

TUDOR

Quarterly

Spring 1986

Gala Opening of Miami Metromover



Miami Metromover

The opening of the Miami Metromover on April 17, 1986, marked the beginning of a new era in urban transportation for Miami, and for the USA in general. Metromover is the first major people mover system to be constructed in a downtown setting.

The dedication of the system, which links the downtown business district to the rapid transit Metrorail system, was met with enthusiasm and optimism by both local residents and public officials. Early ridership figures seem to justify this optimism, as the average number of passengers per day is approximately 12,000. Plans are already underway to extend the present two-mile, double-track system to commercial and residential areas north and south of the completed downtown loop.

The Westinghouse vehicles, which are fully automated and require no driver, are similar to those of the interterminal shuttles at the Seattle and Atlanta airports. The maximum speed is 30 miles per hour, and the minimum rush-hour headway will be 90 seconds.

The guideway structures for Metromover, which are entirely aerial, were designed by a joint venture of Tudor Engineering Company and Parsons Brinckerhoff. Tudor designed the superstructure elements and Parsons Brinckerhoff designed the substructure elements.

Projects

Seattle Monorail

Tudor, as a member of a team led by Kaiser Engineers, is responsible for civil and structural design for the rehabilitation of the existing mile-long aerial guideway and Seattle Center Station of the Seattle Monorail. Tudor is also designing the new guideway approach and pass through of the new Westlake Station, that will be located inside the proposed Westlake Mall. The original system was built in 1962 as a temporary facility for the Seattle World's Fair.

Contract drawings for the rehabilitation of a number of "Urgent Safety Items" are substantially complete. Preliminary design for the Westlake Station and approach guideway also has been completed. One interesting aspect of the design is that, besides being a part of the new Westlake Mall, the guideway is immediately adjacent to one of Seattle Metro's proposed downtown subway stations; in fact, one of the guideway columns will be founded on the roof of the Metro station. The three facilities will be constructed concurrently under three separate contracts by different agencies. Final design is expected to begin this summer.

Bids have been opened for the temporary station that will serve passengers while the Westlake complex is under construction. Will Construction was the low bidder with a contract price of \$614,379. Tudor will provide civil and structural engineering services during construction of the structural steel temporary station. Demolition of the existing Westlake Station and guideway will begin in the fall, as soon as the temporary station is placed in service. Tudor is preparing the demolition plans. Key Tudor personnel on the project are Bela Vadasz, Roger Brassfield, Dick Rudolph and Harry Jasper.



Seattle Monorail

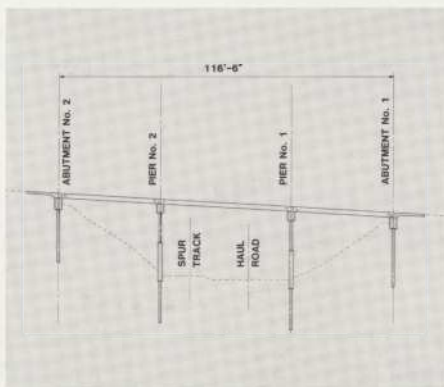
New Mexico Bridges

Tudor is a consultant to Matotan and Associates, Inc. of Albuquerque, New Mexico, for the State Road 264 project for the New Mexico State Highway Department (NMSHD). Matotan and Associates is responsible for the roadway design, and Tudor will provide the structural design of two overcrossing bridges. One structure is a 75-foot long replacement bridge for an existing crossing over the Coal Mine Wash Arroyo. The second structure will be either a widening of an existing 115-foot three-span flat slab bridge crossing the AT & SF railroad and the Pittsburgh and Midway Coal Mining Company haul road, or replacement of the structure.

A roadway alignment study was completed by Matotan and Associates and a Bridge Concept Study was prepared by Tudor and submitted to NMSHD during May 1986. The seven drawings for the Bridge Concept Study Report were created by Roger Mason on Tudor's remote CADD station in the Seattle office. This project demonstrated the successful extension of Tudor's CADD services to remote office locations by producing consistent quality drawings and smooth handling of last-minute changes to meet the tight project submittal schedule.

Final plans, specifications and estimates will be prepared following the Alignment Study and Bridge Concept Study review by the NMSHD.

Working with Roger Mason on the structure design is Harry Jasper. Diane Browning assisted in preparing the cost estimates and the study report. Project Engineer Richard Rudolph is supervising the design and coordinating with Project Manager Mike Ellegood in Tudor's Phoenix, Arizona office.



Bridge crossing Coal Mine Railroad

Tallassee Hydroelectric Project



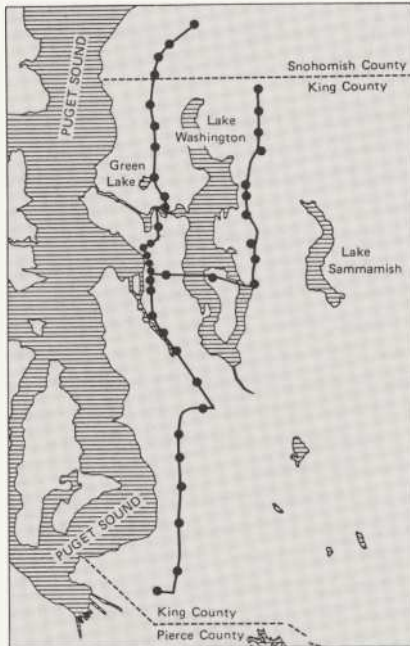
New Tallassee Dam

Tudor's hydro design group began work on the Tallassee Hydroelectric Project in September 1983 under the leadership of Hugh Brown, Project Manager. Owned by the Oglethorpe Power Corporation of Atlanta, Georgia, and located at the Middle Oconee River near the City of Athens, the Tallassee Power Plant is scheduled to come on-line in July 1986. This project has grown considerably from its original concept. Instead of simply filling the breached portion of the existing Tallassee Dam, a completely new dam has been constructed. The major portion of the river flow will be diverted through a headrace canal 1,400 feet downstream to the powerhouse to generate 1.9 MW of power. Fish releases at the dam will be made through a 100 kW auxiliary generating unit.

The Tallassee Project is the first attempt by Oglethorpe at hydropower development, and contributes to their existing power generation system of fossil-fired and nuclear plants. Tallassee will be Tudor's second hydro plant to come on-line in the Southeastern United States. The first one, Capitola, located in Marshall, N.C., began delivery of power in 1985.

Projects

Multi-Corridor Update



Bus/LRT; Trunk Alignments and Stations

Kaiser Engineers has been a consultant to Seattle Metro and the Puget Sound Council of Governments on the Multi-Corridor Project, a two-year study examining long-range transit alternatives for increasing capacity in the Seattle/King County region's three major traffic corridors. Tudor is a subconsultant to Kaiser with responsibilities in the evaluation of alignments, standard structures and movable bridges, traffic engineering, light-rail conversion, and support in right-of-way and utilities engineering. A project steering committee, composed of 14 local elected officials and one Washington State Department of Transportation representative, develops policies and guides the project.

Of the several system and route alternatives studied, three operational alternatives have been selected for final consideration: two bus alternatives and a light rail alternative. The latter combines buses and light-rail vehicles in a trunk feeder system. With this system, conventional buses would carry riders from neighborhoods to stations on the rail trunk lines where riders would board light rail vehicles to major activity centers. Both the downtown Seattle transit tunnel and the new Interstate 90 bridge now under construction can be converted to accommodate light rail transit in the future.

The light rail system would accommodate 180 million transit trips in year 2020. Its estimated capital cost is \$4.5 billion in 1985 dollars. Next, the steering committee will complete its evaluation and make recommendations to the Metro Council and Puget Sound Council of Governments' executive board. The current recommendation is that a light rail system be operational by the year 2020, but that technical options should be kept open until the year 2000.

Bela Vadasz, Dick Rudolph, and Roger Brassfield are Tudor's key personnel.

Los Angeles/Long Beach Light Rail System

Tudor Engineering Company, as subcontractor to Delon Hampton Associates, has been selected to perform the design of aerial guideway structures and bridges for the Long Beach-Los Angeles light rail transit system. The system will extend from Long Beach to downtown Los Angeles, passing through Compton, Carson, Florence, Graham, Wiltonbrook and Dominguez Hills. Fifteen of the 21.2 miles of track will follow an existing Southern Pacific railroad right-of-way.

There will be six major grade crossings carrying a total of two miles of elevated double track. Tudor's primary responsibilities will be to design precast prestressed aerial structure standard spans for the six crossings and the special bridges connecting the main line to the south maintenance yard. The latter will include curved, multiple-span concrete bridges carrying track with a 125-foot minimum radius of curvature.

The Long Beach-Los Angeles project will be the first of several light rail lines that the Los Angeles County Transit Commission plans to build in the Los Angeles metropolitan area during the next several years. Although the project is referred to as a "light rail" system, the vehicles will be 90 feet long with a design crush load of 135,000 pounds each. A maximum of four vehicles will be coupled to form trains 360 feet long. The substructure designs will be heavily influenced by seismic design requirements.

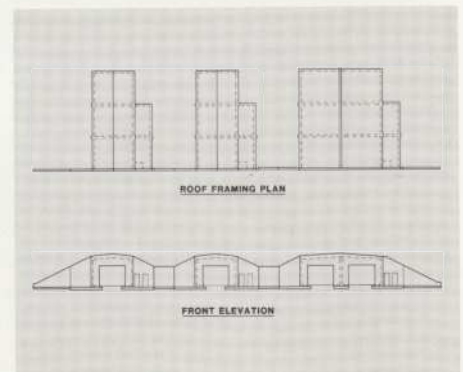
The key staff members for Tudor's efforts include Project Manager Mike Goldberg, Wu-Chieh Chen, Eva Spatenka and Walter Zien. Paul Potter is the Responsible Principal.

Trident Submarine Base

In early 1984 we reported on Tudor's selection to perform the structural design of high explosives magazines for the Trident Submarine Base at Kings Bay, Georgia. A few years earlier the Tudor Seattle office had performed the structural design of similar magazines for the West Coast Trident Base in Washington State that has since become fully operational.

Our work for Kings Bay started in November 1983 and was essentially completed in July 1985. The design involved one type of Missile Motor Magazine (15 MMM's total), and three types of Small Ordnance Magazines. All of the magazines are earth-covered, reinforced concrete structures. The MMM's have thin arch roofs spanning 27 feet. The chambers are about 100 feet long and are secured with 25,000-pound blast-resistant sliding steel doors. Within the chambers, the 50-ton missile motors are moved with air pallets, devices that create floating air pillows by pushing air against the floor with giant fans. For these devices to function properly, the floors were designed for "super flat" construction, involving extremely tight tolerances for levelness, flatness and smoothness.

The Tudor design team included Responsible Principal Mike Harrington, Project Manager Rainer Rungaldier, and Project Engineer and Designer Wu-Chieh Chen. The magazines are now under construction with completion targeted for December 1986. Without further Tudor involvement, the Navy will site-adapt our design for the construction of an additional 42 MMM's during the next three years.



Small Ordnance Magazine

Projects

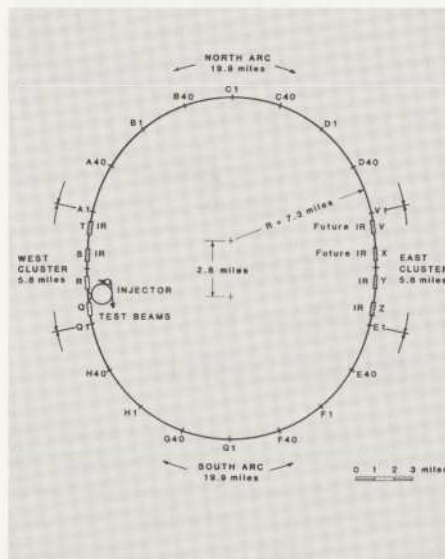
Superconducting Super Collider

The Raymond Kaiser Engineers/Tudor/Keller & Gannon-Knight (RTK) joint venture has been working on the Superconducting Super Collider (SSC) project since March of 1985. A key milestone on the project was the submittal in March of this year of the Conceptual Design Report for non-site-specific conventional facilities to the Central Design Group. Our report will be part of the total project Conceptual Design Report which is to be submitted to the Congress by the Department of Energy in support of the request for further funding.

The purpose of the SSC project is to study sub-atomic particles produced by collisions between protons. As presently envisioned, the SSC will be configured as shown in the site layout. The north and south arcs are circular curves and the east and west clusters will have both curved and tangent sections; total length of the collider ring is 51.5 miles. The protons are produced and accelerated to near the speed of light in the injector. The proton beam line is transferred from the injector to the collider ring at point Q in the counter clockwise direction and R in the clockwise direction. In the collider ring the opposing beam lines are energized to their design energy level (20 trillion electron volts) and beam lines are focused into a collision path at the interaction regions. A research campus and administrative facilities will be located adjacent to the injector facility. The project is not yet sited and there is keen competition among the states for site selection because of the prestige and economic benefit associated with this truly world-class project.

Tudor's role in the RTK joint venture is to design and estimate the cost of the underground facilities, including the interaction halls and collider ring tunnel. The inside diameter of the tunnel is 10 feet and the outside dimension varies with the geology and the type of tunnel lining required. Tudor has developed a computerized Tunnel Cost Model that estimates the cost and construction time for a given length of tunnel and required access shafts. The model is based on tunnel boring machine (TBM) construction, and is capable of estimating a variety of geologic conditions requiring various cutters, support conditions, and linings.

The Project Manager for Tudor's effort is Keith Bull and Don Scapuzzi is lead engineer; Jim Schroeder and Jeff Ghilardi contributed to the Tunnel Cost Model effort. Responsible Principal is Bob Janopaul and Don Rose is a consultant to the joint venture.



SSC Site Layout

Tom O'Neill John Williams Vice Presidents

At the February meeting of the Board of Directors, Tom O'Neill and John Williams were appointed Vice Presidents of Tudor Engineering Company. The appointments were in recognition of the respective role each has carried out as a Tudor Branch Office Manager.

Tom O'Neill first joined Tudor in 1973 through the Atlanta joint venture office of Parsons Brinckerhoff/Tudor (PB/T) working on the Metropolitan Atlanta Rapid Transit Authority project. During that time, Tom became a Project Unit Manager for approximately \$70 million of facility construction including Five Points and Civic Center Stations. After four and a half years, Tom transferred to Tudor's San Francisco office and was a Project Manager on several hydroelectric assignments, including the Monticello Power Project. In late 1981 some opportunities developed in the southeastern part of the United States to develop some hydroelectric projects, and Tom returned to Atlanta to pursue this work. As a result of his efforts, several hydropower studies were completed, and the final design and construction of the Capitola

People

and Tallassee Hydroelectric Projects were undertaken. In the fall of 1983, the O'Neill family moved from Atlanta to Seattle where Tom assumed responsibility for managing Tudor's Seattle office. Under Tom's leadership, the office has completed some significant projects and is diligently pursuing new and challenging work in the Pacific Northwest.

John Williams' first employment with Tudor began in 1972 as a Project Manager in Tudor's San Diego office. Before joining Tudor, he had acquired a wide range of experience in planning and designing water resource projects in the United States and at several locations overseas. In 1974, John moved from Tudor's San Diego office to San Francisco, and worked with Dave Willer in launching the company into the emerging field of small hydroelectric projects. In early 1976, John joined another firm and spent three and a half years in Iran working on a master development plan for a major river basin project. The 1979 revolution in Iran cut short his work on the project and made it necessary to return to the United States and new opportunities. In the fall of 1979, John rejoined Tudor and accepted the responsibility of starting up the Denver branch office. Over the past several years, he has spent considerable time traveling, in that the Denver marketing area covers the Rocky Mountain region and extends through the midwestern part of the United States. Under John's leadership, the office has completed numerous assignments in the fields of water resource development, hydroelectric and energy-related projects.

Tom O'Neill

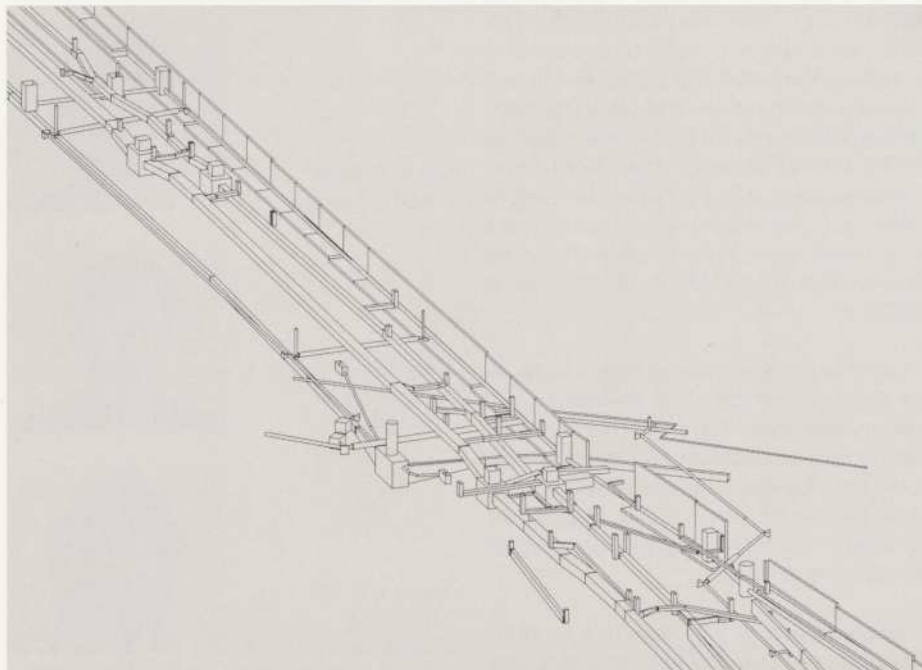


John Williams



Projects

CADD Modeling for MARTA



North Yard Utilities Isometric

In an effort to reduce the number of contractor change orders during construction, PB/T has requested from Tudor's CADD department a three-dimensional modeling of underground utilities for two newly designed maintenance yards. The utilities found in the yards include standard water and sewer lines as well as numerous ductbanks containing the train control circuits and traction power. The intent of the project is to use the Intergraph system to detect and remedy utility system conflicts prior to the start of construction.

The job started in late February with the North Yard, which is a temporary yard located near the new Chamblee Station. When future northward expansion takes place, this yard will be removed and a permanent installation will be built. The South Yard is located on the alignment to the airport and will be a large, permanent installation.

The modeling is accomplished using the Intergraph COGO (Coordinate Geometry) program. North and east coordinates and elevation data points from PB/T plans are input using the alpha numeric terminal. The file is run using the COGO program, and the output is stored in a design file that is called up on the Intergraph work station for modeling. The input data constructs an invert line of the utility, used for reference in the modeling. At the work station, each utility is then defined with a 3-D shape, based on PB/T data.

The final step is to run an in-house developed conflict program that will detect all conflicts between utilities, including those not readily visible from viewing the model.

The North Yard modeling, scheduled for completion in June, will be used by the Contractor to construct the traction power and train control ductbanks. The South Yard is scheduled for completion in mid to late summer, depending on the required design revisions.

Project Manager is Steve Alters with Designer Karen Yapp heading up the Intergraph modeling in San Francisco. Jim Spofford, assisted by Peter DeBoldt, is inputting the COGO data at the Seattle office, using the newly installed remote terminal hookup. Support and program development is being provided by Ivan Mlaker, Avry Dotan and Rich LaRowe.

Market Street Trolley Overhead

Starting in 1982, Tudor has been actively involved in the Market Street Trolley Overhead project for the City and County of San Francisco. The project included complete reconstruction and expansion of the overhead electric conductors that power MUNI's trolley buses and historic streetcars. Also included was complete reconstruction of the underground cabling that supplies power to the wires.

The project included many innovative solutions, as discussed in previous editions of the Quarterly. Tudor led the team that analyzed the project feasibility, then recommended the preferred alternative among European and American systems, prepared the final design documents, and finally, provided extensive design services during construction. The project had a large number of utility conflicts with pole foundations and other items that could only be identified in the field. To keep the construction contractors on schedule, rapid design changes were required.

The entire project is now in operation and has received many compliments from City staff and others. The improved efficiency of the system is credited with decreasing the round trip time of a trolley bus on Market Street by about four minutes. A great deal of effort in design was devoted to making the system unobtrusive, and the general attitude is that this aspect of the work was particularly successful. Gerald Gibney served as Project Manager for the Market Street project.



MUNI - Market Street Trolley Overhead

People and Places

Western Renewed

Tudor's contract with the Western Area Power Administration (Western), Golden, Colorado, has been renewed for the third and final year. Although the second contract year was to extend to July 4, 1986, work assignments authorized by Western exceeded the second year limits of 9,640 manhours and \$568,561 on May 9, 1986. Therefore, Western took action early to renew its option for the third year on May 10, 1986, moving the date for contract completion to May 9, 1987.

Nine work assignments have already been authorized for the third contract year. These include continuation of Ed Barbour's work of developing guidelines for economic analysis; Gene Buffum's work within the Sacramento Area Office; Doug Gruber's and Ron Wright's assignment in the Salt Lake City Area Office, and assignment of Bruce Braaten to the Loveland Area Office for several months. Nelson Jacobs is the Project Manager for the Western Contract.

Stockholders' Meeting

The 1986 Tudor Engineering Company stockholders meeting was held on the afternoon of May 3rd at the Claremont Hotel in Oakland, California. Forty-three stockholders were in attendance. The meeting was chaired by Louis W. Riggs, Chairman of the Board of Directors. At the meeting, reports were given covering financial matters and business operations. The stockholders voted on the slate for Board of Directors and reelected the five previous members, L.W. Riggs, R.N. Janopaul, P.E. Potter, K.D. Bull and D.J. Mansfield. Two new members, M.B. Harrington and R.W. Myrdal, were added.

After the election of Directors, Robert Janopaul chaired a panel discussion program that included short presentations by eight stockholders. Dave Willer spoke about client relations, John Williams discussed the outlook for water and energy projects, Gerry Gibney presented a transit and technology overview, Mike Ellegood talked about highway and bridge opportunities, Tom O'Neill presented the Seattle marketing outlook, Doug Mansfield discussed design quality assurance/quality control, Steve Alters talked about Tudor's CADD operations, and Mike Harrington gave a summary overview of the company's engineering operations. After the presentations, a spirited question and answer period followed until adjournment.

Grant Larsen Retires

After 23 years, architect Grant Larsen has retired from active participation as head of Tudor's specifications department. After working as a consultant on specifications for Tudor on a variety of military and defense projects in the 1960's and writing Guide and Standard specifications and other legal and bidding documents on joint ventures such as the PBTB BART project, Grant joined Tudor permanently in 1970. He has written specifications for most Tudor projects as well as for such major joint venture projects as the Metropolitan Atlanta MARTA and the Caracas METRO.

Grant began his career in Provo, Utah, as an architectural designer, draftsman, site planner and researcher for a wide variety of commercial and institutional projects. At the same time he was an evening instructor at Utah Technical College, Provo, teaching estimating, blueprint reading, architectural and engineering drafting.

Since moving to San Francisco in 1957, Grant has continued to influence specification writing with both the American Institute of Architects and Construction Specifications Institute's San Francisco Chapters as Education Committee member and as an instructor. He is a Fellow in the CSI.

As a member of the BART team in the 1960's Grant helped pioneer some of the real breakthroughs in modern specification writing that have had a continuing influence on today's construction contract documents. In his role as head of the specifications department, Grant has guided Tudor into the standardized and specialized Construction Specifications Institute recommended formats.

As both an acknowledged, consummate professional, and as a thorough practitioner of specifications and other contract documents, Grant will be missed. We wish him happiness, and the freedom to enjoy other pursuits during his leisure years.



Grant Larsen

New Faces . . .

Tudor welcomes new employees:

. . . for San Francisco

Sanae T. Lame
CADD Operator



Sue Park
Intermediate
Engineer



Karen Van Til
Marketing
Coordinator



Congratulations

Harry Jasper and Susan Miller were married January 18, 1986, at Bellevue Presbyterian Church, Bellevue, Washington, and honeymooned in Aspen, Colorado.

John Kennedy and Kelley Kendrick were married April 19, 1986, at McCabe Church in McMinnville, Oregon. After the wedding they took a leisurely drive down the coast.

Paula Dierkop graduated from the University of San Francisco on May 25, 1986, with a B.S. in Information Systems Management.

THE TUDOR QUARTERLY is published by Tudor Engineering Company for the information and enjoyment of its employees, their families, and friends.

CONTRIBUTING AUTHORS: Gerry Gibney, Mike Goldberg, Nelson Jacobs, Harry Jasper, Tom O'Neill, Rainer Rungaldier, Don Scapuzzi, Jim Spofford, Bela Vadasz, and Andy Yeung.

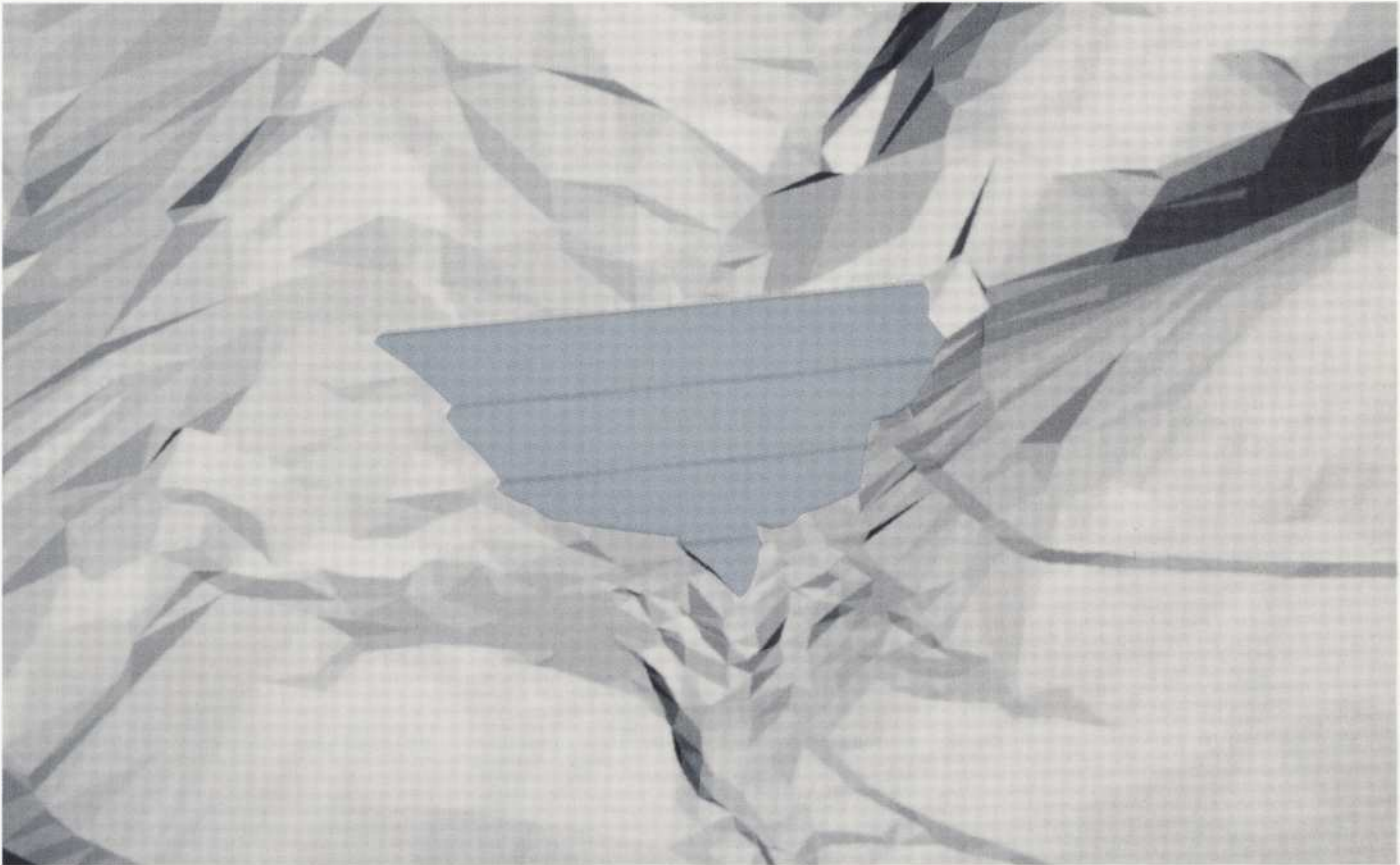
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TUDOR

Quarterly

Summer 1986

Tudor in ASCE



Using typical cross-section and earthwork calculations, a "built" dam is generated on site.

The August issue of the ASCE Journal, Civil Engineering included an article on Tudor's HYSIZE and HYSTOR computer programs. The article, written by Avry Dotan and Dave Willer, describes the program's features and presents the Griswold Hydroelectric Project as a case study.

HYSIZE and HYSTOR computer programs were developed by Avry Dotan, who incorporated Tudor's extensive knowledge and experience in hydro planning and design to perform prefeasibility analyses of hydropower projects in a single computer run. The programs tie together all of the major components that are typically assumed in hydroelectric projects, such as hydrology data, hydraulics data, and financial assumptions, and then defines the feasibility parameters of the optimum project layout.

The programs can run interactively with Tudor's CADD system. The engineer defines, on the topography that is displayed on the CADD's screen, the location of dams, tunnels, penstocks, and power plants, as the computer program analyzes the projects and displays the results on the adjacent screen.

The response to the article was very encouraging. Engineers from PRC Engineering, Denver, read the article and have decided to hire Tudor to perform a prefeasibility analysis of hydropower projects at six dam site locations on the Gila River, Arizona.

Projects

Clavey River Hydroelectric

Recently, Tudor completed the preliminary study of the hydropower potential of the Clavey River Hydroelectric Project for Morrison Knudsen Engineering, San Francisco.

In the screening analysis, ten different project locations were considered using Tudor's HYSIZE and HYSTOR computer programs. Project features included roller compacted and arch dams, horizontal tunnels, vertical shafts, and underground powerhouses.

To conduct the study, an area approximately three miles wide by ten miles long was stereo digitized from aerial photographs and loaded into the CADD system. Using digital terrain modeling, it was possible to "plant" dams in different locations, perform earthwork calculations, and define the project's layout.

The study identified the optimum project, which included a roller compacted dam, a 90,000 acre-foot storage reservoir, ten miles of tunnels, and a 110 MW underground power plant. An additional aspect of the project was the environmental impact of the project location. Using the three-dimensional model of the topography in the CADD station, prospective views of the area in question showing the "as built" project were processed. The study was performed by Avry Dotan and Steve Alters with the assistance of Rich LaRowe, Karen Yapp and David Silveira.



Double-screen allows engineers to see data and topography simultaneously.

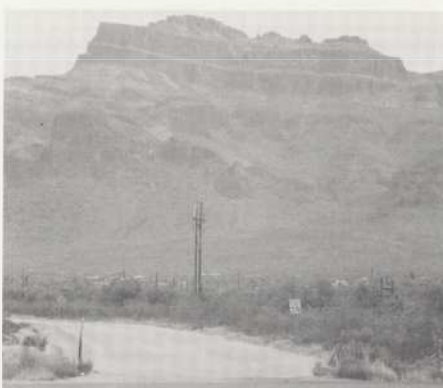
Superstition Highway

Tudor's Phoenix office has been selected by the Arizona Department of Transportation as consultant to perform the design for the extension of the Superstition Freeway (SR 360) from Ironwood Drive to its termination at U.S. 60. The project is located in Pinal County, southeast of Phoenix.

The project, budgeted at approximately \$37 million, includes the design of 3.5 miles of four-lane divided highway with two diamond interchanges, and a modified trumpet interchange at the connection with U.S. 60. The work for includes the design of mainline, cross street structures, grading, pavement, drainage, noise berms, lighting and signals, freeway surveillance, pavement marking, construction traffic control plans, permanent signing, landscaping and off-site drainage.

Tudor's responsibilities as design team leader will be to provide the civil and structural design. Other members of the design team are Cooper Consultants, Inc., surveying; A-N West, Inc., off-site drainage; Henry Haws & Associates, landscape design; and Sergeant, Hauskins & Beckwith, geotechnical design and field explorations.

Notice to proceed was effective August 11, 1986. The project has a tight schedule with a final submittal in June 1987. Tudor has assigned key highway design personnel to the Phoenix office, including Project Manager, Mike Ellegood; Project Civil Engineer, Jim Schroeder; Project Structural Engineer, Dick Rudolph; and Felipe Agosto, Jim Richardson, and Jim Spofford. On temporary assignment from Seattle are Einer Handeland and Pete Paterson. Mike Harrington is the Responsible Principal.



Superstition Mountain near intersection at US 60 and proposed freeway.

Interstate 90

Tudor will soon be finishing a job started over fifteen years ago. Tudor began work on Interstate 90 in the early 1970's as part of a design team assigned to lay out the project across Mercer Island. Now Tudor has been selected to prepare drawings, specifications and estimates for one of the final two I-90 contracts. There is no question that our long-standing relationship with the Washington State Department of Transportation and our performance on a recent I-90 assignment contributed to this selection. All Tudor employees who worked on I-90, or other WSDOT projects, can be proud of our selection.

This major project consists of 4,500 feet of roadway and approximately 3,800 feet of retaining walls, including drainage, signing, lighting, and other supplementary features. It is located on the eastern end of Mercer Island, between the proposed Luther Burbank Lid and the North Mercer Undercrossing. Tudor's Project Manager is Don Hoel, and key personnel will include Einer Handeland, Harry Jasper, DeWitt Jensen and Roger Mason. The work is projected to begin in October, with a duration of approximately 15 months.

Washoe Power Plant

Tudor has been retained by the Sierra Pacific Power Company to assist with the preparation of power studies and cost estimates for the renovation of the Washoe Power Plant. The power project, located on the Truckee River, was built in 1904 and operated without a major overhaul for over 80 years. Water was diverted from the Truckee River into a wood flume that transitions to two wood conduits above the powerhouse. The water was then delivered to four turbines that drive two generators with a maximum capacity of 1,800 kW. The flume failed in 1985 making the project inoperable.

Tudor conducted a previous study in 1985 and recommended that the flume and conduits be replaced. The current study addresses the renovation of the powerhouse. Alternatives under consideration include refurbishing the existing units and one or more new turbine/generators. Project Manager is Don Guild, and Project Engineer is Bob Toothman, with Pete Peterson of the Seattle office assisting with power studies.

Picnic



San Francisco

The San Francisco office picnickers enjoyed a sunny July afternoon in Roberts Park, high in the Oakland Hills. Inflatable flamingos, ducks and sailboats decorated the tables.

The menu included a variety of appetizers and salads that complemented barbecued chicken and New York steaks, baked potatoes and corn on the cob. The desserts were the center of interest, especially Connie Chiappella's cake decorated in the theme of a summer picnic.

A non-stop volleyball game kept most of the athletes busy until lunch, while the afternoon saw some softball and swimming. Lou Salaber led the afternoon games ranging from the egg-in-spoon race for the younger crowd to the grapefruit pass for the grownups.

This year's picnic committee consisted of Karen and Steve Van Til, Diane Alexander, Don and Patricia Scapuzzi, and Kathy Hall. The chefs for the day were Steve Alters, Eric Cansen, S.T. Su and Dave Willer.



from left to right

Bob Myrdal and Wil Pacheco talk about old times, as Bob Janopaul flashes a big grin for the camera.

Louis and Pat Riggs enjoying the perfect picnic weather.

S.T. Su . . . the Master Chef.

Kathy Hall, Diane Alexander, David Silveira, Rudolf and Eva Spatenka, Eric Cansen and Steve Van Til enjoy the food and company.

Pied Piper Lou Salaber has the children in a trance with the egg in spoon race.

Don Scapuzzi leads a game of Simon Says . . . "Stick 'em up."

Picnic



Denver

The Denver office summer picnic was held on Saturday, August 23, at the home of Nelson and Dawn Jacobs. About 25 employees and former employees and their families attended. Everyone enjoyed an afternoon of swimming and games before evening showers forced a retreat under the patio roof for the picnic meal. Delicious hot dishes, salads, and desserts were provided by the guests, and Nelson prepared the "well done" hamburgers and hot dogs.

from left to right

Dawn Jacobs, Clarence Colyn, Bruce Braaten, Diane Van Wormer, Jeff Stevens, and Bill Van Wormer escape the late afternoon showers.

Bruce Braaten, Mary Baldassano, Dawn Jacobs, and Jeanne Barbour enjoy the picnic meal.

Hosts Dawn and Nelson Jacobs.

Jay Rawlings, Susan and Christy Colyn, and Bill and Aaron Van Wormer enjoy the pool as Diane Van Wormer and Clarence Colyn keep a watchful eye on them.

Susan Colyn, Mary Baldassano, and Jeanne Barbour posed for photograph as Debbie Velasquez looks on.

The competition was fierce in the annual volleyball game.

Picnic



Seattle

You've heard the saying "it'll be a cold day in July. . ."? Well, July 26 in Seattle was just that. Undaunted, however, the Seattle office staff held its annual picnic as scheduled. Jackets and sweaters were the order of the day at the Lake Sammamish State Park picnic pavilion. The day was actually made warm by the companionship and camaraderie of the Seattle employees and families. The food, as usual, was something special, and the volleyball and horseshoe games created some pretty stiff competition. It was particularly nice to visit with Dick and Phyllis Rudolph and Jim and Cindi Spofford who are moving to Phoenix. Our best wishes go with them.

from left to right

Eva Vadasz helps Wesley Arnquist with a brownie.

Cindi and Jim Spofford seem happy about moving to warmer weather.

September and Rosemary George; like mother, like daughter.

Einer, Sonja and Marilyn Handeland make ready the volleyball net.

Pete Paterson and DeWitt Jensen on different sides of the fence on a few issues.

Peter and Linda DeBoldt couldn't hide from the camera all day.

Projects

Vallejo Bus Maintenance and Storage Facility

Tudor has been retained by the City of Vallejo, California, to provide conceptual and detailed design and construction assistance for a replacement maintenance and storage facility for Vallejo Transit Lines.

The new complex for the City-owned bus system will be for a diesel fleet expected to expand from the present 28 to 50 or more busses before the year 2000. The site is a five acre parcel located in north Vallejo and will contain one large steel framed, metal clad building of approximately 30,000 square feet, two fuel/service/cleaning stations, a bus washer, an exterior degrease stall, and parking for busses, employees and visitors. The main structure will house a 25,000 square foot maintenance shop, and 5,000 square feet of offices, lunchrooms, and locker rooms for maintenance, operations and administrative staff. The shop areas consist of seven bays for heavy repair, running repair, tire/brake work and body repair, a unit repair shop, parts storage and work support space. The site design will be augmented with landscaping, berms and sound walls since it is located in an area of mixed residential and commercial development.

The design and construction funding of approximately \$3.6 million is primarily UMTA money. Tudor was one of three firms interviewed and was selected by City staff in July. Pursuit of such work is a continuation of Tudor's efforts to remain involved in the design of bus and rail transportation facilities.

Tudor is the prime consultant responsible for project management, industrial equipment layout and selection, civil and structural design. Lou Salaber is the Project Manager assisted by Ken Heilig, Perry Lin, Bob Cermak, Tony Lea, Charlie Tsang and the CADD department. Other members of the team are: S. Iyama and Associates, architecture; Keller and Gannon, mechanical and electrical; Mai Arbogast, landscape architecture; AGS, geotechnical; and Greiner Engineering, surveying. The project schedule is seven months for design ending in March, 1987; two months for advertising, bidding and award; and seven months for construction.

SOFAR

Tudor has been retained by a potential investor to review the project status of the South Fork American River (SOFAR) Hydroelectric Project. The SOFAR Project is being developed by Catalyst Energy Development Corporation, a private New York-based developer under agreement with the El Dorado County Water Agency and the El Dorado Irrigation District.

Similar to the North Fork Stanislaus River Project, the development history of the SOFAR Project can be traced back to the early 1960's. Tudor had provided engineering layout and studies in the early 1970's.

Among the services Tudor is performing for the potential investor are a review of project hydrology and generation, assessment of permit compliance, and evaluation of power purchase agreement. Tudor's Project Manager is S.T. Su, with assistance provided by Dave Willer and Gordon Marsh.

Phoenix Office

In March 1986 Tudor opened an office in Phoenix, Arizona, with the anticipation of an active transportation market. Mike Ellegood relocated from San Francisco as Office Manager.

The selection of Tudor for design of the Superstition Freeway Project for the Arizona Department of Transportation increased the need for staff and equipment and necessitated a move in July into temporary larger offices. Tudor has contracted for permanent office space in central Phoenix, adjacent to our present temporary office. The remodeling is scheduled for completion in early October and will accommodate the proposed staff of 12 to 14.



Tudor Phoenix office in the first large building on the left.

People

New Faces . . .

Tudor welcomes new employees:

. . . for San Francisco

Kelly Ford
Secretary
Mendocino Field
Office



Diana Lee
Structural Engineer



. . . for Phoenix

Lori Egly
Secretary



Congratulations

Andy Nguyen and Michelle Do were married on July 5 at Saint Brendan's Church, San Francisco. The wedding was followed by a Chinese banquet at Ocean View Restaurant. They went on a September honeymoon cruise to the Caribbean.

Ed Peters and Barbara Blunt were married at Seattle's Saint Patrick's Church on July 20. The ceremony was followed by a reception at Kirkland's Shumway Mansion. Ed and Barbara spent their honeymoon bicycling through western Oregon.

THE TUDOR QUARTERLY is published by Tudor Engineering Company for the information and enjoyment of its employees, their families, and friends.

CONTRIBUTING AUTHORS: Avry Dotan, Nelson Jacobs, Tom O'Neill, Lou Salaber, Jim Schroeder, S.T. Su, and Bob Toothman.

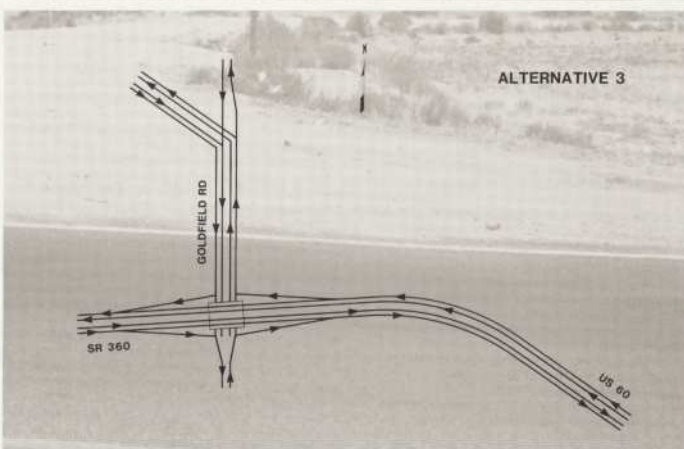
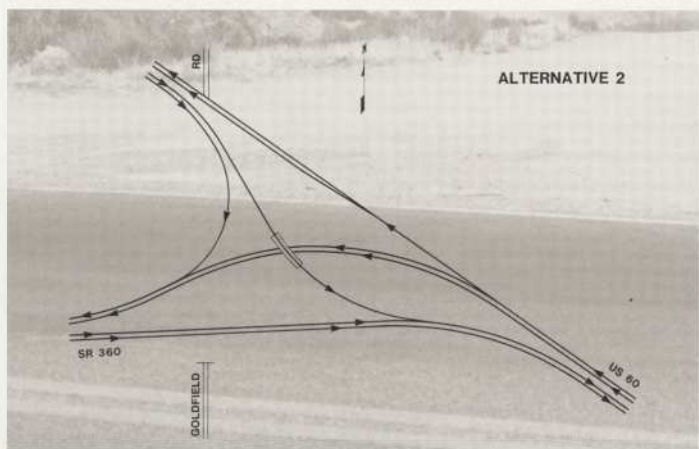
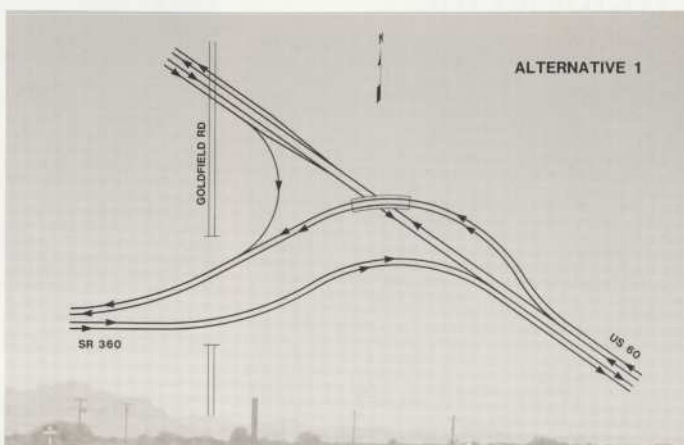
EDITING AND PRODUCTION STAFF: Frank Chiappella, Paula Dierkop, Jim Flannery, Grant Larsen, Greg Reichert, and Karen Van Til.

TUDOR

Quarterly

Fall 1986

Superstition Freeway – Preliminary Design



Proposed Superstition Freeway and three alternative interchanges with US 60

Tudor's Phoenix Office is completing preliminary design of a three-mile segment of the Superstition Freeway east of Phoenix, Arizona. This section extends from Ironwood Road to the termination of the Freeway at US 60 near Apache Junction. The layout of the interchange is one of the major items to be resolved.

The Superstition Freeway will run due east/west, while US 60 runs at angle to the grid—this alignment creates a skewed intersection (see illustration). Tudor staff has evaluated more than a dozen possible arrangements for the interchange, and selected three for further analysis and consideration. These alternatives, shown in the the illustration, were presented to the public at an informational meeting, held at the Apache Junction City Hall.

The three alternatives differ in the ways traffic is directed to and from the Superstition and US 60 and how local access is provided. Citizens attending the public meeting showed considerable interest in the impact each alternative might have on their community.

Tudor will recommend an interchange layout to the Arizona Department of Transportation, and present a preliminary design for the entire freeway segment in early December, 1986. Jim Schroeder is Project Manager, assisted by Einer Handeland, Traffic and Interchange design, Dick Rudolph, Structures, and Pete Paterson, Drainage. The final design is due to be completed in the summer of 1987.

Projects

Tallassee Shoals Hydroelectric



Tallassee Shoals Hydroelectric Project

On October 13, 1986, the Oglethorpe Power Corporation held a ceremony to dedicate the completion of construction and beginning of power production at the Tallassee Shoals Hydroelectric Project. Although a persistent rain may have dampened the spirits of some in attendance at the ceremony, it was a welcome sight for Oglethorpe. They had waited through one of the driest years on record for "just enough water to turn the turbine." Located on the Middle Oconee River near Athens, Georgia, the new dam was constructed just downstream of the breached Tallassee Shoals Dam to impound a 37 acre lake and provide flow to a two megawatt generating unit. The new dam is renamed the Walter W. Harrison Dam, in recognition of his long service and outstanding leadership in pioneering the Georgia rural electrification program. Dave Willer attended the dedication ceremony as Tudor's representative.

Tudor's involvement with Tallassee started in 1983 when our design team was selected from a competitive field of several engineering firms. Hugh Brown and the hydro group completed the design in November 1984, and construction started in January 1985. Oglethorpe, which co-owns several coal-fired and nuclear generating plants, is excited about this run-of-river hydro project. It represents their first wholly-owned generating facility, and is intended to provide valuable experience in the long process from the selection of consultants to project completion.

Seattle Monorail Temporary Station



Council-member George Benson (speaking) and Mayor Charles Royer at opening

To maintain revenue service of the Seattle Monorail while it is being rebuilt at its southern end, it was necessary to construct a temporary station. Tudor, as a subcontractor to Kaiser Engineers, performed the structural design of the temporary station which is located directly in front of Seattle's Westin Hotel. Dick Rudolph, the lead structural engineer for this project, developed a design using structural steel elements. Steel was chosen for its ease of erection and, more importantly, the ease with which it can be dismantled once the new permanent station is put into service. A feature of the design is that the structure could not block traffic on Fifth Avenue, the street immediately below the monorail alignment; therefore, the framing system had to provide a clear span across Fifth Avenue.

The temporary station was opened to revenue service at a ceremony held on September 17. Mayor Charles Royer and Council-member George Benson were among the dignitaries who spoke at the opening. After a ribbon cutting, the opening ceremony entourage boarded the monorail for a quick ride to Seattle Center and back. The temporary station will be in service for about three years. At the end of that period, the new Westlake Station, currently under design, will be ready for operation.

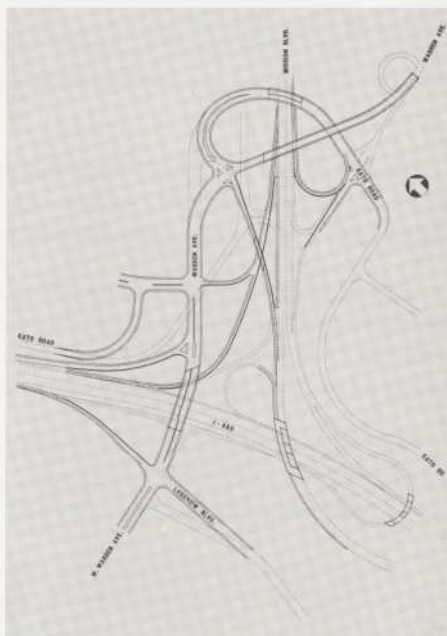
Bela Vadasz is Project Manager for work on the monorail project. Other Tudor participants were Dick Rudolph, Harry Jasper, Jun Quiray and Roger Brassfield. The temporary station was built by Will Construction Company at a cost of approximately \$700,000.

Fremont Freeway Interchange Studies

The City of Fremont, California, has selected Tudor to perform preliminary engineering analyses and other work for four interchanges of Interstate 880, the Nimitz Freeway. The interchanges are located at Durham Road, Fremont Boulevard, Mission Boulevard and Dixon Landing Road.

The California Department of Transportation (CalTrans) and others have done prior studies of the interchanges, and Tudor will be responsible to review and update this work in light of changed conditions and the City's plans for industrial development in the area. Interchange plans will be developed, required rights-of-way will be delineated, and the cost of the improvements will be estimated. The end result of this phase will be recommendations for phased design and construction in accordance with the funds available, a project report for submittal to CalTrans, and execution of a Memorandum of Understanding between CalTrans and the City which defines the responsibility for each party.

Lou Salaber is the Project Manager. Other staff will be assigned as the detailed scope of work is developed.



Proposed Mission Boulevard Interchange

Projects

Seattle's Volunteer Park

Tudor was recently selected by the City of Seattle to provide engineering services for the rehabilitation of various civil works in Seattle's Volunteer Park. Volunteer Park is the centerpiece of an extensive park and boulevard system laid out for the City of Seattle by the Olmstead Brothers landscape architecture firm of Brookline, Massachusetts, in 1903-1904. The Olmstead Brothers also designed New York City's Central Park. Situated on the crown of Capital Hill, the 40 acre park was specially selected by the firm to take advantage of its incomparable vistas. Volunteer Park was named to honor the veterans of the Spanish-American War, and is the current home of the Seattle Art Museum.

DeWitt Jensen will be leading Tudor's efforts in this rehabilitation project. Elements of the park which are to be rehabilitated include the roadways and drainage system. The design must be sensitive to the character of the park and will reflect its historic nature (the park was placed on the National Register of Historic Places in 1975). The anticipated beginning of design will be in late 1986 with a mid-1987 construction period.

BART Pittsburg-Antioch Extension Study

Tudor is part of a team led by Bechtel Civil, Inc., which has been retained by the Bay Area Rapid Transit (BART) District to perform an Alternatives Analysis for public transit in the Pittsburg-Antioch corridor in Contra Costa County, California. The work will consist of studies to define the feasible alternatives for transit in the corridor—an extension of BART or a light rail system connecting to BART are examples—and to prepare an Environmental Impact Report and Draft Environmental Impact Statement for the preferred alternative.

The bulk of Tudor's effort will be in the development of alignments for Express Lanes, Light Rail, and BART-type extensions, including discussions of their characteristics; delineation of required rights of way, including stations and parking; maintenance requirements; and the development of capital cost estimates.

COSO Geothermal

The Tudor-designed cooling water basin and cooling tower foundations for the COSO Geothermal Power Plant have been constructed. While construction proceeded Tudor Engineering Company assisted Guy F. Atkinson Construction Company with the design of foundations for the electrical equipment and the powerhouse.

The sheetmetal-clad steel frame powerhouse, with a 15-ton crane, will be 50 feet wide, 445 feet long and 50 feet high. Approximately 100 feet of the building will be erected initially for the first of the eventual three 25-MW turbine-generators. The electrical equipment includes a switchgear building, a so-called "package house" assembled from prefabricated modules bolted together on the reinforced concrete foundation. Another interesting electrical feature is gas-insulated, high-voltage switchgear that is accommodated on an 18- by 30-foot foundation, whereas an equivalent open-air installation would normally occupy an area ten times larger.

The main transformer with a large oil sump, the Unit No. 1 transformer, station service transformer, neutral cubicle and other electrical equipment are interconnected by cable trenches with steel floor plate covers and above-ground cable supports.

All designs and drawings were delivered on a fast track schedule to keep up with the rapidly progressing construction on the site.

Project Engineer is Kurt A. Scholz. Design Engineers Tony Lea and Perry Lin were assisted by designer/drafters Birgit Chase and Charlie Tsang.



Cooling tower foundation

I-90 Island Crest Way Bid Opening



I-90/Island Crest Way

On Wednesday, October 29, the Washington State Department of Transportation opened bids for Tudor's recently designed portions of Interstate 90. There were four bidders on the project, which had an engineer's estimate of \$21,369,668.84. The bid results are shown below:

Bidder	Amount
1. Donald B. Murphy/Foundation	\$18,108,724.85
2. Moseman Construction Co.	\$18,246,689.88
3. Kiewit Pacific Co.	\$18,654,824.85
4. Max J. Kuney	\$18,900,655.56

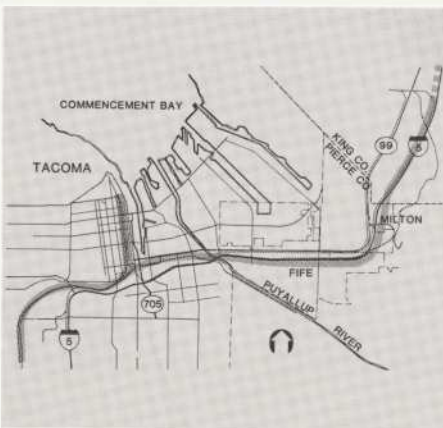
As can be seen, the bids were extremely tight which testifies to a very clear and non-confusing set of bid documents. All those who helped prepare this major design package should be congratulated once again on a job well done. Construction is expected to start in January 1987 and will have a duration of 26 months. Tudor, under the guidance of Don Hoel, will provide some engineering services during construction. Onsite inspection and construction contract administration will be by State personnel.

Projects

TAC-SEA LRT Extension

The Puget Sound region continues to plan for an eventual light rail transit system, and Tudor remains at the forefront of that planning process. We have already completed three studies of various route alignment alternatives, and are now in the midst of a fourth study. That study is for an extension of the LRT alignment from the King/Pierce County Line southward into Tacoma. Our client for this work is the Puget Sound Council of Governments (COG), the local agency which performs long range planning for the entire Puget Sound region.

A similar study was performed for the COG last year on a proposed LRT extension northward into Everett. Based on that performance, the COG selected Tudor on a sole-source basis for this current study. Moreover, the COG specifically requested that the study effort be headed by Bela Vadasz, who led the previous work. The project began in early November and will be completed in January. The primary goal will be to develop a cost estimate for this extension so that capital planning can proceed. Peter De Boldt will assist Bela on this transit planning assignment.



TAC-SEA LRT Alignment Alternatives

Bothell's SR522 Lowering Update

The lowering of State Route 522 in Bothell, Washington, is nearing completion. This project, when completed, will provide an additional two feet of clearance under a bridge in the City of Bothell. The bridge, with an original clearance of 13'6", was hit repeatedly by overheight trucks despite an elaborate detection and warning system. Rather than raise the bridge at an estimated cost of \$2,500,000, the City of Bothell elected to lower the roadway below the bridge at a little more than 10 percent of that cost. Tudor, led by Einer Handeland and DeWitt Jensen, completed the design for the lowering project during the past summer.

The low bidder on the job was Mass Construction Company of Des Moines, Washington, who began work on the project in mid-August. To get the roadway lowered and paved with minimal disruption to traffic, it was necessary to work throughout the weekend of October 18. During that period, the roadway was completely shutdown and traffic rerouted while excavation and paving took place. The work went successfully under the watchful eyes of Roger Brassfield and Einer Handeland, and SR522 was reopened to traffic on Monday morning. The contractor is in the final stage of finishing of the project. Roger Brassfield has provided on-site services throughout construction.



SR522 Lowering (weekend closure)

Littlejohns Reservoir Study

Tudor has been retained by the Calaveras County Water District to prepare a feasibility study of a potential storage reservoir on Littlejohns Creek in Calaveras County. Tudor's efforts include hydrologic studies, layouts and cost estimates, reservoir operation studies, economic analyses and report preparation.

Littlejohns Reservoir would be an off-stream storage reservoir and would store water diverted from the Stanislaus River at Tulloch Reservoir. The purpose of the reservoir would be water supply. Water would be pumped from Tulloch Reservoir into Littlejohns Reservoir and released into a 34-mile long pipeline, eventually discharging into Pardee Reservoir on the Mokelumne River. The possibility of building a pumped storage project to operate between Tulloch and Littlejohns Reservoirs is also being assessed. S.T. Su is the Project Manager, and Bob Toothman is the Project Engineer.

Burlington Northern Railroad – CADD

The Seattle office of Tudor has had an Intergraph CADD workstation since April 1986. During this time various projects have been performed on CADD, such as preliminary layout of bridges in New Mexico and final design of the new monorail Westlake Station. One recent effort deserves special note, however. The Burlington Northern Railroad (BNRR) requested us to prepare a map of all the rail lines within their Seattle Region. That region extends from southern Canada to northern Wyoming and from the Pacific Ocean to western North Dakota.

The map was prepared with as much flexibility as possible so that the ever-changing railroad facilities can be updated quickly and accurately. As an example, lines which are sold or abandoned can be easily deleted from the map. Historically, the BNRR staff has had difficulty keeping maps updated to reflect such changes, and our CADD capabilities may be of real benefit to them. Roger Mason was the CADD Designer in charge of this project.

Projects

Kissimmee River Restoration Modeling Studies



Kissimmee River—Lake Okeechobee—Everglades System

Tudor will be assisting the University of California at Berkeley (UC—Berkeley) in a physical and mathematical modeling project of the Kissimmee River in South Florida.

The South Florida Water Management District (SFWMD) has developed a long-term implementation program to restore the channelized Kissimmee River as a mitigating measure of ecological damages.

The Kissimmee River, prior to its channelization in the 1960s, gently meandered from Lake Kissimmee to Lake Okeechobee in central and southern Florida. During the 1960s the river was transformed into a canal, 52 miles long, 200 feet wide and 30 feet deep with six water control structures and navigational locks. The canal functions as a huge drainage ditch for the lower Kissimmee River Basin. Construction of the canal resulted in the drainage of almost 200,000 acres of river marsh and other wetlands which caused major ecological impacts to the area, including the Florida Everglades.

Tudor participated with UC—Berkeley in the interview conducted by SFWMD's selection committee, and helped UC—Berkeley become the successful contractor from the five contenders. As subcontractor to UC—Berkeley, Tudor will provide engineering services to formulate river structure design criteria, CADD graphic displays, and will assist with presentations to SFWMD and other agencies.

Clear Creek Project

Tudor was selected by the Colorado Water Resources and Power Development Authority for the Clear Creek Project feasibility study, to be conducted in three phases: Phase I—Reconnaissance; Phase II—Prefeasibility; and Phase III—Full Feasibility. The notice to proceed with Phase I was received in August 1986.

Clear Creek is a major tributary to the South Platte River, and the Clear Creek Basin, directly west of the City of Denver, contains several historic mining towns.

During Phase I safe annual yields and associated preliminary costs for several alternative projects for water supply storage in the Clear Creek Basin will be determined. Storable flows available from unappropriated native flows in the basin will be estimated, and other water sources that could enhance the yields also will be considered.

Approximately ten dam sites, including four sites in the Clear Creek Canyon and approximately six off-stream sites, will be identified. All of the sites will be major storages with dams 400 to 500 feet high and reservoir capacities of approximately 100,000 acre feet. At the conclusion of Phase I, three or four alternative projects will be recommended for study in Phase II. The project construction cost will be in the order of \$100 million.

The Tudor team includes three subcontractors, Cheryl Signs Engineering, hydrology and water rights analysis; Woodward-Clyde Consultants, geotechnical engineering; and Western Environmental Analysts, Inc., environmental studies. Project Manager is John Williams, assisted by Sal Todaro and Vince Baldassano.



Clear Creek Canyon

People

On the Road Again

A number of staff members from Tudor's three offices have recently been assigned to Tudor's new Phoenix office, and the Superstition Freeway Project.

In March, Mike Ellegood relocated from San Francisco to Phoenix as Office Manager. Mike and his wife, Julie, who is in marketing with HNC Architects, now live in Encanto Park. Jim Schroeder joined Tudor in Seattle, moved to Los Angeles for the SCRTD Project, and on to San Francisco. This June Jim came to Phoenix where he is now Project Manager for the Superstition Freeway Project. Jim Richardson, Senior Designer, worked on the PB/T MARTA Project in Atlanta, transferred to Seattle, and later to San Francisco. He was then assigned to the Friant field office. In August, Jim, his wife, Patty, and their sons, Matt and Adam, settled in nearby Chandler. Karen Yapp worked on the PB/T MARTA Project in Atlanta, and in San Francisco as a structural designer. In October, Karen was assigned to Phoenix as Senior CADD Designer.

From the Seattle staff Dick Rudolph was designated Chief Structural Engineer. In earlier years, he worked on numerous projects in San Francisco. Dick and his wife, Phyllis, moved to Phoenix in October. Jim Spofford joined Tudor in the Boise Office and later moved to Seattle with assignments in San Francisco. He is currently working on the Superstition alignment. Jim and his wife, Cindi, have moved to the Tempe area where Cindi is a nurse with FHP health plan. Ed Peters has joined the Phoenix staff as Business Development Manager. During his six years with the Seattle office, Ed was in marketing. Ed and his wife, Barbara Blunt, have purchased a home near Squaw Peak. Jun Quiray joined Tudor in 1984 as a Structural Engineer. Recently, he was on temporary assignment in San Francisco. Jun is now working on the structural design for the Superstition bridges and living in Scottsdale. Felipe Agosto joined Tudor's Seattle staff as a draftsman in 1984, and recently rejoined Tudor in Phoenix. Felipe and his wife, Donna, who is employed at Merabank, moved in October.

Bruce Braaten, from Denver, joined Tudor in 1984 as a Civil Engineer, and is currently designing the Superstition drainage system.

A variety of experience and talent has been brought together to provide design services for Superstition Freeway Project.

Bob Ganse — PB/T Award

On October 15, 1986, the tenth annual Parsons Brinckerhoff/Tudor Service Awards Luncheon was held for the employees who are responsible for the design and construction management on the MARTA project. The luncheon was held at the Hyatt Regency Hotel in Atlanta.

Each year, PB/T presents an award of special recognition to a former employee who has provided outstanding service to PB/T and the MARTA project. The Board of Consultants selected Bob Ganse as this year's recipient.

Bob and his wife, Joan, were invited to attend the luncheon where the award was presented to Bob by Doug Mansfield. Doug recounted the work done by Bob on the MARTA project more than ten years ago during the planning studies, County elections, and later during the early design.

Bob and his family went to Atlanta in 1970 for a six-year assignment. The first phase of the assignment was to obtain agreement on the transit routes from the local governments and railroads, and to produce the report which became the basis for the elections and the plan for financing the project. This was a continuation of work done several years before, in 1967, by Lou Salaber.

After the election, Bela Vadasz and Wil Pacheco joined Bob and started the detailed work of refining the location of the transit tracks so that the design could begin. During this phase, Bob managed the preliminary engineering for the East Line. He later managed the Design Review Group before returning to the San Francisco office in 1976.

Also, Tudor's Miguel Cornejo received his five-year service award. There were 27 ten-year awards and one twenty-year award to other PB/T employees.



Bob Ganse, with award, joined by Louis Riggs, Joan Ganse and Doug Mansfield.

New Faces . . .

Tudor welcomes new employees:

. . . for San Francisco

Eriberto Terciano
CADD Operator



Marilyn Tong-Mabry
Receptionist



Greg Tsang
CADD Plotter



. . . for Phoenix

Larry Doescher
Civil Engineer



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CONTRIBUTING AUTHORS: Gerry Gibney, Tom O'Neill, Ed Peters, Kurt Scholz, S.T. Su, Bob Toothman, John Williams, and Andy Yeung.

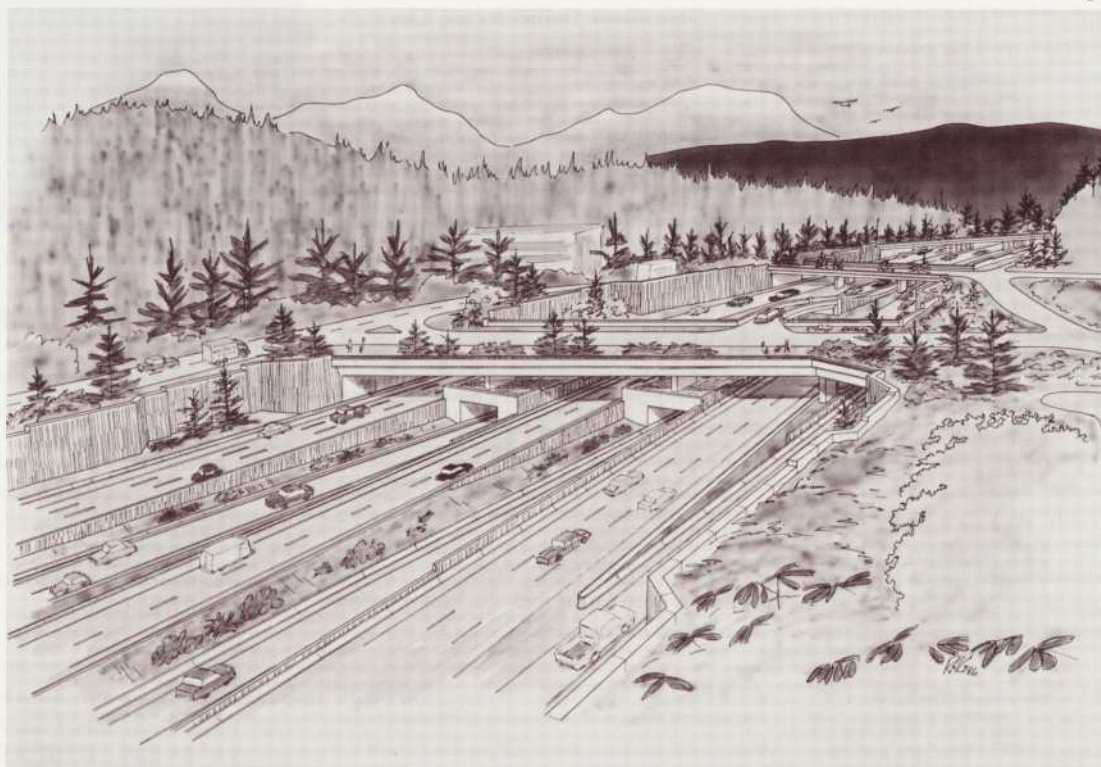
EDITING AND PRODUCTION STAFF: Frank Chiappella, Paula Dierkop, Jim Flannery, Greg Reichert, and Karen Van Til.

T U D O R

Quarterly

Winter 1986

Final Plans for I-90/Island Crest Way



Tudor has completed final plans, specifications and estimates for the \$30 million Central Business District Interchange for I-90 on Mercer Island. Tudor has been working on this project for the Washington State Department of Transportation since February, 1984. The first phase was a value engineering study of the entire central segment of the freeway on Mercer Island. WSDOT used a value engineering consultant to conduct workshops on various topics, and Tudor was asked to participate in the workshops covering earthwork, drainage, structures, and maintenance of traffic during construction. Several of Tudor's suggestions were incorporated in the final design. For example, the drainage design was revised to eliminate a pump station and use a gravity line.

The final design covered all aspects of a three-level interchange including two grade separation structures, two ramp tunnels, a three-lane roadway for westbound traffic, and a two-lane reversible roadway for high occupancy vehicles (HOV). The eastbound roadways will be designed under a subsequent contract for which Tudor intends to compete. One of the tunnels carries the columns supporting the 80th Avenue grade separation structure which supports a ramp connection with the HOV lanes. Both grade separation structures are unusually wide to permit extensive landscaping. The entire freeway is depressed to reduce noise and visual impacts.

Project Manager Don Hoel supervised the large staff that has completed more than 300 drawings. Mike Harrington was principal in charge. Richard Rudolph, lead structural engineer, was assisted by Harry Jasper, Jun Quiray, Darin Johnson, and Heidi Ouren; Pete Paterson was in charge of drainage design; DeWitt Jensen and Roger Mason were responsible for geometrics, and Roger Mason led the drafting effort. San Francisco personnel, Don Scapuzzi and Heinz Mueller, also lent their support. Tudor's principal sub-consultants were INCA Engineers, structural design, CTS Consulting Engineers, traffic systems design, and Converse Consultants, geotechnical engineering.

On the WSDOT side, Jim Gunderson is the project engineer on the Mercer Island section of I-90. During the design efforts, Tudor personnel worked closely with Jim and his staff: Trent Miller, Bruce Johnson, Guy Graham, Phil Cohen and Phil Fordyce.

WSDOT's construction sequence calls for this segment to be awarded for construction in August 1986 and for construction to be completed by January 1989. Tudor prepared the preliminary design for the Mercer Island segment of I-90 in the early 1970's. The firm is proud to have helped bring the project another step closer to completion.

Projects

COSO GEOTHERMAL Update

The ownership and project concept for the Coso Geothermal Power Plant have changed. The project is now owned and will be built and operated by the Atkinson/MHIA Joint Venture. Mitsubishi Heavy Industries America, Inc. (MHIA) will be process engineers and equipment suppliers and Guy F. Atkinson Construction Company is the general contractor for this geothermal power plant near Coso in the China Lake U.S. Ordinance Test Station.

Tudor Engineering Company was retained by Atkinson to design the foundations, water basin and pump pit for the cooling towers for Unit 1. Instead of the previously designed plant with two, four or six 12.5 MW units, a larger 25 MW unit was purchased for the initial installation. The same units are planned for future plant expansion. Each outdoor-type unit will be self-contained with dedicated cooling systems and piping, and separate, preassembled electrical switchgear and controls. The large turbine-generator hall with powerhouse crane, electrical switchgear, and control center annex have been eliminated.

The reinforced concrete design was presented on six metric scale drawings which Tudor prepared on CADD. The preliminary plans were used to solicit bids for reinforcing steel and to begin excavation. The revised final drawings will be issued for construction.

The 31 by 34 meter reinforced concrete water basin must remain watertight in extreme climatic conditions. It will be built, exposed to summer heat in the 120 degree F range, and then filled with water in the 80 degree F range while exposed to the hot sun on the outside face. In spite of the extreme design conditions, no expansion joints will be used, and all construction joints will have waterstops installed. The foundation slab will be placed on a sand bed over excavated rock to allow for expansion and contraction, and the inside water contact surface will receive a special membrane-type coating.

The assignment was performed on schedule and within budget. Principal-in-Charge is Mike Harrington, and Project Engineer is Kurt Scholz. Civil/structural engineers Perry Lin and Tony Lea, and CADD operator Karen Yapp were responsible for the successful completion of this fast-track job.

LOWER OHIO RIVER Hydroelectric

The Louisville District of the U.S. Army Corps of Engineers has retained Tudor under an indefinite delivery type contract to provide hydroelectric evaluation services for the Lower Ohio River Hydroelectric Development. This development will include six hydroelectric projects on the mainstem of the Ohio River that will have a total combined installed capacity of approximately 500 MW. The power plant sites will be located at six of the Corps of Engineers' existing locks and dams; these are Markland, McAlpine, Cannelton, Newburgh, Uniontown, and Smithland.

Work has begun on two levels. First, a reconnaissance level investigation will identify possible technology constraints and cost advantages related to large diameter bulb turbines. The Smithland Project, which will have an installed capacity of approximately 100 MW, will be used to develop the cost estimates included in the investigation. This will be a 10-week study, with Sal Todaro and Jeff Stevens in the Denver office, and Don Guild and S.T. Su in the San Francisco office involved.

Second, a preliminary study of the system characteristics of the total hydropower development on the Lower Ohio River will include the preparation of economic guidelines and procedures to identify feasible plans for system hydropower development. The main focus of this study will be to develop the methodology for identifying four plans for federal development, including a candidate plan for optimum economic development. A feasibility evaluation will also be included in the study. This task will be a 13-week effort for Ed Barbour, Clarence Colyn, and Bruce Braaten in Tudor's Denver office.



Ohio River Lock and Dam

Big Bear MWD



Original Bear Valley Dam built 1884.

The Big Bear Municipal Water District has decided to replace its multiple arch dam, built in 1911-12, with a new dam. This decision was based on Tudor's 1984-85 study. The old dam also provides the support for a CALTRANS bridge that was built in 1924, and CALTRANS has determined that the bridge also is in need of replacement. By agreement between CALTRANS and the District, Tudor was retained by the District to perform a combined bridge-dam feasibility study.

The study includes alternatives of 2, 3 and 4-lane roadway widths and two basic dam types: a massive gravity section with the roadway atop the dam except at the gated spillway, and a dam with a bridge having an ungated ogee crest across the entire dam except at the gated spillway. The dam is envisioned as a roller-compacted-concrete (RCC) dam with a volume of about 60,000-80,000 cubic yards and a height above foundation of about 110 feet.

Spillway sizing studies are included in the work, and flood risk analysis will be performed to reflect estimates of damage to homes and other improvements on the shores of Big Bear Lake.

Project studies are being performed by Project Manager Gordon Marsh, Andy Yeung, and Pete Paterson. Extensive CADD work is being performed by Dave Silveira with assistance from Susan Lee.

Of note is the fact that the original Bear Valley Dam is still in place within Big Bear Lake. It is a masonry arch dam, built in 1884, and a California registered historical landmark. It was used in 1979 while the face of the multiple arch dam was being repaired.

Projects

Calaveras — Finally a Reality



Robbins tunnel boring machine carving out an 8-mile long, 18-foot diameter tunnel.

After nearly 30 years of Tudor Engineering Company involvement, the North Fork Stanislaus River Hydroelectric Development Project is finally under construction. Tudor has a sub-contract with Chas. T. Main, Inc., Boston, Massachusetts, to provide engineers and inspectors to support the field operations of Northern California Power Agency, the financier and ultimate operator of the project.

The contract, a turnkey, guaranteed complete price, was signed in March 1985, with Sierra Constructors, a joint venture comprised of Guy F. Atkinson of South San Francisco and Harrison-Western of Denver, Colorado. The guaranteed complete price is \$276,025,000; however, some options are identified in the contract that could vary the total price between \$252 and \$285 million.

The contractor began mobilizing key managerial personnel in May 1985, and construction began in July 1985. The present work force is 65 salaried employees and approximately 200 hourly employees. The work force will peak at between 400 to 500 employees during the summer seasons. Project completion is scheduled for February 1990.

The project includes many interesting features situated over a wide range of terrain. The upper project, located at the 6,500-foot elevation in the Sierra, includes the 280-foot-high concrete-faced rockfill New Spicer Meadows Dam; a two-mile, 12-foot diameter diversion tunnel from the North Fork Stanislaus diversion dam to the New Spicer Meadows Reservoir; a 3-unit, 5 MW power plant; and a 15-mile buried 21 kV transmission line. The middle project is the 200-foot-high concrete arch McKays Dam located immediately downstream of Calaveras Big Trees State Park. Part of the middle project is a small diversion dam in Beaver Creek, with a short tunnel delivering water to a point where it will cascade approximately 600 feet into McKays Reservoir. The lower project is the Collierville Powerhouse, that will house two 100 MW generators driven by Pelton turbines operating at 2,000 feet of head. Between the middle project and lower project is an 18-foot diameter tunnel eight miles long connected by a 2,000-foot vertical shaft to a 14-foot diameter lined tunnel delivering water to the turbines.

Present construction is centered around the 18-foot diameter Robbins tunnel boring machine (TBM) that has started operation in the main tunnel with progress expected to approach 100 feet per day. Road building and site clearing is in progress on the middle and lower projects. Work at the upper project is expected to resume in April after a four-month winter shutdown.

Tudor personnel presently assigned to the project are Fred Estep, Field Quality Control Supervisor, Greg Colzani, Geologist and Tunnel Inspector and Ray Buffington, Tunnel Inspector. All of the Tudorites are enjoying the quiet, solitude and beauty of living in the Arnold area.

Puget Sound CONCRETE FLOATING DOLPHIN

The concrete floating dolphin is a mooring structure which aids positioning the Puget Sound commuter ferries as they load and unload at the Seattle Ferry Terminal. Adverse winds and tides tend to force docking ferries out of position. A dolphin provides an additional point of support without delaying ferry operations.

Tudor Engineering Company recommended and designed the dolphin to replace a badly deteriorated, rigid timber fender-wall. The 80 by 40 by 14-foot reinforced concrete dolphin provides stable support as well as absorbs energy from the docking vessels which run up to 440 feet long. Anchors fix the dolphin in position and weights attached to the anchor chains act as shock absorbers. The resulting flexible support is easier to use and less susceptible to mooring damage. The dolphin is less expensive to maintain than a timber fender-wall and can be moved to accommodate ferry terminal expansion. Computer hydrodynamic modeling by Nickum & Spaulding aided determination of anchor locations, grade of chain, and size of dampening weights.

This dolphin, which has a layout similar to a floating-bridge pontoon, is one of the largest and one of the first built specifically for this type of application.



Concrete Floating Dolphin

Christmas Party

San Francisco

The Engineers Club was the scene of the 1985 San Francisco Office Christmas Party held on December 7th. The festive evening began with cocktails and hors d'oeuvres, followed by an elegant roast beef dinner.

The after dinner program began with Paul Potter wishing everyone a warm and joyous holiday season. Paul welcomed special guests for the evening Joe and Kaye Carson, Stan and Harriette Froid, Leslie and Agnes Helgesson, Henry and Helen Weast, Horace and Hilda Burrier, Doug and Ann Mansfield, and Adolph Sandner . . . Tudor's oldest retired employee.

Paul then honored those who had received 1985 Service Awards at the special Awards Luncheon on December 5th. Paul commemorated Don Moore's retirement from 21 years of dedicated service to Tudor, and described the Board of Directors' Certificate of Merit, which was presented to Don at the luncheon. Also receiving Service Awards were Fred Estep, Roberto Iniguez and Bob Myrdal for their 20 years of service; Bob Beal for 15 years; and Hugh Brown, Barbara Cooper, Eva Spatenka, and Walter Zien for 10 years. The remainder of the evening was filled with conversation, and dancing to the Music of Nightwind.

from left to right

Paula Dierkop and Connie and Frank Chiappella, enjoying the cocktail hour.

Enjoying dinner are Irene and Dave Willer and Harriette Froid.

A view of the predinner cocktails.

Hugh Brown, Barbara Cooper, Eva Spatenka, ten year Service Award recipients; and Bob Beal, 15 year Service Award recipient.

Paul Potter describes Don Moore's Certificate of Merit as Ethel looks on.

Phyllis Salaber and Lois Pokorny pose for the camera.



Christmas Party



Seattle

The Seattle office held its Christmas party December 14, 1986, in the Oak Room of the Washington Athletic Club. The evening began with a social hour featuring a wide assortment of hot and cold hors d'oeuvres, including rumaki, pot stickers, breaded prawns, Swedish meatballs, salami cornucopias, eggs stuffed with chicken and salmon mousse, and assorted canapes. Special guests, Louis and Pat Riggs, were present for the first time in three years. For the last two years they have gone to Atlanta at Christmas time for MARTA openings and have not been able to attend. Louis and Pat renewed old friendships and met newer members of the Seattle staff. Mr. Riggs also presented a 15-year service award to Einer Handeland, and a 10-year award to Pete Paterson. Richard Rudolph took the presentations as an opportunity to pay an impromptu tribute to Mr. Riggs.

The catered dinner of filet mignon featured a special dessert, Napoleon Joane, created for the occasion by Chef Joan. After dinner, the two-piece combo, Smyles, provided dance music that brought nearly everyone onto the dance floor.

from left to right

Louis Riggs, Bela Vadasz, Pat Riggs, Don and Judith Hoel enjoy the social hour.

Harry Jasper and Susan Miller discuss their upcoming wedding with Tom O'Neill.

Dave and Jeri Alden share a quiet moment.

Everyone dances.

Pete Paterson receives his 10-year Tudor Service Award from Louis Riggs.

Diane Browning and Ned Wolff, Tom and Sandra O'Neill dance to the music of Smyles.

Christmas Party

Denver

The Denver office staff held their annual Christmas party at the Denver Athletic Club on the evening of December 20. Bob Janopaul was the special guest from San Francisco. Highlights of the evening included John Williams' welcoming remarks and Bob Janopaul's recognition of Jeff Stevens for his five years with Tudor. Cocktails and hors d'oeuvres were followed by an excellent filet mignon dinner, and trips by many to the adjacent bar to check on the progress of the Denver Broncos—Seattle Seahawks game. Everyone stayed for an enjoyable evening of socializing.

from left to right

Susan Stevens, Mary Baldassano, Sal Todaro, Bruce Braaten, and Dawn Jacobs are identifiable in the pre-dinner mingling.

Vernon Kotar, Bruce Braaten and Sal Todaro celebrate the holiday season.

Susan Stevens and Vince Baldassano enjoy the social hour.

Bob Janopaul, Janet Williams, Mary Baldassano, and John Williams.

Bob Janopaul congratulates Jeff Stevens on his fifth anniversary with Tudor.

Nelson and Dawn Jacobs display high spirits.



Projects

STREETCAR Extension

The Municipality of Metropolitan Seattle (METRO) has selected Tudor Engineering Company to develop and recommend alternatives for extending the Waterfront Streetcar through the Pioneer Square District to the proposed southern terminal of the new downtown bus tunnel at Union Station. Although the proposed extension is less than a mile long, it presents numerous technical difficulties.

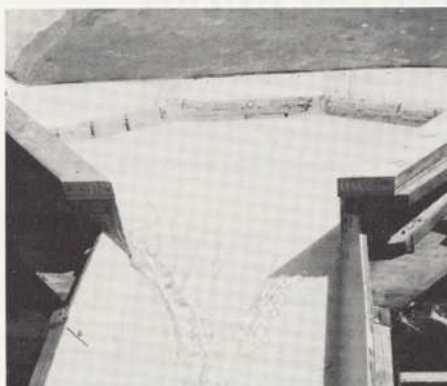
There are several potential alignments, and a choice to be made between single and double tracks. These alternatives present trade-offs between providing service and affecting street traffic. All of the alignments cross a main line of the Burlington Northern Railroad, in the middle of a sharp turn, and special trackwork would be required. A more unusual problem will be to provide enough vertical clearance for railroad cars to pass under the trolley overhead power supply. If the wires are too high, the trolley pole cannot operate. The new alignments also must use existing structures on Jackson Street that limit the location of trackage. A final consideration is that the entire project is located within the Pioneer Square and International District special review areas, so the project must be consistent with the historic and scenic character of these areas.

Tudor designed the initial 1.5-mile segment of the Waterfront Streetcar which has proved very popular. Bela Vadasz, Tudor's project manager for construction services of the original project, will manage the extension study. Roger Brassfield will be project engineer. Our major consultants include Raymond Kaiser Engineers who will handle trolley overhead and traction power, and Arai/Jackson Architects. Former Tudor employee, Gary Weinstein, who worked on the original streetcar project, will provide special consultation.



Seattle Waterfront Streetcar

Leroy Anderson Dam



Leroy Anderson spillway hydraulic model

The Santa Clara Valley Water District (SCVWD) signed a contract with Tudor Engineering Company in January 1986 for Tudor to provide design services for the Leroy Anderson Dam Modification Project near Morgan Hill, California. Tudor was selected by SCVWD's Consultant Review Board in November 1985 after completing a qualification-proposal-interview process.

Leroy Anderson Dam, built in 1950, has the largest reservoir capacity in the SCVWD water supply system. The spillway at Leroy Anderson Dam was originally designed for a 1,000-year flood; however, the California Division of Safety of Dams (DSOD) has determined that the spillway capacity is not sufficient to pass the probable maximum flood (PMF). To comply with DSOD's requirement, SCVWD decided to have a consultant design the modification work for the dam and spillway in order to pass the PMF safely.

Tudor's services include hydraulic, structural and civil designs for enlarging the spillway, raising the crest of the dam, and protecting the downstream channel from erosion. The emphasis of the design will be to provide efficient hydraulic performance of the enlarged spillway, and in the meantime, to retain the existing spillway to the maximum extent. To achieve this goal, a hydraulic model was constructed to verify and refine design concepts. Hydro Research Science of Santa Clara, California, will conduct the hydraulic model study as a subcontractor to Tudor.

Construction of the modification work is scheduled to begin this fall with project completion in 1987. Tudor's team includes Hugh Brown, Chief Design Engineer; Kurt Scholz, Project Engineer; Tony Lea, Design Engineer; and S.T. Su, Project Manager. All design drawings will be produced by Tudor's CADD system.

City of Bothell LOWERING SR-522

The City of Bothell, Washington, has given Tudor notice to proceed with the design for lowering SR-522 as it passes under the 102nd Avenue Bridge in downtown Bothell. Improving this undercrossing will provide better clearance for trucks and other large vehicles. SR-522 is a major east/west arterial that runs along the north shore of Lake Washington and connects I-405 with Bothell and communities along the I-5 corridor. The existing undercrossing has only 13 feet of vertical clearance, and vehicles have struck the bridge repeatedly. Oversize vehicles are currently using Main Street through downtown Bothell to bypass this restriction. The City has renovated Main Street to a landscaped pedestrian/shopping street, and wishes to keep truck traffic on the SR-522 throughway.

Designing this lowering presents several challenges. The existing undercrossing has four narrow lanes, and the bridge piers are immediately behind each curb. Construction must be sequenced to avoid disturbing the bridge foundations. Another critical element of the construction sequence will be to provide detours for the 30,000 to 40,000 vehicles per day currently using the undercrossing.

Einer Handeland is Project Manager, Richard Rudolph is Structural Engineer, and DeWitt Jensen is Civil Engineer.



Bridge six inches too low.

Projects

CADD CONTRACT for Military Mapping

Tudor has recently signed a contract with Royal Computer Graphics of San Francisco to prepare CADD based master planning and database mapping for 16 military communities in Germany for the U.S. Army Corps of Engineers, Europe Division.

Prime contractor Mitchell-Webb Associates, Inc., of San Diego, will be responsible for field verification of all existing map features and utilities at the installations, and the collection of data associated with the type, size, and condition of all structures, landscaping, sewers, water systems, and electrical systems.

The project will involve digitizing 206 maps. Each of the features and utilities will have a corresponding entry in a computer database that will describe the type of material, size, condition, and other pertinent information useful for master planning. When the mapping is completed, reports will be created that can itemize such things as area of paved parking, length of buried cable by type, and length of sanitary sewers by diameter.

Tudor will provide the project management for the creation of the maps and database, and will provide training for Royal Graphics' CADD operator, who will do the digitizing on our system. The creation and maintenance of the databases will be performed by Tudor.

Ivan Mlaker is the Project Engineer with Rich LaRowe in charge of the digitizing and map creation. The project was in full progress in April, and will continue through February 1987.



CADD based master planning and database map

Louis Riggs ROTARY AWARD

During the meeting of the San Francisco Rotary Club on January 27, 1986, Louis Riggs was presented the Paul Harris Fellowship Award. His sponsor was Bill Moore, of Dames and Moore.

The Paul Harris Award signifies a contribution of \$1,000 to the Rotary International Foundation to be used for scholarships for students to study overseas. Louis joins an elite group of Rotarians, for there are 126,000 Paul Harris Fellows out of a Rotary membership of 984,000.



Allen Feder, President of San Francisco Rotary, Louis Riggs, and Bill Moore of Dames and Moore

DARLINGTON PROJECT

Tudor recently completed the preliminary design of a \$50 million spillway structure for the Darlington Reservoir Project in Louisiana. The design also included an alternative design with a \$5.6 million 9 MW powerplant.

Our client, Brown & Butler, Inc. of Baton Rouge, under contract to the State of Louisiana Department of Transportation and Development, developed hydrology and Amite River basin data for this major flood control project. The project entails a three and one-half mile long earthfill dam retaining a 357,000 acre-foot reservoir and maximum impoundment of 780,000 acre feet. The preliminary design work is a continuation of Tudor's previous hydroelectric feasibility study, and FERC preliminary permit application that the State of Louisiana has received.

Work on the project was performed under the direction of Gordon Marsh, Project Manager, assisted by Steve Van Til, Andy Yeung, Ivan Mlaker, and David Silveira.

People

New Faces . . .

Tudor welcomes new employees:

. . . for Denver

Diane Van Wormer
Administrative
Assistant



Debbie Velasquez
Word Processor



. . . for Seattle

Diane Browning
Word Processor



Congratulations

The Consulting Engineers Council of Washington has presented Tudor Engineering Company with an honor award for Engineering Excellence for design of the Concrete Floating Dolphin for the Seattle Ferry Terminal.

Tomi Estep, daughter of Fred and Janie Estep, has been selected as an American Field Service student to study in Uruguay in the summer of 1986.

Greg and Sharry Colzani on the birth of a daughter, Valerie Anne, on May 22, 1985.

THE TUDOR QUARTERLY is published by Tudor Engineering Company for the information and enjoyment of its employees, their families, and friends.

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