

~~RELATED CORRESPONDENCE~~

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
Before the Atomic Safety and Licensing Board

OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

In the Matter of )  
 )  
PRIVATE FUEL STORAGE L.L.C. ) Docket No. 72-22  
 )  
(Private Fuel Storage Facility) ) ASLBP No. 97-732-02-ISFSI

**APPLICANT'S SECOND SUPPLEMENTAL RESPONSE TO  
SUWA'S FIRST REQUESTS FOR DISCOVERY**

Applicant Private Fuel Storage L.L.C. ("Applicant" or "PFS") files this Second Supplemental Response to "Southern Utah Wilderness Alliance's (SUWA) First Set of Discovery Requests Directed to the Applicant," dated May 10, 1999 ("SUWA's First Discovery Requests"). The Applicant files this Supplemental Response pursuant to 10 C.F.R. § 2.740(e), to name additional witnesses it may call at hearing. The Applicant's original response to the SUWA's First Discovery Requests noted that it would file such supplemental responses as it identified additional witnesses.<sup>1</sup>

**I. INTERROGATORIES**

**INTERROGATORY NO. 2.** Please give the name, address, profession, employer, area of professional expertise, and educational and scientific experience of each person PFS expects to call as a witness or expert witness and the subject matter about which each witness or expert witness will testify at the hearing with regard to SUWA's admitted contention. For each expert witness, please include a list of all publications she or he authored within the preceding ten years and a list of any other cases in which the witness has testified as an expert at a trial, hearing or by deposition within the preceding four years. Please describe the subject matter on which each of the

<sup>1</sup> Applicant's Objections and Non-Proprietary Responses to State's First Requests for Discovery, dated April 21, 1999, at 17.

witnesses is expected to testify at the hearing by detailing the facts and opinions to which each witness is expected to testify, including a summary of the grounds for each opinion, and identifying the documents (including all pertinent pages or parts thereof), data or other information which each witness has reviewed and considered, or is expected to consider or to rely on for her or his testimony.

**APPLICANT'S RESPONSE:** The Applicant supplements its response to SUWA's First Requests for Discovery by identifying the following additional persons whom the Applicant may call as witnesses at the hearing with respect to SUWA's admitted contention.

**SUWA Contention B—Alternative Rail Line Alignment**

<u>Name and Address:</u>	Barbara A. Mohrman Stone & Webster Consultants 245 Summer Street, Boston, MA 02210
<u>Profession:</u>	Senior Consultant
<u>Employer:</u>	Stone & Webster Consultants
<u>Professional Expertise:</u>	See attached resume.
<u>Educational, Scientific Experience, and Professional Qualifications:</u>	See attached resume.
<u>Publications in the last ten years:</u>	See attached resume.
<u>Testifying experience as expert in last four years:</u>	none in last 4 years
<u>Subject Matter of Testimony:</u>	Ms. Mohrman will testify regarding the environmental impacts of the construction and operation of the PFS Low rail line in its currently planned location and in potential alternative locations.

Documents reviewed and/or  
relied upon:

Materials reviewed and relied upon by Ms. Mohrman will include the PFS License Application, including the Safety Analysis Report (“SAR”) and the Environmental Report (“ER”), responses to Requests for Additional Information, the Draft Environmental Impact Statement (“DEIS”) and NRC regulatory materials associated with the potential radiological impacts of transporting spent nuclear fuel. In addition, Ms. Mohrman may rely upon materials produced by PFS, SUWA, and the other parties to the PFS licensing proceeding and any new information that comes into the possession of PFS.

Name and Address:

Mr. Douglas Hayes  
Stone & Webster, Inc.  
7677 East Berry Ave  
Englewood, CO 80111-2137

Profession:

Civil design engineer

Employer:

Stone & Webster, Inc.

Professional Expertise:

See attached resume

Educational, Scientific Experience,  
and Professional Qualifications:

See attached resume

Publications in the last ten years:

none

Testifying experience  
as expert in last four years:

none

Subject matter of testimony:

Mr. Hayes will testify regarding the feasibility, the costs, and the direct environmental impacts (e.g., earthmoving requirements) of the construction of the PFS Low rail line in its currently planned location and in potential alternative locations.

Documents reviewed and/or  
relied upon:

The documents reviewed and relied upon by Mr. Hayes will include the PFS License Application, including the Safety Analysis Report (“SAR”) and Environmental Report (“ER”), responses to Requests for Additional Information, and the Draft Environmental Impact Statement (“DEIS”). In addition, Mr. Hayes may rely upon materials both produced by PFS, SUWA, and the other parties to the PFS licensing proceeding and any new

information that comes into the possession of PFS.

Respectfully submitted,

A handwritten signature in black ink that reads "D. Sean Barnett". The signature is written in a cursive style with a large, stylized initial "D".

Jay E. Silberg  
Ernest L. Blake, Jr.  
Paul A. Gaukler  
D. Sean Barnett  
SHAW PITTMAN  
2300 N Street, N.W.  
Washington, DC 20037  
(202) 663-8000

Dated: April 13, 2001

Counsel for Private Fuel Storage L.L.C.

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION**

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE L.L.C.	)	Docket No. 72-22
	)	
(Private Fuel Storage Facility)	)	ASLBP No. 97-732-02-ISFSI

**CERTIFICATE OF SERVICE**

I hereby certify that copies of Applicant's Second Supplemental Response to SUWA's First Requests for Discovery, the attached resumes, and declaration of Sean Barnett were served on the persons listed below (unless otherwise noted) by e-mail with conforming copies by U.S. mail, first class, postage prepaid, this 13<sup>th</sup> day of April 2001.

G. Paul Bollwerk III, Esq., Chairman  
Administrative Judge  
Atomic Safety and Licensing Board Panel  
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Washington, D.C. 20555-0001  
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\* Susan F. Shankman  
Deputy Director, Licensing & Inspection  
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Washington, D.C. 20555

Office of the Secretary  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001  
Attention: Rulemakings and Adjudications  
Staff  
e-mail: [hearingdocket@nrc.gov](mailto:hearingdocket@nrc.gov)  
(Original and two copies)

\* Adjudicatory File  
Atomic Safety and Licensing Board Panel  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

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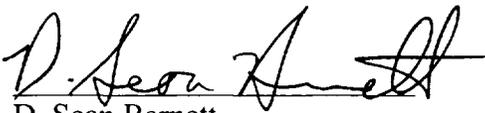
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\* By U.S. mail only

  
D. Sean Barnett

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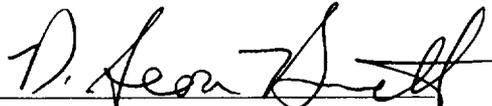
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(Private Fuel Storage Facility)	)	ASLBP No. 97-732-02-ISFSI

**DECLARATION OF D. SEAN BARNETT**

D. Sean Barnett states as follows under penalties of perjury:

1. I am with the firm of Shaw Pittman in Washington, D.C.
2. I am duly authorized to verify Applicant's Second Supplemental Response to SUWA's First Requests for Discovery; specifically, the supplemental response to Interrogatory No. 2.
3. I certify that the statements in such responses are true and correct to the best of my personal knowledge and belief.
4. I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 13, 2001.

  
D. Sean Barnett

## **Resume of Barbara A. Mohrman**

## BARBARA A. MOHRMAN

### *Senior Consultant*

Over 23 years of experience in environmental regulations, impact assessments and permitting. Project experience has spanned all aspects of project development, from site selection and feasibility assessment through construction monitoring, for domestic and international clients in the public and private sectors. Project roles include technical specialist or consultant, and project management. Within the power industry, Ms. Mohrman has been involved in various aspects of development of pipelines, industrial facilities and natural gas, coal, hydroelectric, nuclear, wind and solar electric facilities. She has performed the environmental reviews of pipelines, industrial facilities, process plants and power projects as part of due diligence reviews for asset finance, purchase and divestiture and has developed methodologies for site/corridor selection covering pipelines and electric transmission lines. Ms. Mohrman has also been responsible for the organization and management of major public forums and meetings and public information programs, and has been an Expert Witness in various jurisdictions covering environmental areas including socioeconomics, land use, cultural resources and other environmental issues in New York, Massachusetts, and Maine.

### PROFESSIONAL EXPERIENCE

2000-Present	<b>Stone &amp; Webster Consultants</b> Senior Consultant Environmental Program Director
1995-2000	<b>Stone &amp; Webster Engineering</b> Senior Principal Environmental Scientist Environmental Program Manager
1994-1995	<b>John Milner Associates</b> Senior Project Manager New England Branch Manager
1988-1994	<b>Stone &amp; Webster Engineering</b> Senior Principal Scientist Environmental Program Manager
1979-1990	<b>Stone &amp; Webster Engineering</b> Supervisor, Socioeconomic & Land Planning Group
1979-1980	<b>Stone &amp; Webster Engineering</b> Senior Environmental Planner
1977-1979	<b>Stone &amp; Webster Engineering</b> Environmental Planner

### Experience Summary

**Pipeline Experience:** Pipeline experience has been gained through the review, assessment and permitting of over 500 miles of new natural gas pipeline corridors in the northeastern United States (Connecticut, Maine, Massachusetts, New Hampshire, New York, Pennsylvania, Rhode Island, and Vermont), and Florida and Kentucky. Acted as Assistant Project Manager and Cultural Resource Coordinator for the Northeast Settlement, Niagara Settlement, NESEX and NOREX Projects (Open Season), Connecticut Lateral Supply Project, BECO Project, and the

NORTRAN, NEPCO and ANE Projects for Tennessee Gas. Served as Environmental Lead in charge of corridor selection for Granite State Gas Transmission, Inc., and Environmental Consultant for projects for Distrigas and Boston Gas. Responsibilities on these projects included contract management, scheduling of field surveys and permit applications, agency coordination, management of cultural resource investigations and sub-contractors, and technical review of environmental documents and permit applications. Also worked with right-of-way agents and pipeline engineers to develop avoidance routes and/or mitigation strategies for numerous sensitive sites within the pipeline corridor. Most recently, acted as environmental consultant for selection of a new pipeline corridor in western Massachusetts for the Massachusetts Municipal Wholesale Electric Commission.

**Site Selection Studies:** Most recently, managed the environmental portion of a major siting study that identified potential sites for new power plant development in over 30 states. As part of the study, worked with natural gas specialists, transmission specialists and economists to determine market capacity, demand, and availability of gas and transmission. For Braintree Electric Light Department and Seminole Electric Cooperative (SECo), performed site selection studies for the identification of new electric transmission line corridors (2 miles in MA and 80 miles in FL). Special concerns included routing through a congested residential and business district (MA) and avoidance of sensitive environments (FL). Also for SECo, sited a new 30-mile pipeline corridor. For Granite State Gas Transmission, managed the siting of a new LNG storage facility in Maine, and an 80+ mile pipeline corridor from Haverhill, MA to Portland, ME. The pipeline study was performed in compliance with the New England Corps of Engineers' Highway Methodology. Also participated on an international team as socioeconomic, land use and cultural resource consultant, to review potential corridor alternatives for expansion of the Panama Canal, and developed a "how to" guide for facility siting for AITEK, an Italian company looking to locate new sites for chemical facilities in Italy.

**Hydroelectric Experience:** On Stone & Webster's support services contract with the FERC, acted as Deputy Project Manager. In that role, managed up to 6 relicensing and compliance projects simultaneously and took over 2 highly controversial projects (Cushman Project EIS and Kennebec River Basin EIS) that were having problems and brought them to successful completion. On the Kennebec River Basin Project (value in excess of \$1.5 million), the EIS evaluated both individual and inter-related impacts and operations of 11 different hydroelectric projects located within the river basin in Maine. Key issues included fish passage, flow management, and recreation. For the Cushman Project EIS (value in excess of \$2.0 million), key issues included flow management, flood control, fish passage and restoration, Native American treaty rights, and traditional cultural properties. General responsibilities included management of budgets and schedules, development of project scoping documents, technical oversight of studies and EIS preparation, management of subcontractors, public/agency meeting preparation and management, and preparation of special support documentation for use by FERC's Hydro Working Group and other staff. Also acted as Cultural Resource Specialist in the review of cultural resource issues including Native American traditional cultural properties, treaty rights, and spiritual values. In this role, consulted with Tribes and developed mitigation strategies to preserve cultural values while maintaining acceptable operating levels.

Other recent hydro experience includes the due diligence review of environmental operations of several hydroelectric projects for possible bid offering on the facilities and for project financing. Also acted as socioeconomic/land use specialist in the impact assessment and preparation of license documents for 9 hydro facilities in four states.

**Fossil Experience:** Most recently, developed plan and managed the preparation of local permits

for a proposed combined cycle gas fired facility in Michigan and acted as consultant to four towns in Massachusetts to aid in their review of two proposed gas fired combined cycle plants. For the Hardee Power Station in Florida, acted as Socioeconomic/ Land Use Consultant responsible for identification and analysis of impacts, and preparation of sections of the application under the Florida Power Plant Siting Act. Supervised all socioeconomic, visual and land use studies for Draft Environmental Impact Statement preparation for the conversion of Danskammer Station in New York from oil to coal. Provided expert testimony on the Danskammer Project at New York Dept. of Environmental Conservation hearings for the project. Worked with lawyers in the preparation of initial and reply briefs for the permitting of the Arthur Kill fossil and waste burning plant that was proposed by the New York Power Authority (NYPA). Also worked with NYPA to develop a plan for dealing with homeowner concerns during facility construction.

**Due Diligence Reviews:** Responsible for environmental due diligence reviews of simple and combined cycle gas fired, nuclear, and hydroelectric assets for divestiture, acquisition and financing of facilities located throughout the United States and in Mexico. The reviews covered completeness of permitting activities and the identification of fatal flaws or potential liabilities. Site visits and meetings with project personnel were included in the evaluations.

**Nuclear Experience:** Most recently, oversaw the socioeconomic, land use and ecological analysis and reviews required for the permitting of independent spent fuel storage installations (ISFSI) in Utah and Maine. Also performed the environmental due diligence review of the proposed BNFL operations for fuel vitrification at the Hanford Reservation, and prepared the socioeconomic, cultural resource and environmental justice sections of the Environmental Report for the proposed Mixed Oxides Fuel production facility at Savannah River. As Environmental Consultant, reviewed project design alternatives for the Yucca Mountain Repository for completeness and reasonableness and prepared summary descriptions of alternatives for inclusion in the Environmental Impact Statement.

Past experience includes the management and preparation of socioeconomic, demographic, land use and cultural resource sections of five different Environmental Reports (ER), Safety Analysis Reports (SAR) and Probabilistic Risk Assessments for plant licensing. She also managed the demographic analysis for Evacuation Time Estimates for six nuclear plants as part of emergency plan development.

**Solar Electric Experience:** Under contract to the Department of Energy, participated as part of a team identifying the potential for large scale development of solar facilities (photovoltaic, wind and solar thermal facilities) in the southeastern and southwestern parts of the United States. For this study performed demographic analysis and reviewed projected labor requirements against regional labor supplies. Also prepared permits and managed the public information programs of demonstration photovoltaic facilities in Massachusetts and New Mexico. The public information programs included design of visitor's centers and preparation of information hand outs for different target audiences.

**Other Experience:** Provided cultural resource consulting services for the demolition of the Pownall Tannery in Vermont, a nominated National Register property and superfund cleanup site. Also provided cultural resource consulting services under contract to DOD at the Badger Army Ammunition Plant in Wisconsin, and at Westover Air Reserve Base in Massachusetts. At both facilities, oversaw the preparation of Cultural Resource Management Plans. At Badger, also coordinated the review of Native American concerns.

Served as the Environmental Expert on a Value Engineering (VE) team with 5 bridge/highway experts to review the design and planning for the proposed replacement of the Missiquoi Bridge in Vermont. As part of the VE team, reviewed project design and identified project improvements and mitigation that would save the project money and help to ensure that project schedules could be met.

Acted as Project Manager of a study of 30 towns in western Massachusetts to identify the extent of pesticide contamination in public drinking water supplies. The study involved aerial photo analysis to identify planting patterns and crop types and the mapping of public water supplies (including drinking water wells and distribution systems). It also developed recommendations for monitoring locations and frequency of monitoring.

As Environmental Lead, managed the environmental studies required for determining site capacity and potential impacts of developing a multi-season destination recreation resort in northwestern Massachusetts.

## **EDUCATION**

<b>Boston University</b> <b>Boston, MA</b>	1978 Master of Urban Affairs
<b>University of New Hampshire</b> <b>Durham, NH</b>	1973 B.S., Human Development
<b>Cornell University</b> <b>Ithica, NY</b>	1976 Historic Preservation Planning Intensive Seminar
<b>U.S. Bureau of the Census</b> <b>Boston, MA</b>	1982 Population Project Methodology & Use of Census Data Workshops
<b>Stone &amp; Webster</b> <b>Boston, MA</b>	1979-1995 Various training programs on supervision of personnel, project management, and marketing.

**LANGUAGES:** Spanish

## **PROFESSIONAL AFFILIATIONS:**

International Association for Impact Assessment  
Women's Educational and Industrial Union –  
Trustee, Clerk and past President of the Board  
National Trust Forum

## **TECHNICAL PAPERS AND PRESENTATIONS:**

*Utility Corridors as Greenways: New Opportunities for Multiple Use and Public Support.* Fifth International Symposium on Environmental Concerns in Rights-of-Way Management. Montreal, Canada, 1993.

*Siting and Permitting New Electric and Gas Transmission Corridors.* Speaker/Faculty Associate. Development of Utility and Abandoned Rail Corridors: New Partnerships for Multiple Use Seminar. Lincoln Institute of Land Policy. Providence, R.I., 1992.

*Siting Methodology for New Utility Corridors.* Power Transmission: Access, Pricing and Regulation Conference. 1992.

*The Environmental Approval Process.* Speaker and member of "Managing the Waterfront" panel. The Real Estate Institute, New York University. Waterfront Development Conference. 1988.

*Data Base Development for Pesticide Monitoring.* Agricultural Impacts on Groundwater Conference. National Water Well association. Des Moines, IA. 1988.

*Mapping Pesticide/Water Supply Relationships in Massachusetts.* Agricultural Impacts on Groundwater Conference. National Water Well association. Des Moines, IA. 1988.

*Planning Concepts and Decision Criteria for Sheltering and Evacuation.* Member of the National Environmental Studies Project Task Force. Atomic Industrial Forum. 1985.

*Physical Impacts of Nuclear Power Plant Construction.* Guest Lecturer to International Atomic Energy Association Training Course on Nuclear Power Development. Argonne Center for Educational Affairs. 1980.

*Socioeconomic Factors Affecting the Deployment of Central Solar Power Plants.* International Solar Energy Society International Congress. 1977.

## **Resume of Douglas W. Hayes**

**Experience Summary**

Mr. Hayes is a Civil Design Engineer in the Denver office of Stone & Webster Inc. He joined Stone & Webster in 1980 and is responsible for civil engineering and design requirements of site and corridor development. His assignments include access and site road design of asphalt, concrete and gravel roads, including earthwork, structural and drainage considerations, railroad loading, unloading and transportation for heavy and light rail and site development on a variety of projects. He has more than 40 years experience in surveying and engineering civil projects. Prior to joining Stone & Webster, Mr. Hayes worked for the U.S. Geological Survey in the Rocky Mountain Region for eight years performing geodetic surveys. Mr. Hayes also worked for consulting engineering firms in Colorado for ten years on various surveying and civil engineering projects. He owned and operated his own surveying business in Colorado for approximately two years.

**Education**

Industrial Engineering - (Course Work - No Degree) Fresno City College, Fresno, California

**Licenses, Registrations, and Certifications**

Certified Engineering Technician - 1968

Registered Land Surveyor - Colorado - 1971

## **Experience History**

### **STONE & WEBSTER ENGINEERING CORPORATION, DENVER, COLORADO (JUN 1980 - PRESENT)**

#### **Private Fuels Storage Facility, Skull Valley, Utah (May 2000 - Present)**

As Lead Railroad Design Engineer responsible for the layout and development of construction drawings and railroad construction specifications for the new railroad alignment from the proposed PFSF storage site to a interconnect with the Union Pacific Railroad at Low Pass, in Utah. Comprising a total length of approximately 32 miles and maximum vertical grades of 1.5%.

#### **Great River Energy, Pleasant Valley Station, Minn. (Jan 2000 - May 2000)**

As Lead Civil Design Engineer responsible for the layout and development of construction drawings for a new peaking power station located in Minnesota. Developed site access road, on site roads, grading and drainage including calculations and construction specifications.

#### **Monticello, Martin Lake and Big Brown Stations, Texas Utilities (Jun 1996 - Jan 2000)**

As Lead Civil Design Engineer developed bypass and unloading loop for switching fuel delivery from existing 14 car lignite trains to proposed 140 car Powder River Basin coal trains for the three generating stations. Provided cost studies, traction studies and unloading time line studies for unloading 140 car unit coal trains at the three stations. The projects included railroad plans, site plans, calculations, drainage and realignment of existing roads, including the crossing of Interstate 45 with a new rail line.

#### **Monticello - North Interchange, Texas, Utilities (Apr 1996 - Jan 1997)**

As Lead Civil Design Engineer responsible for the layout and development of construction drawings for approximate 2 mile spur track connecting Southern Pacific Railroad with existing TU track to allow receiving Western coal unit trains at Monticello Station. Project includes construction drawings, construction specifications, grading and drainage.

#### **Northern States Power Company, Mescalero, New Mexico (Feb 1996 - Apr 1996)**

As Lead Civil Design Engineer provided conceptual railroad routing from existing SP mainline to several sites under consideration for independent spent fuel storage site on or near the Mescalero Indian Reservation in New Mexico. The railroad spur was to accommodate heavy rail loads having grades of 2% ± over lengths of 2 to 10 miles and considered grading and drainage.

#### **Northern States Power Company, Goodhue County, Minnesota (Nov 1995 - Feb 1996)**

As Lead Civil Design Engineer developed rail spur of approximately 2 miles from existing CTX mainline to independent spent fuel storage site for Prairie Island Nuclear Generation Plant. Mr. Hayes performed the necessary alignment, grading and drainage calculations and produced design drawings for submission to the NRC.

**Stanton Station, Ash Haul Rosa, United Power Association  
(May 1995 - Oct 1995)**

As Lead Civil Design Engineer, Mr. Hayes was responsible for the final design and grading of an Ash loading loop road and Ash Haul Road capable of handling CAT 773B off highway trucks. The loaded gross weight of this vehicle is approximately 186,000 lbs with approximately 125,000 lbs on the rear axle. The design period was 20 years, and the design included crossing of 2 existing railroad spurs, 13 buried utilities, the design of a concrete road crossing at an existing main access road to an adjacent power plant. The design also included the surface drainage features along the haul road alignment.

**Hampton Corners Mine Site, Akzo Nobel Salt, Inc.  
(Dec 1994 - May 1995)**

As Lead Civil Design Engineer, Mr. Hayes was responsible for the conceptual layout and design of the surface facilities of a new salt mine and processing facility. His area of responsibility included roads and access, site grading, railroad access, loading and car storage for 100 car unit trains, surface runoff detention highway access improvements and building, parking, working and storage pad development. All design and drawings for the site work was created using AutoCad and ADCADD.

**Tesla Hydroelectric Project, City of Colorado Springs  
(Jun 1994 - Dec 1994)**

As Lead Civil Design Engineer, Mr. Hayes was responsible for development of an AutoCad, AdCADD final design of a 15 acre regulating reservoir and approximately 0.85 mi of access and maintenance roads in a mountainous area. The grading design includes a balanced earthwork scheme for the 250,000 cubic yards of earthwork excavation.

**Banfield LRT System Improvements, Tri-County Metropolitan Transportation District of Oregon  
(Nov 1993 - Jun 1994)**

As Lead Civil Design Engineer, Mr. Hayes' responsibilities include design of two and one-half miles of double tracking for an existing light rail transit system mainline. The work includes preparing horizontal and vertical alignments using AutoCad and preparing special trackwork details. He is also responsible for design of an expansion to an existing maintenance and storage yard.

**Three - 750 MW Coal-Fired, Navajo Generating Station, Salt River Project  
(Aug 1993 - Oct 1993)**

As Lead Civil Design Engineer, Mr. Hayes supervised final design of site preparation for the addition of scrubbers to the three - 750 MW coal-fired Navajo Generating Station. The work included modifying one mile of Arizona State Highway 98, upgrading three existing intersections, and adding one new

intersection. The work also included site grading and layout and design of on-site plant roads. He was responsible for coordinating and interfacing with the Arizona Department of Transportation

**Thompson Falls Hydroelectric Project, Montana Power Company  
(May 1993 - Aug 1993)**

As Lead Civil Design Engineer, Mr. Hayes supervised final design of an Intergraph CAD grading, dredging, drainage design for a new 50 MW powerhouse at Thompson Falls Hydroelectric Plant. Grading included removal of 100,000 cubic yards of rock excavation, including one-quarter mile of river channel tailrace excavation, using a current diversion dike. Tailrace excavation was accomplished using a moving rockfill work pad.

**Keahole Combined Cycle Project Company, Hawaiian Electric Light Company  
(Jan 1993 - Apr 1993)**

As Civil Design Engineer, Mr. Hayes provided final design of an Intergraph CAD grading and drainage design for a two-unit expansion of the existing Keahole power plant site. Design included site grading, site roads, and site drainage, including storm water detention and stormwater reinjection.

**NO<sub>x</sub> Abatement Project, Idaho National Engineering Laboratory  
(Sep 1992 - Dec 1992)**

As Civil Design Supervisor, Mr. Hayes supervised final design of an AutoCad grading, excavation, and draining design for a NO<sub>x</sub> abatement process at an existing site, including grading, excavation, utility relocation, emergency fire access, and ammonia storage on a very congested area of Idaho National Engineering Laboratory.

**Rosario Dominicana, Dominican Republic  
(Jun 1992 - Aug 1992)**

As Civil Design Supervisor, Mr. Hayes supervised preliminary design of an 85 million metric tonne per year tailings reservoir, decant reservoir, drainage diversion system, drainage capture and treatment system, and drainage capture around a planned, expanded open pit mining operation. The total area was 1241 hectares with drainage to handle 14.5 million cubic meters of annual runoff. All design and drawings were produced using Microstation, Version 4.0, and Inroads/Insite, Version 4.

**Pathfinder Combined Cycle Expansion, Northern States Power Company  
(Apr 1992 - Jun 1992)**

As Civil Design Supervisor, Mr. Hayes supervised final design of an Intergraph CAD grading and drainage design for a combined cycle facility on the existing Pathfinder generation site. All civil design and construction drawings were produced using Microstation, Version 4.0, and Inroads/Insite, Version 4.0. They included site grading, drainage, road improvements, contractors parking and laydown, and wetlands improvement areas.

**Prairie Island Nuclear Generation Plant, Northern States Power Company  
(Feb 1992 - Apr 1993)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD civil design of an independent spent fuel storage installation site at Prairie Island Nuclear Plant. The design included grading and drainage, 18-foot high, earth protection berms, spent fuel cask transport vehicle access road, security fencing, and drainage from the site to existing off-site drainage facilities.

**Healy Clean Coal Project, Alaska Industrial Development and Export Authority  
(Aug 1991 - Feb 1992)**

As Civil Design Supervisor, Mr. Hayes supervised final design of an Intergraph CAD grading and drainage site design for a second unit at the Healy Power Plant site. The design included excavation, grading and drainage, bottom ash settling pond, fly ash haul road, new access road, and plant parking lot.

**Thompson Falls Hydroelectric Project, Montana Power Company  
(Oct 1991 - Apr 1992)**

As Civil Engineer, Mr. Hayes performed Intergraph CAD grading and quantity development for a detailed cost analysis of a proposed 50 MW second powerhouse at Thompson Falls Power Plant. All civil design and drawings were produced on an Intergraph 32C workstation, using Intergraph's Insite/Inroads civil design program. Work consisted of intake excavation, tailrace excavation, cofferdam quantities, powerhouse excavation, access road, and development of powerhouse concrete quantities.

**Miscellaneous Architect/Engineer Services, Lowry Air Force Base  
(Jun 1991 - Oct 1991)**

As Civil Design Supervisor, Mr. Hayes coordinated mapping, surveying, CAD design, and manual design drafting of a relief storm sewer line approximately two miles in length for a portion of Lowry Air Force Base.

**Engineering Design Services, Department of Defense  
(Jun 1991 - Oct 1991)**

As Civil Design Supervisor, Mr. Hayes supervised final design of Intergraph CAD grading and drainage design of a site for a 17,000 square foot warehouse addition. Design included grading and drainage, excavation of old landfill trash under structure, concrete access road design, asphalt POV parking, and vehicle staging area.

**Public Utility District No. 2 of Grant County, Washington  
(Mar 1991 - Apr 1991)**

As Civil Design Supervisor, Mr. Hayes used Intergraph's site design program and Interview 32C workstation to three-dimensionally model a hydro turbine blade from manufacturer's supplied information. He was responsible for extracting cross sections at specific locations to analyze potential surface wear problems of in-service blades.

**Steamboat Hills Geothermal, Yankee-Caithness Joint Venture  
(Dec 1990 - May 1991)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD civil design of the site work for a geothermal site near Reno, Nevada. All design and drawings were produced on Intergraph Interview 32C workstation, using Microstation and Inroads/Insite software packages.

**Bradley Lake Hydroelectric Project, Alaska Energy Authority  
(Dec 1990 - Apr 1991)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD civil design of a rehabilitation contract, including waterfowl nesting area, fish rearing area, and construction camp rehabilitation.

**Engineering Design Services, Department of Defense  
(Sep 1990 - Dec 1990)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD grading and drainage design of two warehouse sites. One was a general purpose warehouse of approximately 101,000 square feet, and the other was a warehouse addition of approximately 17,000 square feet. Design included grading and drainage, new road design, tank road relocation, and parking.

**Thousand Springs Project Unit No. 1, Great Basin Energy  
(Jan 1990 - Aug 1990)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD civil design of the site work for a coal-fired power plant site near Wells, Nevada. All design and drawings were produced on Intergraph Interview 32C workstation using Microstation and Inroads software packages. Design included grading and drainage for a 160 acre plant site, 14-mile main access road, five miles of plant site roads, 14 mile railroad spur for unit train delivery of coal, evaporation ponds, and ash disposal area.

**Colorado River Water Supply, Unocal  
(Sep 1989 - Nov 1989)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD grading and drainage design of a 14-acre site to accommodate two settling ponds, site access road, and electrical substation. In addition two 5-acre sites located at an existing oil shale processing plant site were designed to accommodate mobile water filter units, access road, backwash pond, and surge basin.

**Denver International Airport, City and County of Denver  
(Dec 1988 - Aug 1989)**

As Lead Civil Engineer, Mr. Hayes was responsible for civil design of Runway 8L-26R site preparation for the new Denver International Airport. The area designed included the main terminal and parking area, a three concourse configuration apron area, Ramp Taxiways K, M and Q, Parallel Taxiway J, Crossfield Taxiways XT-5, XT-4, and XT-H, along with Runway 8L-26R and Parallel Taxiway 3. All design and drawings were done on a VAX 8550 Intergraph CAD system using ESP software. Earthwork volume calculations generated by the Intergraph system were checked using a 80386 PC with DCA V10 software. All construction drawings were translated using a VAX based OCTAL translator to an Autotrol Series 5000 Apollo system per client requirements.

Additionally, Mr. Hayes provided a mass earthwork balance for the entire Phase I Airport Project

(approximately 20 square miles), which included six runways, all associated taxiways, maintenance and support area, terminal area, and concourse-apron area. The total earthwork volume for Phase 1 is approximately 113,000,000 cubic yards.

**Teberebie Goldfield Ltd.  
(Jul 1988 - Nov 1988)**

As Civil Design Supervisor, Mr. Hayes supervised Intergraph CAD civil design of a new open pit gold mining operation in Ghana, Africa. The design included location and grading for a 19-unit family housing area and mess hall. Also included was location and grading of separate sites for an administration and office building with a helicopter landing pad, a maintenance facility, and grading for a 5000 metric ton per day ore crushing plant. In addition, 6200 meters of 9-meter wide access roads and 1600 meters of 24-meter wide heavy vehicle maintenance and ore hauling road was designed using Intergraph's ESP package.

**Southern Pacific Railroad Spur, Lower Colorado River Authority  
(Nov 1987 - May 1988)**

As Lead Civil Engineer, Mr. Hayes was responsible for civil effort of a five route alignment study and CAD-produced preliminary civil design of two twenty-mile rail alignments connecting the Southern Pacific main line near La Grange, Texas with an existing rail unloading loop at Fayette Power Plant.

**Salton Sea Unit 3 Geothermal Power Project, Unocal  
(Mar 1987 - Nov 1987)**

As Civil Design Supervisor, Mr. Hayes was responsible for civil design of the plant site for a geothermal power plant. Site drawings for this project were produced on the Intergraph CAD System.

**Bear Canyon Geothermal Power Project, Freeport  
(Jun 1986 - Jan 1987)**

As Civil Design Supervisor, Mr. Hayes was responsible for civil design of the plant site for a geothermal power plant, including site grading, site drainage, and site access. Design of this plant site was created on the CAD system utilizing IGDS, digital terrain modeling, and earthwork software.

**Land Base Mapping, City of Aurora, Colorado  
(Jan 1987 - Feb 1987)**

As Civil Design Supervisor, Mr. Hayes was responsible for a test project creating CAD-produced base maps for the Public Works Department. Input data was client-supplied recorded subdivision plats and engineering drawings. The graphics files were created using customized Land Base Mapping software to produce a series of base maps for various public works departments.

**Land Base Mapping, Salt River Project  
(Nov 1986 - Dec 1986)**

As Civil Design Supervisor, Mr. Hayes was responsible for creating Intergraph CAD files from client-supplied planimetric mapping, including recorded subdivision plats, quarter-section assessor's maps,

address and street name plats, city street maps, and aerial photography. Graphics files were created using customized Land Base Mapping software to produce a series of base maps for various utility uses.

**Assessor's Mapping, Town of Winchester, Connecticut  
(Apr 1986 - Aug 1986)**

As Civil Design Supervisor, Mr. Hayes was responsible for creating Intergraph CAD files from a combination of stereo-digitized data and planimetric base maps to produce assessor maps in and around Winchester, Connecticut.

**Cloverdale-Geysers Road Improvement, Central California Power Agency  
(Sep 1985 - Apr 1986)**

As Civil Design Engineer, Mr. Hayes was responsible for civil design of highway improvements to two and one-half miles of existing Sonoma County Highway to eliminate substandard alignment conditions.

**Ramsey/Washington Waste to Energy Project, Northern States Power Company  
(Jan 1985 - Aug 1985)**

As Civil Design Engineer, Mr. Hayes was responsible for civil engineering design of a plant site for a refuse derived fuel processing plant. The design included site access and on site roadways capable of handling 500 trucks per day, site grading, and site drainage. The design for this job was developed on Intergraph CAD using IGDS graphics.

**Coldwater Creek Geothermal Power Plant, Central California Power Agency  
(Mar 1984 - Jan 1985)**

As Civil Design Engineer, Mr. Hayes was responsible for civil engineering design of a 13-acre plant site for a geothermal power plant, including site grading, site drainage, and site access. Approximately one-half of the civil drawings on this job were developed on the CALMA CAD System.

**Aidlin Geothermal Project, Geothermal Resources International  
(Jul 1984 - Sep 1984)**

As Civil Design Engineer, Mr. Hayes was responsible for civil engineering design of a 3-acre plant site for a 12.5 MW geothermal power plant in a mountainous region of California, including site grading, site drainage, and site access.

**Fluid Gas Desulfurization Retrofit Project, Wyodak  
(Feb 1984 - May 1984)**

As Civil Design Engineer, Mr. Hayes was responsible for civil engineering design of site modifications to an existing plant site to accommodate installation of a flue gas scrubber, including new roads, site grading, and site drainage.

**Salem Station, Montana Power Company  
(Nov 1983 - Jan 1984)**

As Design Engineer, Mr. Hayes was responsible for supervision of preliminary civil engineering design of nine miles of railroad and the relocation of approximately one-half mile of county road.

**Biomass Combined Cycle Power Plant, OPC Bio-Energy Corporation  
(Jun 1983 - Jul 1983)**

As Design Engineer, Mr. Hayes was responsible for supervision of civil engineering design of the plant site and main access road.

**Sage Point, Dugout Canyon Project, SUNEDCO  
(Oct 1982 - Jan 1983)**

As Lead Civil Engineer, Mr. Hayes was responsible for supervision of the preliminary civil engineering design of twelve miles of railroad, railroad loading loop, and site grading of central facilities area. He also supervised preparation of the plant area, raw coal and clean coal storage areas, two mine portal areas, and one portal area being capable of supporting facilities for miners and equipment to mine 6.7 million tons of coal per year. In addition, he was responsible for preliminary design of 16 miles of main access and maintenance roads to service portal areas and refuge disposal areas.

**Western Fuels Project  
(Jun 1980 - Jan 1983)**

As Design Engineer, Mr. Hayes was responsible for supervision of civil engineering design of three and one-half miles of overland conveyor pad and maintenance road, site grading around transfer buildings, site grading of slot coal storage area, and civil design of 35 miles of electric railroad, railroad loading loop, and maintenance facility area.

**Sacramento Municipal Utility District Geothermal Project  
(Jun 1980 - Jun 1981)**

As Design Engineer, Mr. Hayes was responsible for design of the main access road approximately two miles long through a mountainous region.

**Southeast Project, Public Service Company of Colorado  
(Jun 1980 - Apr 1982)**

As Design Engineer, Mr. Hayes was responsible for supervision of civil engineering functions of the plant site and a 2-mile railroad unloading loop, access roads, etc.