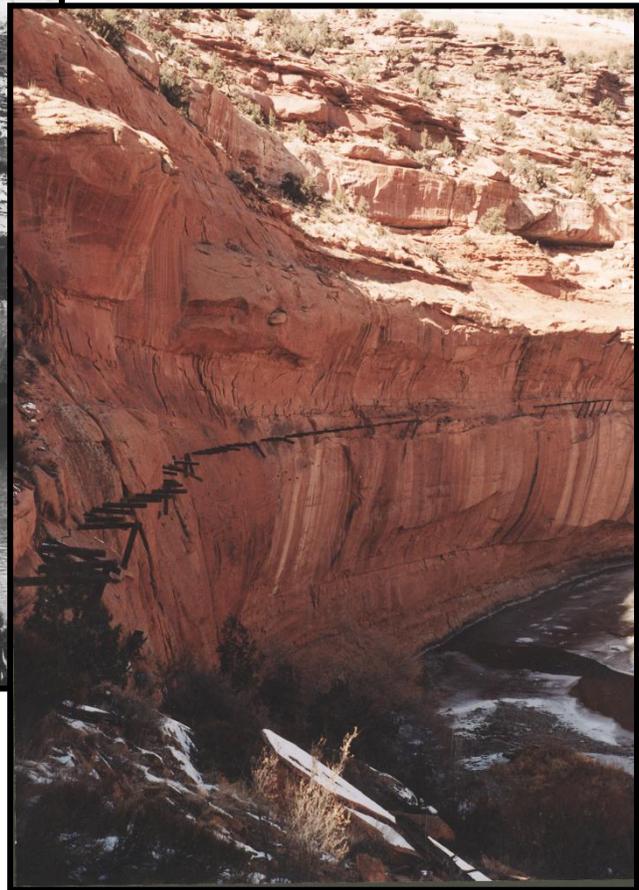
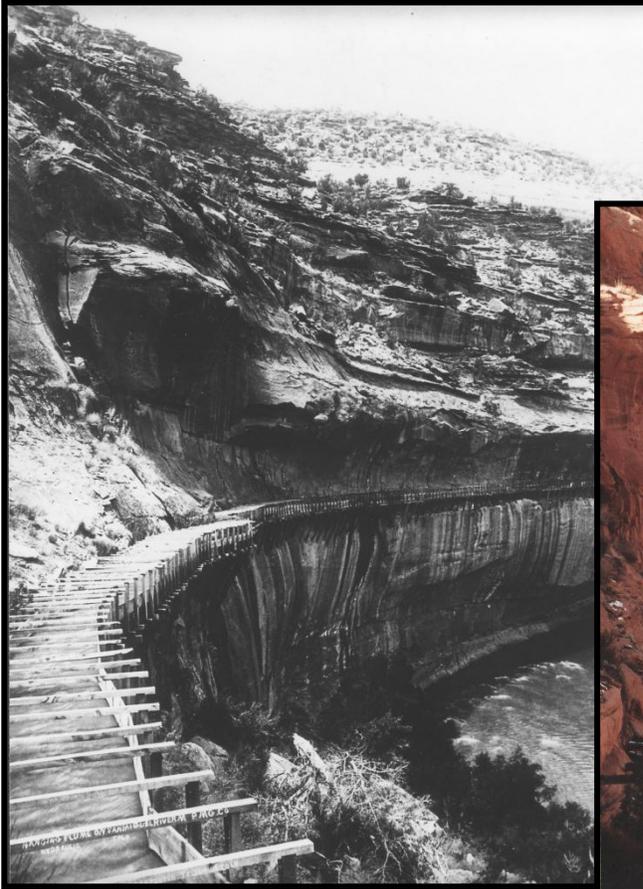


**STABILIZATION AND RESTORATION OF A SEGMENT OF THE
HANGING FLUME, MONTROSE COUNTY, COLORADO**



Submitted by:

**Western Colorado Interpretive Association
2250 Highway 50
Delta, CO 81416**

May 4, 2011

STABILIZATION AND RESTORATION OF A SEGMENT OF THE HANGING FLUME, MONTROSE COUNTY, COLORADO

Project Description

The goal of the proposed project is to restore a segment of the Flume to its original construction configuration to highlight the engineering complexity and construction difficulties of the Hanging Flume. This segment is referred to as the mock-up.

In January 2006 a series of reports was published after completing the Historic Structure Assessment of the Hanging Flume. The reports included:

- A Cultural Resource Inventory of the Hanging Flume (5MN1840) and Associated Sites in Montrose County, Colorado
- Existing Condition Assessment of Montrose Placer Mining Company Hanging Flume, Uravan, Colorado
- Materials Assessment, Hanging Flume, Montrose County, Colorado
- A Plan for the Montrose Placer Mining Company Hanging Flume, Montrose County, Colorado

As determined in the master plan developed during the Historic Structure Assessment phase¹, "Restoration of a [segment] of the Hanging Flume would contribute to the longevity and use of the structure in many ways. It would provide an opportunity to interpret the structure by allowing people to see how it originally looked and functioned, offer a way to learn more about the Hanging Flume's construction and to develop a more informed strategy for long term preservation, slow the eventual deterioration of a part of the Hanging Flume, and contribute to heritage tourism efforts along the Unaweep Tabeguache Scenic Byway."

The Materials Assessment of the Historic Structure Assessment² recommended that of the areas studied, Drop 2 contained a section of the Hanging Flume that would be the most suitable for restoration in that the remaining wood is in relatively good condition. This location meets many of the criteria to protect the site while accommodating the viewer. This site has good visibility from the gravel road that parallels the San Miguel River. The gravel road across the river from the Flume has potential locations for a safe

¹ "A Plan for the Montrose Placer Mining Company Hanging Flume, Montrose County, Colorado", written by Cultural Resource Planning, Durango Colorado, September 2005.

² Materials Assessment, Hanging Flume, Montrose County, Colorado, written by Anthony & Associates, Inc., Fort Collins, Colorado, June 2005.

vehicle pullout within view of Drop 2. The Drop 2 site is sheltered by an overhang and is protected from vandalism because it is difficult to access.

The Condition Assessment of the Historic Structure Assessment³ included an engineering study that showed that the structure is relatively stable and that existing timbers could be used as the basis for stabilization and restoration. The engineering study within the Condition Assessment addressed the following:

- Loads and geometry for structural models appropriate for the segment to be restored (based on field conditions identified during the previous documentation phase).
- Structural analysis to determine requirements for the mock-up.

The most recent phase of work on the Hanging Flume has resulted in a set of construction documents that provide the materials, construction and load information necessary to stabilize and restore a short segment of the Flume at Drop 2. Construction of the mock-up in-situ (on the face of the cliff) will serve as an interpretive feature for the site. It will also provide the means to accurately define the design and construction criteria, as well as the construction sequence, to restore a larger segment of the Flume in a future phase. This is essential since no one has experience restoring a wooden flume on the face of a cliff without the benefit of modern heavy construction equipment.

Fieldwork Methods and Materials

As part of the implementation of the preservation plan we have produced construction documents necessary for reconstructing a segment of the Flume. Using the construction documents as a guide, we propose to restore a segment of the Flume to its original configuration. The construction documents take into consideration several factors to extend the life of the mock-up, including drainage of precipitation to reduce the likelihood of future deterioration, limited access to reduce vandalism and placement on the cliff that maximizes the visual impact for visitors viewing the restored segment from below.

Based on the field research conducted during the Historic Structure Assessment, the construction documents provide the following information for restoration of the Flume:

- Wood species

³ Existing Condition Assessment of Montrose Placer Mining Company Hanging Flume, Uravan, Colorado, written by Robert Silman Associates, P.C., New York, New York, October 2004.

- Source of timber for producing replacement timbers and boards
- Size of wood members
- Size of iron rods
- Connection details
- Information on wood, iron and rock properties

Using this information, trees from the original stand of timber are the intended source of replacement wood. The trees will be harvested and milled, according to the requirements of the construction documents, well in advance of the field construction. Site investigation and reconnaissance will be conducted to determine the best access for workers and materials. Field construction will be conducted by the Historic Structure Assessment team (because of familiarity with the site and to provide continuity and efficient use of project funds) and local contractors experienced with both industrial rigging (i.e. climbing) and historic wood construction. Incorporating local contractors is essential to ensure that future work on the Flume can be conducted without relying on the consultants that investigated the Flume prior to the restoration work.

The construction work will be conducted working from the existing Flume timbers in each bent. Since some of the team members were responsible for accessing and documenting Drop 2 during the Historic Structure Assessment, safety precautions similar to those developed for the earlier investigative work will be used. A crew of four will conduct the hands-on work at any given time. Others team members will support the construction effort from either above or below the cliff by provide materials as needed. Documentation of the restoration work will include photographs, video and field drawings to ensure that the methodology used for the restoration is recorded.

Key aspects of the fieldwork and materials include:

- Restoring and stabilizing in-situ approximately 40-48 feet of Hanging Flume (up to 6 bents) on the cliff face (the mock-up).
- Including local preservation construction specialists in the restoration.
- Using locally available timber from the original forest stand.
- At the completion of the restoration, revising the construction documents, detailing the construction sequence, specifications and typical detail drawings to facilitate additional restoration of the Flume.

Scope of Work

The scope of work is limited to reconstructing approximately 4 to 6 sections (48 lineal feet, est.) of the Hanging Flume on top of existing structural timber bents that remain on the cliff face. The work site is above the Dolores River at approximately N 38 23.107 / W 108 47.547 (the “drop zone”). The work will involve moving a relatively small amount

of wood timbers and planks from a staging area at N 38 23.087 / W 108 47.519 to the drop zone. Timbers and planks will then be lowered to the flume framing below, where workers will rebuild the flume water box.

The proposed work area falls within and or adjacent to the bounds of the Environmental Assessment # DOI-BLM-CO-S050-2009-0037 EA undertaken by the U.S. Department of the Interior Bureau of Land Management, Uncompahgre Field Office, Montrose, Colorado, in 2009 (Appendix 1) This was confirmed during a site visit with Glade Hadden on April 4th, 2011. During that site visit, the approximate limits of the Work Zone were identified in the field, using orange surveyor's tape. Photos of the work site were taken that day and are appended to this document. Others participating in the site visit that day included Kent Diebolt, of Vertical Access, Ed Pearsall, Executive Director of the Western Colorado Interpretive Association and Jerald Reid, local advocate for the Hanging Flume.

Identification and Mitigation of Potential Environmental Impact

Protecting the fragile environment at the work site will be a central component of this reconstruction project. The small scale of this demonstration project will, by its nature, limit environmental impact.

- Site work will be completed by a crew of 6 to 8 people over a period of up to two weeks.
- Similar to the "leave no trace" ethic of backcountry camping, this project will leave no wood scraps or other evidence at the work area or below the flume, after the completion of the project.
- Tools used will be limited to small hand tools, hand power tools such as circular saws and drills and a small electrical generator.
- All the tools and materials to be used will be carried by hand from the roadside pull off to the construction staging area above the cliff.
- All the anchors used to support worker's ropes or material to be lowered will be removed from the site.
- All sawdust will be from locally harvested and milled, untreated pine lumber, representing no environmental hazard.
- Sawdust will be directed away from potential watercourses and areas of runoff.
- A portable generator, small enough to be carried by hand (5,000 watts), will be used to provide power for operating portable tools. Some generator noise is to be expected while cutting and drilling but this will be kept to a minimum.
- Generator fuel will be added very carefully and the generator will be maintained well away from any potential watercourse.
- A "port-a-john" will be available for all crew members during the project.

Further precautions will be taken to protect vegetation at the work site and the slopes above, e.g. no trees will be cut, rocks moved, etc.). The site was chosen in part due to the lower angle and accessibility to the highway via the original cart trail, without causing further erosion of fragile soils. The historic cart trail and future interpretive site pullout provides access for carrying equipment and materials to the work staging area without further impacting the soils and vegetation.

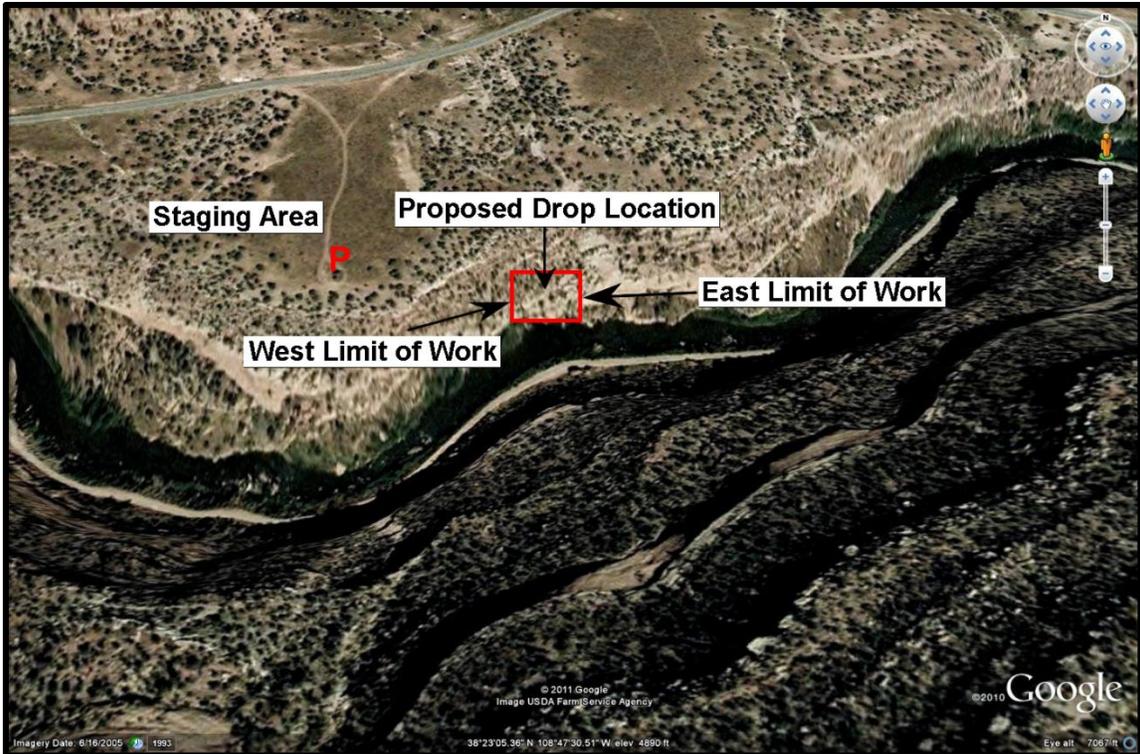
We anticipate the participation of volunteer student and community labor to assist in moving materials from the staging area to the drop zone.

In addition to volunteer labor, we will also install and use a temporary cable “tram” system for delivery of small tools, parts and other materials as well as drinking water to the Drop Zone from the Staging Area. This will further mitigate environmental impact to soils and vegetation by reducing the number of trips and foot traffic required to move materials from the Staging Area to the Drop Zone.

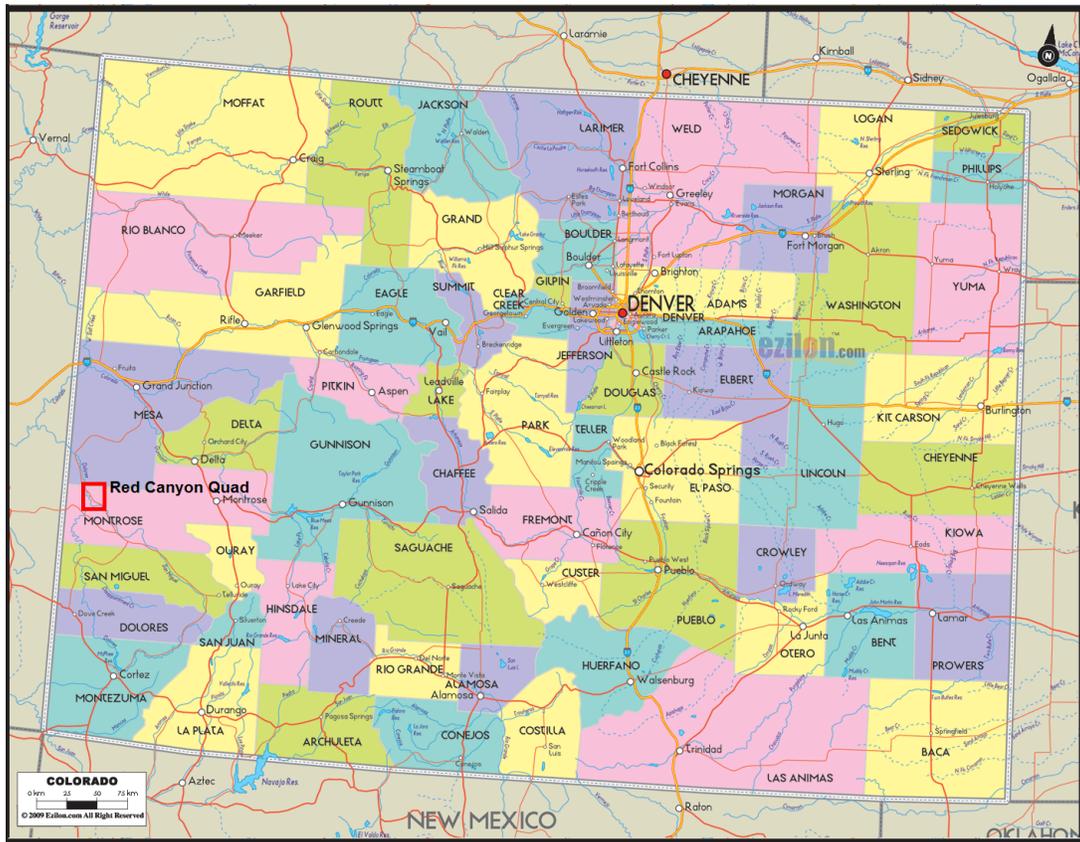
Site selection and construction planning have been chosen to avoid archeological sites (e.g., construction camps) and artifacts. We do not anticipate any detrimental effects on water quality or the riparian communities below the work area, because all of the work will be accomplished from above, and not directly over the river.



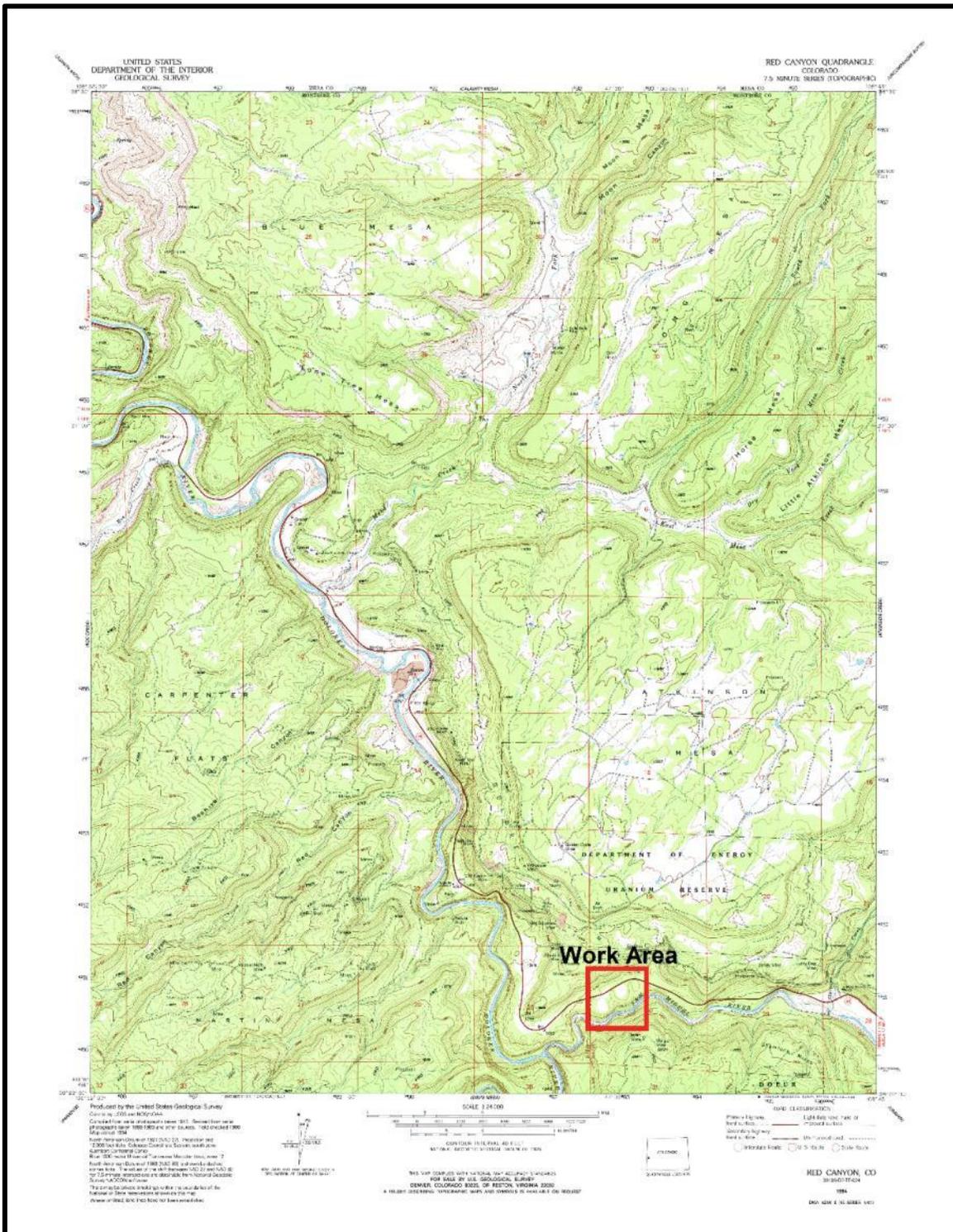
Aerial View of the Hanging Flume Staging and Work Area



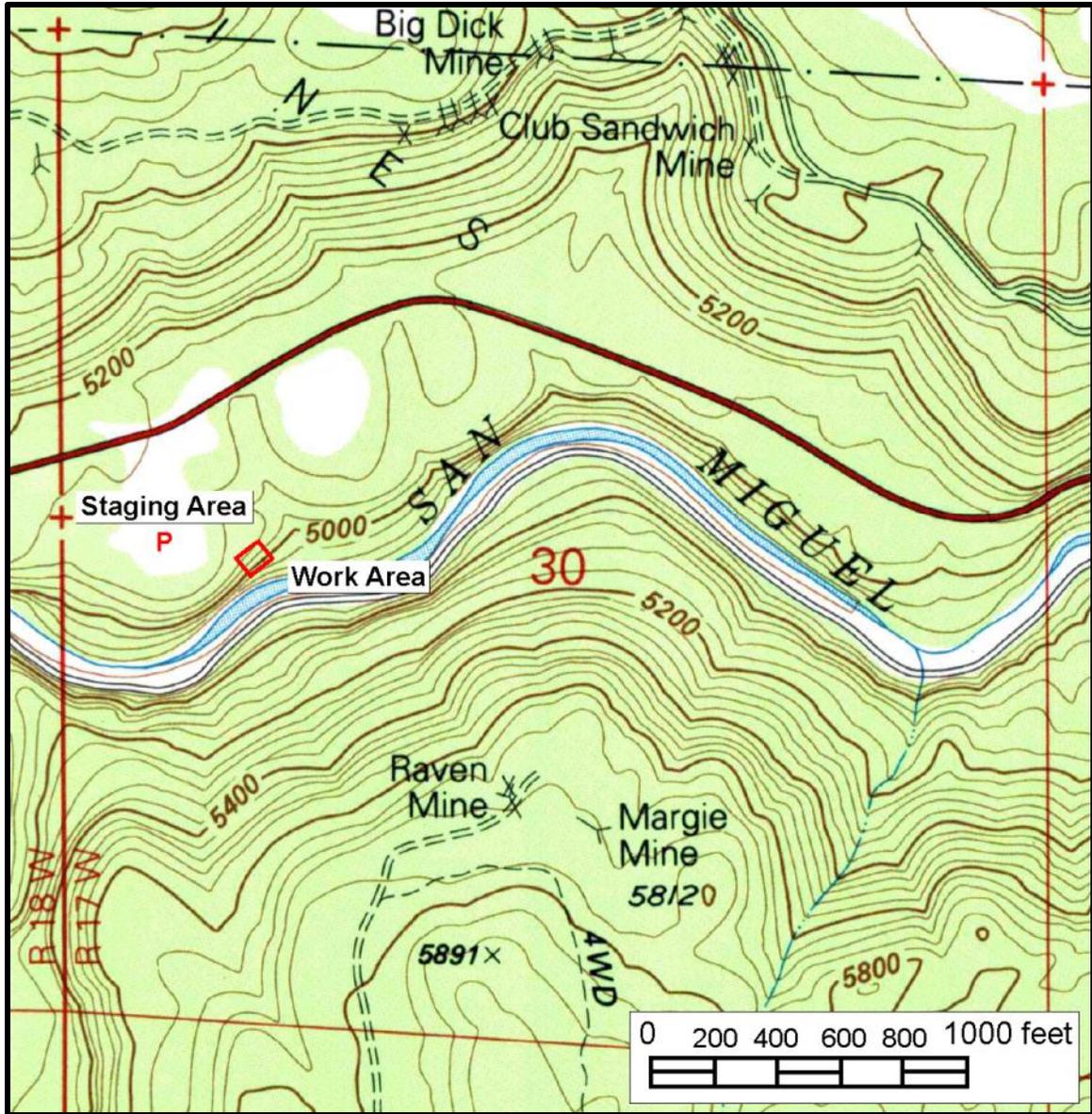
Aerial View of the Hanging Flume Staging and Work Area



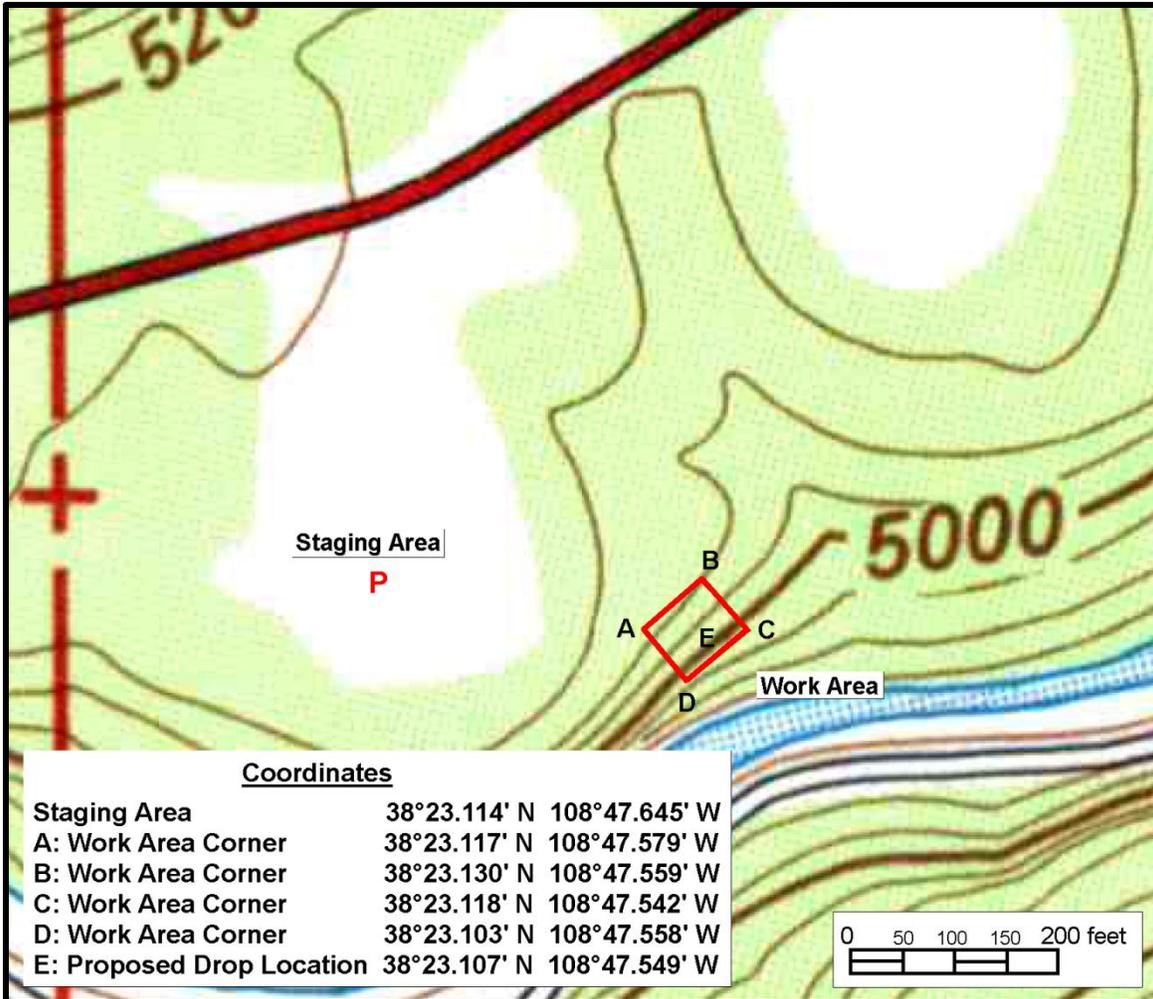
Hanging Flume Location



Work Site Topographic Map, "Red Canyon" Quadrangle

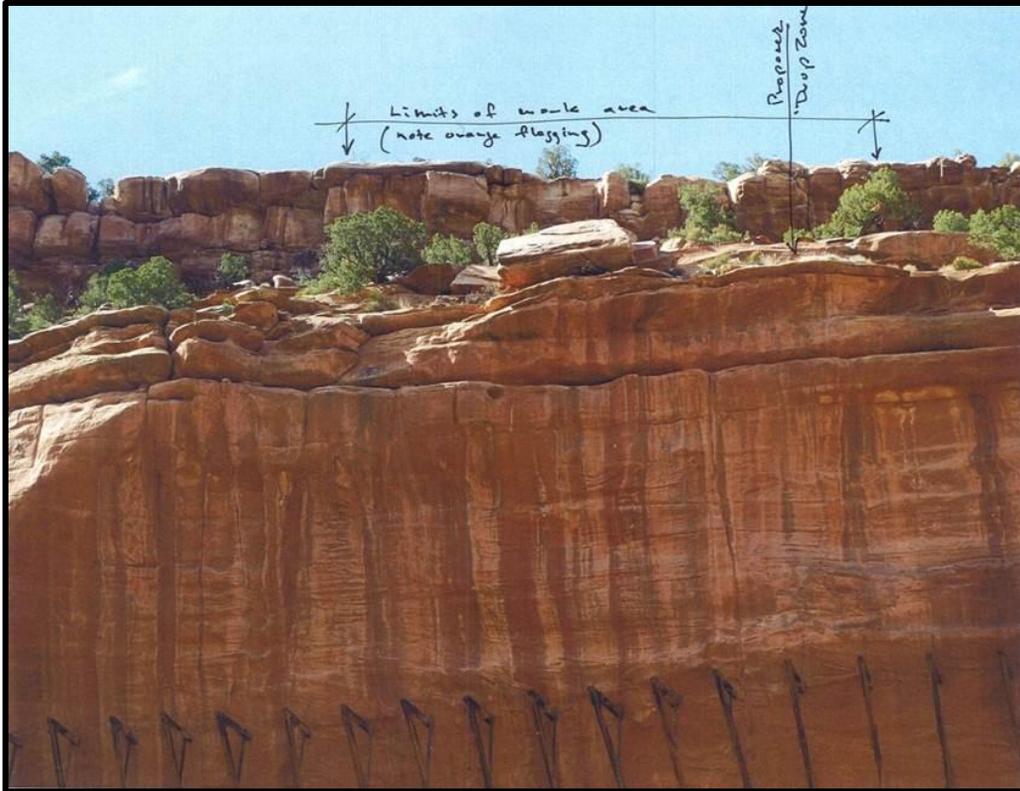


Work Site Topographic Map

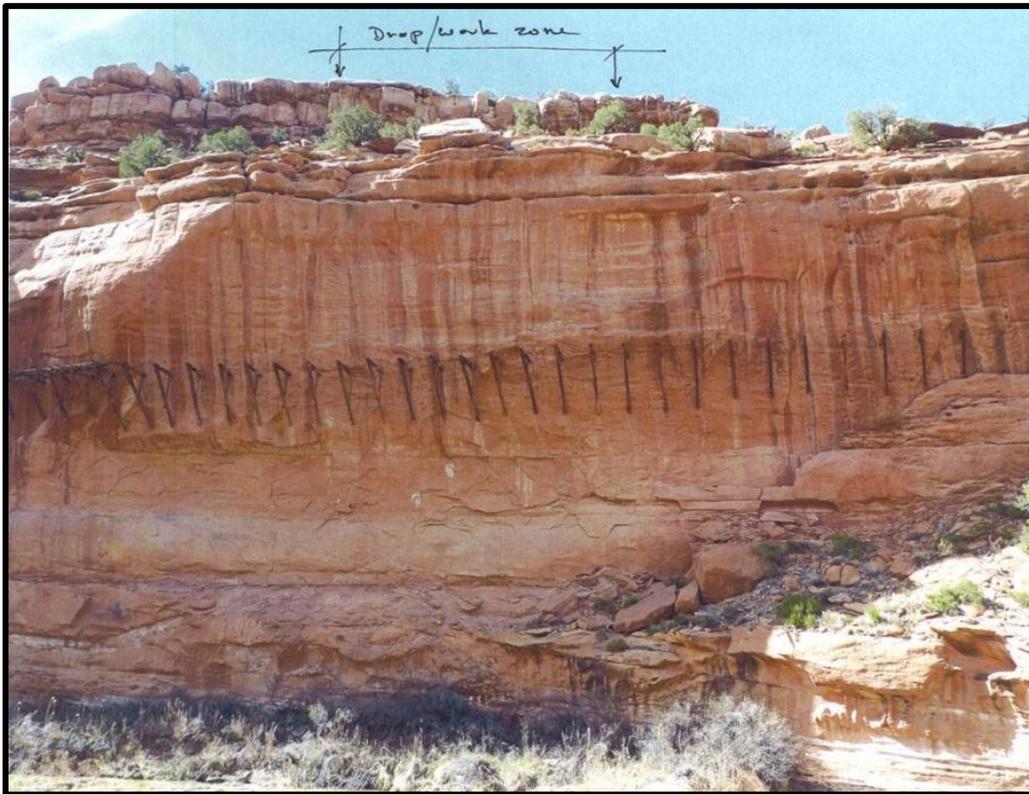


Work Site Topographic Map Detail

Coordinates A-D were flagged at the site on April 4, 2011



Close-up of the Project Staging Area and Work Zone



Overall View of the Project Area

Project Completion Timeline

The project is anticipated to take 12-15 months to complete once funds are approved. Anticipating a start date during the summer of 2011, the proposed timeline information is provided below.

June 2011	Contracts with consultants in place
July 2011	Materials selected for restoration of a segment of the Flume
September 2011	Materials fabricated per specification and delivered to site
September 2011	Field construction
December 2011	Revise construction documents based on as-built conditions
February 2012	Report submitted to J. M. Kaplan Fund
Spring 2012	Submit publication / presentation on restoration efforts

Why This Team?

The Hanging Flume Complex covers approximately 10 miles in rugged terrain along the San Miguel and Dolores Rivers. It is in a remote area of western Colorado where few services exist. Travel to the site and conducting work on-site is time consuming. Parts of the ditch and flume are on level ground; much of it is either suspended up to hundreds of feet above the river or in areas where access is difficult due to the lack of roads or trails. Construction of a mock-up in accordance with the Secretary of the Interior's standards cannot be accomplished without professional climbers with historic preservation experience.

To address the complexities of building a mock-up on the face of the cliff that will enable preservation of the Hanging Flume for future generations, a project team has been assembled with extensive experience in historic preservation. The proposed project team has that experience, having worked together on the assessment and documentation phases of work on the Hanging Flume project. It is our intent to expand the team, where feasible, by incorporating additional expertise from within the region. Team members were selected based not only on their ability to achieve their assigned goals but also to interact with other disciplines to provide data and assistance under extraordinary field conditions. This does not increase either the scope or cost of the project, but rather represents the most efficient use of grant funds because it makes use of every team member's skills to complete tasks under difficult conditions while ensuring the safety of all team members on site.

How Much Will It Cost? Who Pays What?

Task	Contractor	Amount	
Project Preparation Fees	Anthony & Associates	\$2,400.00	(Paid 2/26/2010)
Non Profit Administration	WCIA	\$6,435.00	
Project Management	Ron Anthony	\$6,250.00	
Supplies & Equipment	Misc Local Vendors	\$7,000.00	
Construction Contracted Services	Anthony & Associates	\$24,880.00	
Construction Contracted Services	Vertical Access LLC	\$56,815.00	
Construction Contracted Services	Robert Silman Associates	\$29,750.00	
Misc Fees & Expenses	Contingency Funds	\$4,000.00	
Total Expenses		\$137,530.00	
Funding Sources			
J.M. Kaplan Fund		\$100,000.00	
Hendricks Donation		\$25,000.00	
BLM Remainder Phases 1-3		\$9,394.00	
SHF Remainder Phases 1-3		\$1,173.00	
NSB Remainder Phases 1-3		\$1,963.00	
Total Funding Reserved		\$137,530.00	

Budget Notes:

Administrative Fees are for WCIA as Project Administrator responsible for financial and program reporting.

Project Management Fees are for Anthony & Associates, Inc. Ron Anthony will serve as Project Director responsible for all technical aspects of the project.

Supplies and Equipment includes funds for procuring trees and custom milling of the timbers and boards consistent with the existing or original fabric, fabrication of metal rods and purchasing hardware for the stabilization and restoration.

Contracted Services - Contracted services for Anthony & Associates, Inc. (\$24,880) includes non-managerial labor, travel and expenses for acquiring lumber and metal supplies, field work and revisions to the construction documents specific to material requirements. Contracted services for Vertical Access LLC (\$56,815) includes

mobilization and demobilization, field work (safety coordination and construction), travel, project planning and coordination, consumables, report writing and construction document revision. Contracted services for Robert Silman Associates, P.C. (\$29,750) includes engineering consultation, field work, travel, project planning and coordination, report writing and construction document revision. Travel costs are included in the contracted services for each contractor.

How Will You Evaluate Success?

The success of this project will be determined by the completion of the following deliverables.

- Restoration of approximately 40-48 feet of the Hanging Flume using the existing timbers at Drop 2.
- Revision of the construction documents to include a description of the construction sequence so that, if the restored segment were to be extended, documentation would be available to allow for cost-effective restoration.
- A report to J. M. Kaplan Fund that describes the work done and how the restored segment will help to ensure preservation of the Hanging Flume and its removal from endangered status.
- One or more publications or presentations in professional journals or meetings that will publicize the Hanging Flume, describe the work done, and promote the J. M. Kaplan Fund's role in preservation.

Summary of Qualifications for Project Director and Other Relevant Personnel

Curriculum vitae for key project personnel are provided on the following pages. A summary for each individual is provided below:

Ron Anthony, of Anthony & Associates, Inc. will serve as the Project Director for the proposed work. He received B.S. and M.S. degrees in Wood Science and Technology from Colorado State University. He is the 2002 recipient of the James Marston Fitch Foundation grant for his approach to evaluating wood in historic structures. He has worked on James Madison's Montpelier, the Eisenhower Executive Office Building at the White House, Benjamin Latrobe's Basilica of the Assumption in Baltimore and Gustav Stickley's Craftsman Farms in Morris Plains, New Jersey. Mr. Anthony will serve as Project Manager and lead materials consultant. Mr. Anthony has been involved with all three phases of assessment work on the Hanging Flume as Project Manager and Wood Scientist and will provide continuity with the restoration efforts.

Kent Diebolt founded Vertical Access, LLC in 1992. Vertical Access has pioneered industrial roped access techniques derived from rock climbing and caving activities. Employing these techniques, Kent and his crew have inspected a number of historically significant buildings constructed of a wide variety of materials. Prior to forming Vertical Access, Kent worked in construction and as a carpenter. Kent is the past president of the Association for Preservation Technology, International (APTI). Mr. Diebolt led the investigation team responsible for data gathering and condition assessment of the Historic Structure Assessment phase. Mr. Diebolt will be responsible for overseeing the construction aspects of the stabilization and restoration of a segment of the Hanging Flume, including safety provisions.

Ed Meade of Robert Silman Associates, P.C. was the Principal Engineer for the condition assessment phase of the Historic Structure Assessment and brings his knowledge of the construction of the Flume to the restoration and stabilization work. He will be responsible for overseeing the structural engineering aspects of the restoration efforts as well as revision of the construction documents to allow for extension of the restored flume segment, if desired.



RONALD W. ANTHONY

Wood Scientist
Anthony & Associates, Inc.
P.O. Box 271400
Fort Collins, CO 80527-1400
Phone: (970) 377-2453
Fax: (970) 377-2469

woodguy@anthony-associates.com

Ron Anthony received an M.S. in Wood Science and Technology from Colorado State University. He earned his B.S. in Forest Management and Wood Science and Technology, also from Colorado State University. Prior to forming Anthony & Associates in 1999, he conducted research and consulted on wood properties and the use of wood in construction applications. Anthony & Associates, Inc. focuses on evaluating the performance of wood in historic structures and conducting forensic investigations. Mr. Anthony's research activities have focused on nondestructive evaluation and materials testing to better understand how wood interacts with other materials and performs over time. His efforts have led to applications of resistance drilling and digital radiography for quantifying decay in structural timbers and investigating hidden conditions.

His consulting activities have focused on the application of these innovative inspection technologies for assessment of wood in historic structures, such as Gustav Stickley's Craftsman Farms in Morris Plains, New Jersey; James Madison's Montpelier in Virginia; Benjamin Latrobe's Basilica of the Assumption in Baltimore; Mission San Miguel Arcangel in California (named to the National Trust for Historic Preservation's 11 Most Endangered Historic Places List, 2006), and the Hanging Flume in Colorado (named to the World Monument Fund 2006 100 Most Endangered Places List). He also conducts forensic investigations on wood-related failures, such as the collapse of Pavilion I at the University of Virginia. Additionally, he has participated in the development of standards and specifications for structural applications of wood, including the development of stress-grading procedures for lumber in the Philippines. Mr. Anthony is the 2002 recipient of the James Marston Fitch Foundation Grant for his approach to evaluating wood in historic buildings.

His activities extend to organizing and participating in workshops and lecturing on wood properties and the use of wood in construction applications. He has lectured at Columbia University, the University of Pennsylvania, the University of Colorado and Colorado State University on investigating wood in historic buildings and given presentations at the Association for Preservation Technology International, Colorado Preservation, Inc., American Society of Civil Engineers conferences, and ICOMOS and RILEM symposia. He has authored approximately 100 publications; participated in conferences and seminars; and consulted throughout North America, Europe, Asia, Africa, Australia and the South Pacific. He is a member of the Association for Preservation Technology International, Colorado Preservation, Inc., the Society of Wood Science and Technology, the Forest Products Society and chairs the Committee on Forensic Investigation for the American Society of Civil Engineers.

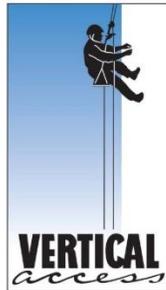
Kent Diebolt

PRESIDENT AND FOUNDER, VERTICAL ACCESS LLC

Company History

In 1985, upon leaving graduate school at Cornell University, Kent began working in construction. An English alpinist and former fellow graduate student introduced Kent to the concept of utilizing lightweight rigging systems for purposes of conducting condition surveys on all types of structures.

While this concept has been utilized sporadically on a local basis, the industrial access industry has, in the last twenty years, become highly developed in England, France and other parts of Europe as well as Australia.



In 1991, Kent was invited to work on a large masonry inspection project in Brighton, England where he learned the basics of rigging, inspection, non-destructive testing, and report preparation. Vertical Access was

founded in January of 1992, as Kent continued to operate Diebolt Construction Company through the fall of 1995, when the construction business was closed.

Since the first Vertical Access project in 1992, Kent and his team have inspected a number of historically significant buildings, constructed of a wide variety of materials, including brick and stone masonry, terra cotta, concrete, wood, architectural sheet metals and cast iron. While most of the firm's work is on historic buildings, other projects include contemporary buildings, bridges, towers, monuments and sculptures.

Education

- Cornell University, Ithaca New York
Masters of Science Program, 1983-1985
- Cornell University, Ithaca New York
Bachelor of Science, 1983
- General Equivalency Diploma, 1974

Public and Industry Service

- The Association for Preservation Technology International
Past president of the board of directors
- US/ICOMOS
Past APTI liaison to the board of directors
- Historic Ithaca and Tompkins County
Past president of the board of directors
- Historic Roofing Conference and Exhibition
Historic Preservation Education Foundation Program committee
- Preserving Historic Guastavino Tile Ceilings, Domes and Vaults Symposium
Grant writer and Program Planning Committee chair
- Monitoring and Protecting Historic Buildings Symposium
Program Planning Committee Chair

Professional Affiliations

- The Association for Preservation Technology International
corporate member
- Boston Society of Architects, *associate member*
- AIA, New York City Chapter, *associate member*
- New York Landmarks Conservancy Professional Circle,
member
- ASTM, E06 Subcommittees on Facade Inspection and Industrial Rope Access, *member*
- American Institute of Conservation, *member*
- The Society of Professional Rope Access Technicians,
member
- US/ICOMOS, *member*

www.vertical-access.com

kent@vertical-access.com

EDMUND P. MEADE, P.E., Principal and Director of Preservation

Career Profile

Mr. Meade has managed many large preservation projects ranging from the restoration of the New Jersey State House Dome to Columbia University's Low Library. He has designed innovative structural solutions while preserving and maintaining the original architectural and structural elements. He has been instrumental in saving significant historic buildings – in the process giving them decades of new life and productive use. As Director of Preservation, Mr. Meade provides RSA's staff of structural engineers with information and guidance in conjunction with their direct field experience. This enhances their knowledge of the historic preservation approach to older buildings and permits our knowledge of existing buildings to be applied to new construction. Mr. Meade shares his understanding and expertise by lecturing at industry events across the US, Canada, the Caribbean, and Europe.

Mr. Meade has worked on projects focusing on the historic preservation, stabilization, and / or reuse of existing buildings. These projects have included numerous national historic landmarks. The range of his work includes the preservation of a five hundred year old stone church in Puerto Rico to the sensitive study and restoration of the wood structure of Gustav Stickley's Craftsman Farms in New Jersey. He is currently guiding the team of engineers who are evaluating the structural condition of the Solomon R. Guggenheim Museum in New York. His experience has taught him to become an advocate for respect for historic materials, use of modern analysis techniques and materials, and the importance of a collaborative team approach to surveying, analyzing, designing repairs, and implementing repairs for existing buildings. His work has included use of advanced non-destructive evaluation techniques, sustainable design, leading-edge analysis, monitoring, measuring techniques and leading-edge structural analysis techniques.

Education

- Bachelor of Science in Civil Engineering, Johns Hopkins University, 1986
- Master of Architectural History & Certificate in Historic Preservation, University of Virginia, 1989

Experience

- Robert Silman Associates, 1989-Present
- Higgins Gardner & Partners (London) 1988
- Watkins & Vitale Engineers, Inc. 1984-1985
- National Institutes of Standards and Technology 1983

Teaching

- Drew University, Certificate Program in Historic Preservation, Office of Continuing Education, Adjunct Faculty Member
- Columbia University, Historic Preservation Program, Graduate School of Architecture, Planning, and Preservation, Visiting Lecturer

Professional Affiliations

- Association for Preservation Technology International, Member (APTII)
- American Society for Testing and Materials, Committee E06 on Performance of Buildings, Member (ASTM)
- Association for Preservation Technology, Northeast Chapter, Board of Directors (APT)