Pacific Gas and Electric Company

Power Generation

245 Market Street
San Francisco, CA 94105

Mailing Address
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P.O. Box 770000
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March 18, 2005

Mr. Constantine G. Tjoumas, P.E., Director
Division of Dam Safety and Inspections
Federal Energy Regulatory Commission
888 First Street, N.E., Room 6NA-01
Washington, D.C. 20426

Project No. 2105-CA, Upper NF Feather River
Nomination of Independent Consultants for
Part 12D Safety Inspection Reports

Dear Mr. Tjoumas:

Pacific Gas and Electric Company, in accordance with Section 12.34 of the Commission's Regulations, nominate Mr. William A. Rettberg and Mr. John H. Northrop as co-Independent Consultants to conduct the safety inspections, and prepare the Part 12D Independent Consultant's Safety Inspection Reports for the following dams and appurtenant structures of the Upper NF Feather River Project No. 2105-CA. Three copies of Mr. Rettberg and Mr. Northrop's professional qualifications are attached.

DAM NAME	REPORT NO.	REPORT DUE DATE
Lake Almanor	8th	December 1, 2005
Butt Valley	8th	December 1, 2005
Belden Forebay	8th	December 1, 2005

The Independent consultants will inspect the project works for the Upper NF Feather Project and evaluate and identify any actual or potential deficiencies that might endanger public safety. Their inspection reports will follow the format of FERC's "Outline for Independent Consultant Inspection Reports", which include the Dam Safety Performance Monitoring Program (DSPMP) and Potential Failure Modes Analyses (PFMA).

If you have any questions, please contact me at (415) 973-3076.

Sincerely,

Wing H. Lee
Facility Safety Coordinator

Attachment

cc: One copy with attachment:
Mr. Takeshi Yamashita, Regional Engineer
San Francisco Regional Office
Federal Energy Regulatory Commission
901 Market Street, Suite 350
San Francisco, CA 94103-1778

One copy w/o attachment:
Mr. William A. Rettberg
GEI Consultants, Inc.
2201 Broadway, Suite 321
Oakland, CA 94612-3017

One copy w/o attachment:
Mr. John H. Northrop
Northrop Engineering Corporation
110 Winn Road
Falmouth, ME 04105

William A. Rettberg, P.E.

EDUCATION

M.E., Civil Engineering/ Business Administration,
University of Colorado, 1984
B.S., Civil Engineering,
University of Illinois, 1971

REGISTRATION

California and Illinois

Mr. Rettberg is the Oakland Branch Manager with GEI. Mr. Rettberg has over 30 years of engineering and management experience which includes a wide range of water resources and environmental projects, including pipelines and penstocks, FERC Part 12 Inspections, dam rehabilitation, hydroelectric projects, water supply, flood control, tunnels, tailing dams, waste impoundments, permitting and licensing, and special projects. Mr. Rettberg has performed complete engineering and project management services from planning and investigation through design and construction management on numerous projects throughout the United States and overseas. During his career, Mr. Rettberg was director of a public water district and understands the issues confronting public agencies.

EXPERIENCE

Pacific Gas and Electric Company FERC Part 12 Safety Inspections, California GEI provided engineering services to the Pacific Gas and Electric Company (PG&E) to conduct FERC Part 12D inspections on 60 hydroelectric power facilities in California. River Basins include: Pit Feather River, Yuba-Bear, American, Mokelumne, San Joaquin, and Kings. These hydropower facilities include a wide variety of dam types including concrete arch, rockfill and earthfill embankments, rubble/masonry, roller compacted concrete, and concrete gravity dams, with heights ranging from 12 to 315 feet. Inspections of powerhouses, spillways and ancillary facilities were also conducted. Experience includes serving on the core team for a beta-test of the Failure Mode Analysis of Tiger Creek and Salt Springs Dams in 2002.

Leroy Anderson Dam FERC Part 12 Safety Inspection, Santa Clara Valley Water District Independent Consultant for 5-year safety inspection and report for critical dam and reservoir located near Morgan Hill, CA. Anderson Dam is a 240-foot high, zoned earth-rock dam close to the active Calaveras Fault

Matthews Dam FERC Part 12 Safety Inspection, Humboldt Bay Municipal Water District, Trinity County, CA Performed safety inspection, including a spillway stability evaluation for this critical water supply and hydroelectric dam on the Mad River.

Nacimiento Dam FERC Part 12 Safety Inspection, California Project Manager and Independent Consultant for FERC Part 12 Safety Inspection of dam and appurtenant structures associated with a hydroelectric project owned by Monterey County Water Resources Agency located in San Luis Obispo County.

Krumbo Dam (OR), Dorris Dam (CA), Jacobs Dam (OR), Swan Lake Dam (NV), and Catnip Dam (NV) Performed dam inspection and prepared Safety of Existing Dams (SEED) reports for these dams owned by the U.S. Fish and Wildlife Service.

Perch Lake Dam (SD), Columbia Road Dam (SD), Little White River Dam (SD), Crab Orchard Dam (IL), Little Grassy Dam (IL), and Devil's Kitchen Dam (IL). Performed detailed dam safety inspections and prepared formal Safety of Existing Dams (SEED) reports for dams in South Dakota and Illinois including four significant high hazard dams, owned by U.S. Fish and Wildlife Service. Devil's Kitchen Dam is a 120-ft. high concrete gravity dam and is located near Carbondale, Illinois.

Strontia Springs Dam Hydroelectric Project, Cabin Creek Pumped Storage Hydroelectric Project and New Don Pedro Dam Hydroelectric Project Assisted the Independent Consultant on four FERC Part 12 Safety Inspections including the Strontia Springs Dam Hydroelectric Projects in Colorado (initial and second reports), the Cabin Creek Pumped Storage Hydroelectric project in Colorado (fifth report), and the New Don Pedro Dam Hydroelectric Project in California.

Butt Valley Dam Seismic Upgrade, Plumas County, California Project Manager during construction phase to improve stability of a PG&E embankment dam located at the headwaters of the North Fork Feather River. The project included oversight and management of resident field construction engineer.

Milton Lake Dam, Farmers Reservoir and Irrigation Company, Weld County, Colorado Project Manager for the rehabilitation of an 85 year old, concrete-faced embankment dam. The design included 30,000 square yards of innovative, slip-formed, fiber-reinforced, concrete lining for the dam replacement of deteriorated lining, and over 1200-feet of new steel sheet piling to replace deteriorated wooden piling. Services included design and quality assurance during construction.

Scott Dam Rehabilitation Project, California Project Manager for feasibility study addressing increasing stability of a 120-foot-high concrete gravity dam owned by PG& E. Alternatives to improve the stability included large drilled piers, roller compacted concrete (RCC) buttress, and post tensioned anchors (PTAs).

Lake Fordyce Dam Face Improvement Project, Emigrant Gap, California Project Manager/Project Engineer for PG&E's Lake Fordyce Dam Face Improvement Project. Project services included detailed inspection of a 140-foot-high, concrete faced, rockfill dam built in stages over a 100-year period. Preparation of detailed designs, plans, and specifications were included.

Devil's Gate Dam, Pasadena, California Project Coordinator for the rehabilitation during the pre-feasibility and pre-design phases of the work. Devil's Gate is a debris control and flood control facility operated by the Los Angeles County Public Works Department near Pasadena, California. Project involved a seismic and hydrologic upgrade to meet current (DSOD) earthquake and flood criteria.

Elkhead Lake, Craig, Colorado Project Manager for the spillway modification

study to increase the water storage and meet the flood passage criteria of the State Engineer. Dam raising was evaluated as well as, modification to the duckbill chute spillway.

Silver Lake Dam, Goose Lake Dam and Lake Albion Dam, City of Boulder, Colorado Project Manager for a comprehensive, basinwide safety and rehabilitation assessment of five water supply dams. For three of the dams, located in a high, alpine environment, directed preparation of designs, plans, and specifications for safety and operational improvements, including helicopter construction requirements and a roller-compacted concrete (RCC) overtopping section. The Silver Lake Dam included expansion of a side channel spillway. The Goose Lake Dam modification included a RCC overtopping buttress section. Lake Albion modifications included a new valve house.

Barr Lake Dam, Farmers Reservoir and Irrigation Company, Brighton, Colorado Project Manager for relining the embankment dam. Project included design and construction services for 58,000 square yard of innovative, steel-fiber-reinforced concrete lining.

Corbett Irrigation Water Supply Dam and Tunnel, Cody, Wyoming Project Manager for rehabilitation analysis of 3.3-mile-long Corbett Irrigation Water Supply Dam and Tunnel near Cody, Wyoming, operated by the Shoshone and Deaver Irrigation Districts. Field investigations incorporated core holes and pulse-echo soundings to determine the physical condition of the 75-year-old concrete lining and the surrounding bedrock. Analysis revealed the tunnel was basically sound but required an extensive contact grouting program to seal voids above the tunnel's crown. The study saved the client $10 Million, as compared with the next-best alternative.

Beaver Park Reservoir, Colorado Division of Wildlife, South Fork, Colorado Project Coordinator for feasibility study to enlarge spillway capacity to accommodate the probable maximum flood at Beaver Park Reservoir near South Fork, Colorado. Work included foundation investigations, alternative layouts, and cost estimates for a side channel spillway modification.

PIPELINES AND PENSTOCKS

Bill Rettberg has experience on a wide range of pipelines and penstocks. His experience includes steel, concrete, and wood pipelines under varying terrain and head conditions. In addition, he served on an ASCE taskforce that developed guidelines for inspection and evaluation of in-service penstocks published in 1998.

Raw Water Seismic Improvement Project, California Project Manager for investigation, testing, and geotechnical aspects for four separate projects to improve the water supply reliability during seismic events for Contra Costa

Water District. The district serves over 400,000 people east of San Francisco. Projects included an evaluation of a pipeline crossing an active fault; design of a new 48-in diameter, 2,600-ft long pipeline for redundancy; evaluation of a site for an emergency interconnection to another aqueduct; and evaluation of the liquefaction potential of petroleum pipelines crossing the main water supply canal.

Mokelumne Aqueduct, California Project engineer for a study to evaluate whether the hydraulic head could be increased on this 82-mile long aqueduct serving 1.3 million people. This study is part of the Raise Pardee Dam and Associated Improvements Project, a feasibility study to evaluate raising a major concrete gravity dam 50 to 100 feet.

Tule Woodstave Penstock Replacement Project, California Project Manager for a feasibility study to replace 1,000-feet of a 6-foot-diameter woodstave penstock for PG&E's Tule Hydroelectric Powerhouse. Studies included field evaluation, alternatives, costs, recommendation for replacement with steel pipe, and preliminary engineering.

Lake Valley Pipeline, California Project Coordinator for the replacement feasibility study in northern California for PG & E. Project involved establishing design criteria and preliminary designs for a steel pipeline delivering water to a hydroelectric power project under high head conditions.

Replacement of Pipeline Segment, Boulder, Colorado Project Manager for a feasibility study of improvements to a 12-mile-long, low head, concrete penstock delivering water to a hydroelectric power project near Boulder, Colorado. Project involved a condition assessment, geotechnical evaluation, hydraulic analysis, and recommendations for repairs/replacement of a pipeline segment and five major inverted siphons.

Drainage Pipeline Replacement Project, Lafayette, California Project Manager for the feasibility of replacing a deteriorated CMP storm drainage line beneath the busiest intersection in the city. Evaluated *in situ* rehabilitation and total replacement options. Constructability, costs, and minimizing traffic disruptions were considered.

HYDROELECTRIC AND LICENSING PROJECTS

Cabin Creek Pumped-Storage, Colorado Project Manager for 300-MW Cabin Creek Pumped-Storage Project. Project involved FERC 5-year safety inspection, probable maximum and incremental-damage flood studies, and remedial work. Completed final design and construction services for new over-the-dam concrete auxiliary spillway.

Georgetown and Salida Project, Colorado Project Manager for FERC relicensing of the Georgetown and Salida hydroelectric project.

Seminoe Dam, Wyoming Project Coordinator for the USER Rim Basin pumped-Storage hydroelectric projects.

Iron Creek Diversion Dam, Shoshone Irrigation District, Cody Wyoming Project Manager for feasibility study of a new dam and 6-MW hydroelectric power plant on the Shoshone River. The work scope included layouts, mapping, power and economic analyses, and cost estimates.

Guri Project, Venezuela Project Engineer for stability studies for massive embankment dams flanking major concrete gravity dam. Guri is the world's second largest hydroelectric project.

Commonwealth Edison, Illinois Project Engineer for siting of a dam and upper reservoir for a 2,000- to 3,000-MW underground pumped-Storage generating facility. Work also included planning and field studies.

2,100-MW Bath County Pumped-Storage Project, Virginia Field Engineer for embankment materials exploration associated with the upper reservoir dam for the 2,100-MW Bath County Pumped-Storage Project.

5-YEAR FERC[1] PART 12, SEED[2], AND OTHER DAM INSPECTIONS
1986-2005
Completed by William A. Rettberg, P.E.

Project	State	Inspection Type: FERC Part 12	FERC PFMA[3]	SEED	Other	Dam Safety Trainer	Year	Dam Type
Cedar Springs Dam	CA	x	x				2005	Earth & rockfill
Devil Canyon Dam	CA	x	x				2005	Earthfill
Elderberry Dam	CA	x	x				2005	Earth & rockfill
Pyramid Dam	CA	x	x				2005	Earth & rockfill
Quail Lake Dam	CA	x	x				2005	Earthfill
Merced Falls Dam	CA		x(4)				2004	Concrete gravity & earthfill
Wishon Dam	CA		x(4)				2004	Concrete-faced rockfill
Courtright Dam	CA		x(4)				2004	Concrete-faced rockfill
Balch Afterbay Dam	CA	x	x				2004	Concrete arch
Balch Diversion Dam	CA	x	x				2004	Concrete arch
Chili Bar Dam	CA	x	x				2004	Concrete gravity
Crane Valley Dam	CA	x	x				2004	Earth & rockfill
Kerckhoff Dam	CA	x	x				2004	Concrete gravity
Blue Lake Dam	CA	x	x				2003	Embankment
Fuller Lake Dam	CA	x	x				2003	Embankment
Kidd Lake Dam	CA	x	x				2003	Embankment
Lake Fordyce Dam	CA	x	x				2003	Concrete faced rockfill
Lake Spaulding Dam (3 Dams)	CA	x	x				2003	Concrete arch, gravity and buttress dams
Lake Valley Dam	CA	x	x				2003	Embankment
Meadow Lake Dam	CA	x	x				2003	Embankment
Rucker Lake Dam	CA	x	x				2003	Embankment
Upper Peak Lake Dam	CA	x	x				2003	Embankment
Lower Bear River Dam	CA	x	x				2002	Concrete faced rockfill
Upper Bear River Dam	CA	x					2002	Gunite faced rockfill
Upper Blue Lake	CA	x					2002	Embankment
Lake Tabeaud	CA	x					2002	Embankment
Tiger Creek Afterbay	CA	x	x				2002	Concrete arch
Salt Springs Dam	CA	x	x				2002	Concrete faced rockfill
Tiger Creek Regulator	CA	x					2002	Concrete slab & buttress
Westville Dam (Corps)	MA				x	x	2002	Embankment
Anderson Dam	CA	x					2001	Earth Rock Embankment
R.W. Matthews Dam	CA	x					2001	Earthfill
Iron Canyon	CA	x					2001	Embankment
Manzanita	CA	x					2001	Compacted arch dam
McCloud	CA	x					2001	Embankment
North Battle Creek	CA	x					2001	Embankment
Pit 1	CA	x					2001	Compacted earth and rockfill
Pit 3	CA	x					2001	Concrete gravity
Pit 4	CA	x					2001	Concrete gravity & slab and buttress
Pit 5 Open Conduit	CA	x					2001	Embankment
Pit 6	CA	x					2001	Concrete gravity
Pit 7	CA	x					2001	Concrete gravity
Muskrat Dam	CO			x		x	2001	Embankment
Stang Lake Dam	ND			x		x	2001	Embankment
Dam 357	ND			x		x	2001	Embankment
Lake Darling Dam	ND			x		x	2001	Embankment
Lower Pine Lake Dam	WA			x		x	2001	Embankment
Rynearson 1 & 2 Dams	WI			x		x	2001	Embankment
Orangeburg Substation Dam	SC			x		x	2001	Embankment
Cash Lake	MD			x		x	2001	Embankment
Lake Ilo	ND			x		x	2000	Embankment
Umbarger	TX			x		x	2000	Embankment w/RCC
Comanche	OK			x		x	2000	Embankment
Grama	OK			x		x	2000	Embankment
Rush	OK			x		x	2000	Embankment
Jed Johnson	OK			x		x	2000	Embankment
New Elmer Thomas	OK			x		x	2000	RCC
Dorris Dam	CA			x		x	2000	Earthfill
North Attleboro	MA			x		x	2000	Embankment
Erie	PA			x			2000	Embankment

[1] Federal Energy Regulatory Commission

[2] Safety Evaluation Existing Dams (Department of the Interior)

[3] FERC New Potential Failure Mode Analysis (PFMA) Workshops and Report. Did initial Beta Tests of new program on Tiger Creek Regulator and Salt Springs dams in 2002.

[4] FERC/PFMA Independent Facilitator

		Inspection Type						
Project	State	FERC Part 12	FERC PFMA[3]	SEED	Other	Dam Safety Trainer	Year	Dam Type
Lake Almanor	CA	x					2000	Hydraulic fill
Butt Valley	CA	x					2000	Embankment/Hydraulic
Belden Forebay	CA	x					2000	Rockfill
Rock Creek	CA	x					2000	Concrete gravity
Cresta	CA	x					2000	Concrete gravity
Bucks Storage	CA	x					2000	Rockfill
Bucks Diversion	CA	x					2000	Concrete arch
Grizzly Forebay	CA	x					2000	Concrete arch
Philbrook	CA	x					2000	Earthfill
Lake Ho Dam	ND			x			2000	Earthfill
Balch Afterbay Dam	CA	x					1999	Concrete arch
Balch Diversion Dam	CA	x					1999	Concrete arch
Caples Lake Dams	CA	x					1999	Earthfill embankment & concrete arch
Chili Bar Dam	CA	x					1999	Concrete gravity
Courtright Dam	CA	x					1999	Concrete-faced rockfill
Crab Orchard Dam	IL			x			1999	Earthfill
Devil's Kitchen Dam	IL			x			1999	Concrete gravity
Dorris Dam	CA			x			1999	Embankment
Echo Lake Dam	CA	x					1999	Roller compacted concrete
El Dorado Forebay Dam	CA	x					1999	Earthfill
Little Grassy Dam	IL			x			1999	Earthfill
Medley Lake Dams	CA	x					1999	Mortared masonry
Quiver Creek Dam	IL			x			1999	Steel sheetpile
Scott Dam	CA	x					1999	Concrete gravity
Silver Lake Dam	CA	x					1999	Earth and rockfill embankment
Taylor Draw Dam	CO	x					1999	Reinforced-earth spillway & earthfill
Wishon Dam	CA	x					1999	Concrete-faced rockfill
Blue Lake Dam	CA	x					1998	Earthfill & rockwall
Crane Valley Dam	CA	x					1998	Earth & rockfill
Drum Afterbay Dam	CA	x					1998	Concrete arch
Drum Forebay Dam	CA	x					1998	Earthfill
Fuller Lake Dam	CA	x					1998	Rockfill w/ gunite face
Gross Dam	CO	x					1998	Concrete gravity arch
Halsey Afterbay Dam	CA	x					1998	Rockfill
Halsey Forebay Dam	CA	x					1998	Earthfill
Kerckhoff Dam	CA	x					1998	Concrete gravity
Kidd Lake Dam	CA	x					1998	Earth & rockfill w/ gunite face
Lake Fordyce Dam	CA	x					1998	Concrete faced rockfill
Lake Spaulding Dams	CA	x					1998	Concrete arch, concrete gravity & rockfill
Lake Valley	CA	x					1998	Earth & rockfill
Meadow Lake Dam	CA	x					1998	Earth & rockfill w/ gunite face
Merced Falls Dam	CA	x					1998	Concrete gravity & earthfill
Nacimiento Dam	CA	x					1998	Earthfill
Rock Creek Drum Dam	CA	x					1998	Concrete multiple arch, earth & rockfill
Rucker Lake	CA	x					1998	Earth & rockfill
Upper Peak	CA	x					1998	Earth & rockfill
Wise Forebay Dam	CA	x					1998	Earthfill
Butt Valley Dam	CA		x				1997	Earthfill
Catnip Dam	NV			x			1997	Earthfill
Dorris Dam	CA			x			1997	Earthfill
Jacobs Dam	OR			x			1997	Earthfill
Krumbo Dam	OR			x			1997	Earthfill
Moccasin Reservoir Dam	CA		x				1997	Earthfill
Swan Lake Dam	NV			x			1997	Earthfill
Columbia Road Dam	SD			x			1996	Earthfill
Crab Orchard Dam	IL			x			1996	Earthfill
Devil's Kitchen Dam	IL			x			1996	Concrete gravity
Don Pedro Dam	CA	x					1996	Earth & rockfill
Little Grassy Dam	IL			x			1996	Earthfill
Little White River Dam	SD			x			1996	Earthfill
Milton Lake Dam	CO				x		1996	Concrete faced earthfill
Perch Lake Dam	SD			x			1996	Earthfill
Lake Fordyce Dam	CA		x				1995	Concrete faced rockfill
Scott Dam	CA		x				1995	Concrete gravity
Devil's Gate Dam	CA				x		1992	Concrete gravity
Strontia Springs Dam	CO	xx					1991	Concrete arch also in 1986
Georgetown & Salida Hydro	CO		x				1990	Earth & rockfill
Cabin Creek Pumped Storage	CO	x					1989	Concrete faced rockfill (upper dam)
Cabin Creek Pumped Storage	CO	x					1989	Earth & rockfill (lower dam)
Goose Lake Dam	CO				x		1988	Earthfill
Lake Abion Dam	CO				x		1988	Concrete gravity
Silver Lake Dam	CO				x		1988	Earthfill

NEC
NORTHROP ENGINEERING CORPORATION

John H. Northrop, P.E.
Principal Engineer

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Fax: (207) 878-3279
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Education

Vermont Technical College, Randolph, Vermont - Associate in Civil Engineering Technology, 1970

Northeastern University, Boston, Massachusetts - Bachelor in Civil Engineering Technology, 1975

Professional Licensing/ Registration

Professional Engineer - Colorado, Georgia, Idaho, Maine, Massachusetts, New Hampshire, New York, Ohio, Pennsylvania, Texas, and Vermont

Professional Affiliations

Member, American Society of Civil Engineers
Member, Association of State Dam Safety Officials
Member, National Society of Professional Engineers
Member, United States Society on Dams
Member, ASCE Task Committee for Inspection and Monitoring of In-Service Penstocks (1995-98)
Member, ASCE Task Committee for Guidelines for Inspection and Evaluation of Water Control Gates (ongoing)

Summary of Experience

Mr. Northrop has over 34 years of experience in the design, construction and inspection of electrical power plants and industrial projects as well as experience in operation and maintenance of hydroelectric stations and related fish passage facilities.

Prior to joining Northrop Engineering Corp., he was Principal Engineer with Duke Engineering & Services, Inc (formerly Northrop, Devine & Tarbell, Inc.) serving as the Project Manager/Engineer on major power plant projects. He also performed several five-year Part 12 Safety Inspections as the FERC – Approved Independent Consultant.

Prior to joining Duke Engineering & Services, Inc. he was a Senior Project Engineer serving on major power plant projects in the Energy Division of E.C. Jordan Company. He also provided technical direction on all hydroelectric projects within the Jordan Company.

Prior to joining the Jordan Company, Mr. Northrop was the Project Engineer with C. T. Main, Inc. assigned to the 176-MW Safe Harbor Hydroelectric Plant Expansion and directed all civil and structural activities for the addition of five new units to this Project.

Before joining C. T. Main, Inc., Mr. Northrop held various positions with Stone & Webster Engineering Corp. involved in the engineering of one nuclear, one fossil fueled, and three hydroelectric power plants.

In addition, Mr. Northrop has served as a Construction Rigger for the Vermont Marble Company and managed the operation and maintenance activities at the West Enfield Hydroelectric Project.

DETAILED PROJECT EXPERIENCE

Big Creek Dam No. 7, Shaver Lake Dam, and Rush Meadows Dam, Southern California Edison Company, Sierra Nevada, California – Independent Consultant responsible for providing the criteria for stability analysis and evaluating the results of the stability analysis of the water retaining structures at these projects.

Skelton Hydroelectric Project, Florida Power & Light Energy, Saco, Maine – Project Engineer responsible for the complete design of a fish lift to convey fish over the dam. This work included temporary removal of the downstream fish passage, cofferdam design, rock excavation and demolition plan, concrete substructure and steel superstructure design, and a motorized fish hopper traveling up/down an inclined lift system.

Echo Lake Dam, Citizens Utilities Company, Newport, Vermont – Project Manager/Engineer responsible for the rehabilitation of the dam. This work included concrete resurfacing of the spillway and gate outlet structures and demolition of the top of the spillway crest for increased water passage.

Newport Hydroelectric Project, Citizens Utilities Company, Newport, Vermont – Independent Consultant responsible for the internal inspection and evaluation of approximately 3,800 linear feet of penstock and 12-foot-diameter surge tank.

Schaghticoke Penstock Replacement, Niagara Mohawk Power Company, Schaghticoke, New York – Project Engineer responsible for the replacement of a failed penstock including a river crossing support structure and stabilization of a steep support slope.

Auglaize Hydroelectric Project, City of Bryan, Bryan, Ohio – Project Manager/Engineer responsible for the condition assessment of the project structures, replacement of the powerhouse intake and gated spillway, and rehabilitation of the ungated spillway.

FERC Part 12 Dam Safety Inspections, Southern California Edison Company, 23 Dams and 1 Canal, California - FERC-approved Independent Consultant for the five-year Part 12 Safety Inspections in 1997 and 2002 for projects including Shaver Lake, Florence Lake, Big Creek/Huntington, Mammoth Pool, Vermilion, and several other projects on the east and west slopes of the Sierra Nevada Mountains. The projects include a mix of earthfill, earth and rockfill, concrete faced rockfill, concrete gravity, and concrete multiple arch dams.

Private Sector Hydropower Development, Kingdom of Nepal – A member of a team of consultants who participated in Nepal's efforts through USAID to promote private sector hydropower development for the Kingdom. This work included writing draft requirements for the design and construction of hydropower plants in Nepal.

FERC Part 12 Dam Safety Inspections, Pacific Gas & Electric Company, Sacramento River Tributaries, California - FERC-approved Independent Consultant for the five-year Part 12 Safety Inspections for four projects, including nine dams: McCloud, Iron Canyon, Pit 1, Pit 3, Pit 4, Pit 5, Pit 6, Pit 7, and North Battle Creek dams. The projects include a mix of earthfill, earth and rockfill, concrete faced rockfill, concrete gravity and slab/buttress dams up to 235 feet in height.

Bad Creek Pumped Storage Project, Dam Safety Inspection, Duke Power Company, Bad Creek, South Carolina - Participated in the first five-year FERC Part 12 Safety Inspection of Duke Power Company's 1,065 MW Bad Creek Pumped Storage Project. The project includes three earth fill, rock shell dams up to 360 feet in height, a 31,338 acre-feet upper reservoir, and a four single stage reversible pump/turbines with vertical-type motor/generators situated in a powerhouse cavern located about 600 feet underground. The project includes several hundred feet of power, tailrace and access tunnels mined in gneissic bedrock. The head difference between the upper and lower reservoir is up to 1,200 feet.

Pontook Hydroelectric Project, Swift River Hafslund Company, Dummer, New Hampshire - Project structural engineer responsible for conducting due diligence for acquisition of this 10.7 MW hydroelectric project on the Androscoggin River in northern New Hampshire.

Murphy Dam, New Hampshire Department of Environmental Services, Pittsburg, New Hampshire - Lead structural engineer responsible for the assessment of stability and structural integrity of the structures for this hydroelectric project. This work included measuring the penstock thickness ultrasonically to determine life expectancy.

McKay and Weldon Hydroelectric Stations, Bowater-Great Northern Paper Company, Millinocket, Maine - Project manager and lead structural engineer responsible for the preliminary design, scope document, schedule, and budget estimate required to convert both stations to 60 Hertz from 40 Hertz generation.

Rocky Reach Fish Bypass Project, PUD No. 1, Chelan County, Washington - Project structural engineer for the design of two large venturi control gates guides and lifting beam as part of a downstream migrant fish collection and passage.

Lake Blackshear Dam, Crisp County Power Commission, Warwick, Georgia - Project Manager/Project Engineer responsible for overall management and engineering for the design and construction monitoring for the earth embankment repairs, including temporary cofferdams, additional spillway capacity, and cement-bentonite slurry wall installation. Repairs were required after the dam was breached as a result of flooding from tropical storm Alberto.

Clyde River Hydro Project, Citizens Utilities Company, Newport, Vermont - Project Engineer responsible for the design to restore the dam due to overtopping and erosion failure and participated in a feasibility study for project redevelopment alternatives. During restoration of the dam and a turn of events, it was decided to remove the dam and decommission the powerhouse.

Spencer Hydro Project, Nebraska Public Power District, O'Neil, Nebraska - Project Engineer responsible for a feasible study for continued operation of the hydro facility including refurbishing, upgrading, and decommission options while assessing engineering, operation/maintenance, environmental, licensing, and economic impacts.

Lake Chelan Expansion Project, Public Utility District No. 1, Lake Chelan, Washington - Project Engineer responsible for a feasibility study to determine the potential for expanding the existing hydroelectric project from 50 MW to potentially 150 MW. Four schemes were studied including a new intake tunnel with above and below ground powerhouses and silo-type powerhouse layouts.

Rock Creek Dam (Drum), Seismic Rehabilitation Feasibility Study, Pacific Gas & Electric Co., Rock Creek, California - Project Engineer and lead structures engineer for a feasibility study to rehabilitate a 1,020-foot-long, 35-foot-high multiple arch dam for Pacific Gas & Electric Company. The dam was suspected of being deficient to resist instability due to cross-channel seismic loading by the California State Department of Safety of Dams (DSOD). Work included development of a number of different feasible remediation alternatives.

Hampden Operations Center, Bangor Hydro-Electric Company, Hampden, Maine - Project Engineer responsible for the site development of a 25-acre parcel to provide headquarter facilities for Bangor Hydro-Electric Company. This work included site regrading and design of roads, parking, drainage system, underground utilities, and wetland preservation. Construction of this project has been delayed.

Brassua Hydroelectric Project, Expert Witness for Piping Failure, Rockland, Maine - Expert witness for the contractor during post-construction litigation of a piping failure which developed during construction. The piping developed underneath the existing concrete gravity dam founded on glacial till. He provided a deposition during the discovery period and made a technical presentation for a mediation hearing on the design and constructability of the penstock intake and a review of the chronology of events leading to the piping failure.

Baldwin Hydroelectric Project, Baldwin Hydroelectric Corporation, Clarksville, New Hampshire - Project Engineer responsible for the design of this 4.4 MW hydroelectric facility including reconstruction of an abandoned dam, canal intake, new 4,600-foot-long power canal, penstock intake, penstock, powerhouse, and tailrace structures.

Ellsworth Hydroelectric Project, Bangor Hydro-Electric Company, Ellsworth, Maine - Project Engineer responsible for the study to determine the most viable method to bring the Ambersen-type dam into compliance with the FERC stability criteria. Following completion of the study, he served as an engineering consultant responsible for the quality assurance for the design of the selected remediation alternative.

Graham Lake Dam Project, Bangor Hydro-Electric Company, Ellsworth, Maine - Project Engineer responsible for the detailed feasibility study to assess potential remediation alternatives to bring the embankment dam and gated concrete spillway into compliance with the FERC stability criteria. The study included identification of alternatives, development of conceptual layouts, detailed hydrology/hydraulic assessments, cost estimates, and identification and review of environmental resource concerns. Alternatives considered were raised and armored embankments, cellular dam, and conventional and roller-compacted concrete. Following completion of the study, he served as engineering consultant responsible for the qual assurance for the design of the selected remediati alternative.

Ellsworth Hydroelectric Project, Bangor Hyd Electric Company, Ellsworth, Maine - Proj Engineer responsible for the forebay modificatio This project consisted of installation of a tempor cellular cofferdam, replacement of an existi forebay structure with a new intake structure wh includes slide gates, a downstream fish passa facility, provisions for a future upstream fishway, a the extension of 3 steel penstocks.

West Enfield Hydroelectric Project, Bangor-Pac Hydro Associates, West Enfield, Maine - Pl Manager for the overall operation and maintenar activities for the 20 MW hydroelectric station on Penobscot River. This work also included operati and maintenance of three radial gates and hoi intake and draft tube gates, various slide ga flashboards, and upstream and downstream f passage facilities.

West Enfield Hydroelectric Project, Bangor-Pac Hydro Associates, West Enfield, Maine - Proj Engineer responsible for the technical content, des and overall quality for this 20 MW project on Penobscot River. The project design includ cofferdams, removal of a timber crib dam, a n powerhouse, spillway, fish passage facilities, a expansion of the existing capacity from 2,500 cfs 14,000 cfs. Fish passage facilities included design a new vertical slot fishway with a three entra collection gallery, tailrace attraction water suppl pumping system, and a fish monitoring facility wit viewing window. Also was directly responsible the layout and design of three 26-foot by 26-f radial gates which were included in the dam provide spillway capacity and aid in the replacem of flashboards.

Pontook Hydroelectric Project, Combust Engineering, Dummer, New Hampshire - Proj Engineer responsible for the design of the Pont Hydroelectric Project in Dummer, New Hampsh The project included cofferdams, replacement o timber crib dam, a 6,000-foot-long power ca power canal intake structure, penstock int structure and trash rake, three 8-foot-diam penstocks, a powerhouse housing three identi tubular type turbines and accessory electri equipment, a 1,000-foot-long tailrace, and substation. The project is rated at 11.4 MW at 58 f of head. The project was selected by the Consult Engineers of Maine to receive the "Award Engineering Excellence" in January 1988.

Dolby Hydroelectric Project, Great Northern Pa Company, East Millinocket, Maine - Proj Engineer responsible for the design for this 6 M $5.0 million installation of a new No. 5 turbi generator in the existing Dolby Station. The des required significant electrical equipment relocat

and powerhouse demolition in order to prepare the No. 5 turbine bay for the new unit.

Lockwood Hydroelectric Project, Central Maine Power Company, Waterville, Maine - Project Engineer responsible for the design for this 2.1 MW project on the Kennebec River, which was installed in a new powerhouse located between the existing Lockwood Station and a mill facility. The design included a split axis turbine due to the site configuration. Also responsible for the rehabilitation of the gated headworks structure located at the upstream end of the canal.

Safe Harbor Hydroelectric Project, Safe Harbor Water Power Corporation, Conestoga, Pennsylvania - Project Lead Structural Engineer on this 188 MW, 5-unit expansion of the Safe Harbor Hydroelectric Project for Safe Harbor Water Power Corporation, Baltimore, Maryland. Directed all the civil and structural activities for the project; including the plant layout, design studies, design criteria, specifications, calculations, schedules, estimates and engineering-construction coordination. Also responsible for the development of the access road, site preparation, unwatering and sediment removal schemes and complete powerhouse structure.

Prairie Island Nuclear Plant, Northern States Power Company, Redwing, Minnesota - Structural Engineer on modification to this 550 MW plant. Responsible for the civil and structural design effort for the modifications to the cooling water system of the existing plant. Supervised a squad of engineers and drafters. The new screenhouse with gates, trash racks, and a continuous traveling screen system to remove fish and larvae, discharge, and de-icing system pumphouse; including internally braced cofferdams, concrete substructures were all designed under his direction. Also supervised the design for the roadwork, dikes and sheet piling retaining walls for the project.

Rocky Reach Hydroelectric Project, Public Utility District No. 1, Chelan County, Washington - Lead Structural Engineer on modification to this 1,300 MW project. Responsible for the preparation of the stability analysis for the project structures; including the powerhouse, service bay, forebay, center dam, spillway and east abutment. Also responsible for the design of a post-tensioned anchor system for the existing structures to meet the raised pool condition of three feet and the latest stability analysis requirements.

Osage Hydroelectric Project, Union Electric Company, St. Louis, Missouri - Structural Design Engineer on modification to this 172 MW project. Made on-site evaluations of the existing condition of the Bagnell Dam. Responsible for the preparation of the stability analysis and the design of a post-tensioned anchor system for the existing spillway, powerhouse, and non-overflow structures for the probable maximum flood conditions.

Rock Island Hydroelectric Project, Public Utility District No. 1, Chelan County, Washington - Structural Design Engineer on the 410 MW project. Responsible for the structural, architectural, and civil design calculations and drawings for the project. This project included the removal of a portion from the existing dam and construction of the new powerhouse, which now houses the first bulb turbines to be placed into service in the United States. This project also included; modifications to the existing powerhouse, spillway, and non-overflow section originally built in 1931.

Rock Island Hydroelectric Project, Public Utility District No. 1, Chelan County, Washington - Structural Senior Designer on this 410 MW project. Participated in the conceptual structural design of the second powerhouse. Responsible for the design of the intake area, mat, headworks, and turbine pit walls of the second powerhouse. He prepared the stability analysis and drawings for the Federal Power Commission license application. Also designed the middle fish ladder, diffusion chamber, make-up water supply, and the fish counting facilities. He participated in the design and the detailing of the post-tensioned anchors used in the modifications of the existing structures, and the design modifications and relocation of the spillway gate hoists and latch frames.

Maine Yankee Nuclear Project, Maine Yankee Atomic Power Company, Wiscasset, Maine - Structural Designer on modification to this 850 MW project. Responsible for the design and drawings for the circulating water diffuser discharge system which included; dikes, retaining walls, intake and discharge structures, steel gates and gate guides, civil work, excavation and pipeline layout.

Northport Diffuser Pump Station - Structural Senior Draftsman on this project. Responsible for the design of trashrack and stoplog gate guides. Developed details and prepared original steel drawings.

Northfield Pump Storage Project, Northeast Utility Company - Structural Senior Draftsman on this 1,000 MW project. Responsible for the design of the Metropolitan District Commission intake abutment slab, guard wall in the access tunnel and security portal room. Developed concrete and steel drawings for the M.D.C. intake structure and intake bridge; including fish screens, lifting beams, and stop logs. Developed details and prepared original concrete and steel drawings for various areas of the powerhouse.

Oswego Steam Station, Unit No. 5, Niagara Mohawk Power Corporation, Oswego, New York - Structural Senior Draftsman on this 800 MW project. Responsible for the design of the footings for the fuel oil pipe supports, floor systems in the screenwell structure, various steel platforms, concrete pilasters and trashracks. Developed details and prepared drawings for the steel gates and guides, dogging devices and concrete for the screenwell structure.

Shoreham Nuclear Project, Long Island Lighting Company, New York, New York - Structural Draftsman on this 850 MW project. Responsible for the development of details and drawings for such areas as; office and service building, turbine building; and the reactor containment.

Marble Valley Pump Storage Project, Virginia Electric and Power Company - Structural Draftsman on this 1,500 MW project. Responsible for the development and preparation of various concrete and steel drawings; including the spillway and radial gates. This project was not constructed due to geological site conditions.

Vermont Marble Company, Proctor, Vermont - Construction Rigger on various plant facilities for this company. Worked on general carpentry, major repairs and overhaul of hydroelectric turbines and generators. Also installed heavy machinery for marble cutting and finishing, built formwork, placed concrete, and repaired flashboards on dams.

FERC Potential Failure Mode Analysis Facilitator

- Mongaup Falls Hydroelectric Project
- Rio Hydroelectric Project

FERC 5-Year Safety Inspections - FERC-approved Independent Consultant responsible for 5-year Part 12 Safety Inspections at the following projects:

- Dundee Hydroelectric Project
- Ellsworth Hydroelectric Project
- Graham Lake Dam
- Stillwater Hydroelectric Project
- Veazie Hydroelectric Project
- Bad Creek Hydroelectric Project
- Buzzards Roost Hydroelectric Project
- Holyoke Hydroelectric Project
- Hydro-Kennebec Hydroelectric Project
- North Highlands Hydroelectric Project
- Vischer Ferry Hydroelectric Project
- Crescent Hydroelectric Project
- Tallulah Falls Hydroelectric Project
- Tugalo Hydroelectric Project
- Yonah Hydroelectric Project
- Nacoochee Hydroelectric Project
- Burton Hydroelectric Project
- Mathis-Terrora Hydroelectric Project
- Bartletts Ferry Hydroelectric Project
- Gem State Hydroelectric Project
- St. Lawrence/FDR Power Project
- Hells Canyon Hydroelectric Project
- Brownlee Hydroelectric Project
- Oxbow Hydroelectric Project
- Newport Hydroelectric Development
- Lake Blackshear Hydroelectric Project
- Agnew Lake Dam
- Balsam Meadow Dam
- Big Creek Dam 4
- Big Creek Dam 5
- Big Creek Dam 6
- Big Creek Dam 7
- Bishop Creek Intake and Dam
- Borel Canal
- Florence Lake Dam
- Gem Lake Dam
- Hillside Dam
- Huntington Lake Dam 1
- Huntington Lake Dam 2
- Huntington Lake Dam 3
- Huntington Lake Dam 3A
- Lundy Lake Dam
- Portal Forebay Dam
- Mammoth Pool Dam
- Rush Meadow Dam
- Shaver Dam
- Sabrina Dam
- Saddleback Dam
- Tioga Lake Dam
- Vermillion Dam
- Iron Canyon Dam
- McCloud Dam
- North Battle Creek Dam
- Pit 1 Forebay Dam
- Pit 3 Dam
- Pit 4 Forebay Dam
- Pit 5 Open Conduit Embankment Dam
- Pit 6 Dam
- Pit 7 Dam
- Canada Falls Dam
- Caucomgomoc Dam
- Dolby Development
- Mattaceunk Hydroelectric Project
- Millinocket Development
- Millinocket Lake
- North Twin Development
- Ragged Lake Dam
- Ripogenus Hydroelectric Project
- Seboomock Dam

Technical Papers

Findlay, R.C., Northrop, J.H., Crisp, R., and Rentfrow, S. (1995). Effects of the Georgia Flood of 1994 on Lake Blackshear Dam. Waterpower '95, San Francisco, California.

Findlay, R.C., Northrop, J.H., Crisp, R., and Rentfrow, S. (1995). Repair of Lake Blackshear Dam. ASDSO '95, Atlanta, Georgia.

Publications

Guidelines for Inspection and Monitoring of In-Service Penstocks, ASCE, 1998; Contributing Author

Inventions

Combined Positive Controlled Sludge Dryer and Burner
U.S. Patent No. 5,357,881 - October 25, 1994

Awards

Ricky Medal - ASCE 1999 Recipient

World Record Holder

Designed and supervised the building of the world's tallest hand-built sand castle (29 feet, 3 inches high using 400 tons of sand) in June 2003 and is documented in the Guinness Book of World Records.

Military

Specialist 5 Northrop was a member of the Army National Guard. He served most of his six-year enlistment with the 45th Engineering Company, Rutland, Vermont.

During his military career, he participated in clearing and grubbing land for roads and airstrips, construction of military roads and airstrips, and installation of drainage culverts. He also operated heavy earthmoving construction equipment.