# Friant Division
## Central Valley Project

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# The Friant Division

Water is life the cliché goes, but in California, the reality is water is power. The Eureka State is blessed with warm days and productive soil, but deprived of enough water to go around. The pursuit of the power conferred by the water flowing in its rivers, and bubbling up from underground, is a much more complicated part of the Central Valley Project (CVP) than authorization, design, and construction. An anomaly in the CVP's labyrinthine history, the Friant Division developed along lines similar to other Reclamation projects in the West. One of three original segments of the CVP, the Friant Division, is separate, simple in design, but has seen it share of the same kinds of controversy plaguing the rest of the project. In spite of the disputes Friant generated, of the top five agricultural producing counties in the nation, three -- Fresno, Tulare and Kern -- are watered by Friant Division facilities. The clear sky, fertile land, and dry air of the southern San Joaquin Valley provide the backdrop where great promises have been met and modest hopes destroyed all in order to create "the richest agricultural region in the history of the world."[1]

## Project Location

Because of the number and variety of individuals and groups it benefits, the San Joaquin River has earned the title of "California's hardest working and most fought-over waterway." Friant Dam is twenty-five miles northeast of Fresno, in the shadow of the Sierra Nevada Mountains. The 319-foot high dam, and Millerton Lake behind it, holds and delivers water to a million acres to the four counties in the San Joaquin Valley under the project's jurisdiction -- Fresno, Kern, Madera, and Tulare. With a maximum capacity of 520,500 acre-feet, the water in Millerton Lake is sent south through the 152-mile long Friant-Kern Canal and north through the 35-mile-long Madera Canal. Except for releases to manage floods, and to meet the irrigation needs of riparian water-right holders immediately below the dam, the upper San Joaquin River's entire flow is diverted and impounded by Friant Dam. Friant controls floods, prevents salt water

1. Stephen Johnson, Gerald Haslam, and Robert Dawson, *The Great Central Valley: California's Heartland*, (Berkeley, California: University of California Press, 1993), 6.

from destroying thousands of acres in the Sacramento-San Joaquin Delta, but its original mission, and first priority, is to serve irrigators.

The San Joaquin River Basin encompasses nearly 15,000 square miles. The river's headwaters begin life as snow on the peaks of the Sierra Nevada Mountains. Most of the Sierra's annual average 80 to 90 inches of snowpack eventually melts toward the valley floor during hot, dry summers. Six inches of moisture annually is the norm in this semi-arid desert. With a growing season averaging 260 days a year, the dry, Mediterranean climate nurtures most every seed planted by man, but it is internationally famous for producing fruit, nuts and vegetables of all kinds.[2]

## Historic Setting

Since the 1940s, it has been impossible to find Fresno County's first county seat, Millerton, on a map. Born in a spasm of gold rush fever, Millerton soon fell under the protection of Fort Miller, a Federal military post built to protect settlers from frequent clashes with Indians. The Fort's presence brought some stability to the region, but it was not until 1871, that residents felt secure enough to form a company to dig canals near the future site of the Friant Dam. By the mid-nineteenth century, life around Millerton lapsed from gold rush frenzy to the pastoral tempo of cattle ranching. The town slowly died until the only remaining structure of significance was the old county courthouse. When Reclamation came to the valley, ready to build Friant Dam, Federal purchase of the old town was more than another California real estate deal. It represented a new order supplanting the tranquil past with a modern, more mechanized environment.[3]

Southeast of Sutter's Mill, in the San Joaquin Valley foothills, the Gold Rush never got out of the starter's blocks. Within a few years after the first cry of gold, many disappointed novice miners came to understand the area would not yield the riches discovered elsewhere in

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2. U.S., Army Engineering District, Corps of Engineers, *Friant Dam and Reservoir San Joaquin River, California Reservoir Regulation Manual for Flood Control*, (Sacramento: 1965), 4-5; Sue McClurg, "San Joaquin River," in *Western Water*, (January-February, 1994): 4; U.S., Department of Interior, Water and Power Resources Service, *Project Data*, (Denver: 1981), 195.
3. U.S., Department of Interior, Bureau of Reclamation, *Central Valley Project Studies, Project 23: Recreational Uses of Project*, (May, 1944): 51.

California. The valley held its riches for the next golden moment in California's economic history – the "wheat boom" of the 1860s and 1870s. The national demand for California wheat created a cartel of powerful "wheat barons," owning thousands of acres of grain and reaping massive profits. The most powerful member of the baronage was the Miller & Lux Co. By the 1870s, the San Francisco firm owned nearly a hundred miles of riparian property along the San Joaquin River. Low prices and poor wheat yields broke the barons' hold by the turn of the century. The line of economic progression passed to land development companies and cooperative colonies around the towns of Fresno, Selma and Kingsburg. These groups and individuals blocked the San Joaquin and its tributaries with timber and stone, promoting small-acreage farming. Growers, and their teams, dug canals with the "Fresno Scraper," a satchel-mouthed device developed especially to break the soil of the valley. In a brief amount of time, through irrigation, these "orchardists" uprooted the control of the wheat barons, planting figs, grapes, oranges, and running water from a number of different sources on to pasture land.

In last two decades of the nineteenth century, new techniques combined with old methods to make water work in a number of different ways for the people of the valley. High in the Sierras, private and state surveyors mapped the steep canyons and measured snowpack to generate hydroelectric power with the runoff. By 1895, much of the city of Fresno received electricity from hydropower turbines. Before the century's turn, the pairing of the gasoline engine with pumps to force water from underground, took California agriculture off the back roads and put it on a paved highway. In the new century's first decade, powerful electric motors replaced gas, drills sunk wells deeper, and the groundwater was slowly sucked dry. The dwindling flow of many San Joaquin Valley rivers and tributaries only compounded the dilemma. Streams that gave out by June or July each year required storage facilities to sustain the existing acreage under irrigation. The valley's dependence on wells and pumping did not stop some prudential locals from building a handful of small dams and reservoirs across minor

tributaries during the 1920s.[4]

In the prosperous 1920s, multi-hued fruit and vegetable crate labels trumpeted California's agricultural bounty to the rest of the country. Behind those billboards to a happier life, a crisis was developing. The head of the Orange Cove Water District southeast of Fresno, B. J. Foster, remembered the mid-20s and early-30s when the bottom fell out both above and below ground: "Our pumps were producing 150 to 175 gallons per minute. In 1931 they were producing 50 gallons a minute. The people were just pumping all the water right out of the ground." He explained: "We can't go any deeper even if it would be economical to operate deeper wells -- we've hit granite." The disappearing aquifer caused the abandonment of forty thousand acres in the late 1920s. One grower saw his orange grove producing "only a crop of firewood" once his wells dried up. The arrival of the national economic Depression in California, caused planters to worry an additional 160,000 acres, worth more than $50 million, would also return to desert.[5]

The views of the state of California and the Federal Government on how to harness the rivers of the Central Valley came together on drafting tables in Sacramento and Washington in the Depression's early years. In order to capture and control the San Joaquin River, Reclamation in the mid-thirties designed a straight, 319-foot high gravity dam symbolizing utilitarianism. Reclamation's squat slab of concrete would impound a half-million acre-feet of flows from the river, providing downstream releases to the fields of some 15,000 small farms. The first surveys for the Friant Dam commenced in November 1935, and studies of where to dig two delivery canals followed in early 1936.

The desire of California's economic and political leadership to water the Central Valley was not popular with all its citizens. That spirit was magnified in the person of W. A. Beard of

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4. M. Catherine Miller, *Flooding the Courtrooms: Law and Water in the Far West*, (Lincoln, Neb.: University of Nebraska Press, 1993), 3; U.S., Department of Interior, Bureau of Reclamation, *The Contribution of Irrigation and the Central Valley Project to the Economy of the Valley and the Nation*, (1955), 8-9; McClurg, "San Joaquin River," 6.

5. U.S., Department of Interior, Bureau of Reclamation, Record Group 115, *General Correspondence Files, 1902-42*, Box 287, File 915, (Record Group 115 hereafter known as RG 115); U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Central Valley Project*, Vol. 1, 1936-8, 124; *San Francisco Chronicle*, 10 July 1949, p. 15.

Marysville, California. Beard carried the passion only a zealot can hold, as he was a one-man arsenal of sarcasm against the Central Valley Project. In 1936, he saw the Federal government's efforts as a "colossal mistake," an "engineers' dream" and "a taxpayers nightmare." However, that same year Beard singled out the authorization of Friant as being "in accord with the dictates of humanity, of reason and common sense" rescuing the crops and livelihoods of the upper San Joaquin Valley. The *1940 Annual Project History* noted some people along the San Joaquin River "have individually and through committees expressed apprehension, in some cases through attorneys, that Friant may interfere with their future uses of water." While many Californians approved of Friant, the seed of Beard's rhetoric grew in others after World War II, as the sentiment toward federal involvement in private agricultural activity grew increasingly bitter.[6]

Because of the dual complexities of moving water from one watershed to another, and diverting the natural flow of the San Joaquin, a number of water rights claims had to be settled before construction progressed. California water law provides for riparian rights entitling a land owner on a stream to the full beneficial use of the stream's natural flow. The Bureau could not divert water away from a stream until it settled the question of downstream water rights. Miller & Lux held the most important water rights claims on the San Joaquin. After negotiations stretched across the later half of the thirties, Reclamation eventually settled with Miller & Lux in the spring of 1939.[7]

**Project Authorization**

Like a shotgun at hastily arranged nuptials, the Great Depression was the force that wedded the state of California to the federal government. In 1933-34, when the state could not find enough takers to buy revenue bonds to complete the California Central Valley Project Act, they went to Washington seeking assistance. The passage of the Rivers and Harbors Act of 1935 by the U.S. Congress put funding under federal direction and construction under the U.S. Army Corps of Engineers. By order of President Franklin D. Roosevelt, $20 million was transferred

6. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Central Valley Project*, Vol. 3, 1940, 82; RG 115, *General Correspondence Engineering*, Box 287, File 915.
7. Charles Eugene Coate, *Water, Power, and Politics in the Central Valley Project, 1933-1967*, (unpublished Ph.d thesis, University of California: Berkeley, 1969), 74.

from the Emergency Relief Act funds to the Department of the Interior for construction of Friant Dam and other initial features on September 10, 1935. The President signed the Act later that year. Estimated cost of the Friant Dam and Reservoir came in at $14 million, the Friant-Kern Canal came in at $26 million, and the Madera Canal was $3 million. Representing the state of California in negotiations with the Federal government was its Water Project Authority. In March 1936, the Authority signed a co-operative agreement with the United States creating three divisions, including Friant, for the Central Valley Project. Six months later, the Authority approved Reclamation's prospective location of the Friant Dam and the Bureau's design of the dam and canals.

Central Valley Project legislation was re-authorized as the Rivers and Harbors Act of 1937. Along with the Friant Dam, Friant-Kern and Madera Canals, initial major features authorized were Shasta and Keswick Dams, the Tracy Pumping Plant and the Delta-Mendota Canal. The amendment transferred a $12 million authorization from the 1935 Rivers and Harbors Act earmarked for flood control and navigation to the Interior Department. More importantly for the Bureau, the 1937 Act placed the CVP under Reclamation law. Additional funding under the Rivers and Harbors Act of 1940 allowed for improvement of certain rivers and harbors in the interest of national defense.[8]

**Construction History**

Early in his 13-year term as Secretary of the Interior, the acerbic Harold Ickes considered the Bureau of Reclamation unimaginative. Once, Ickes suggested to the Department of Agriculture a trade of his Reclamation Bureau for their Forestry Service. His opinion of the Bureau changed once the plans for the Central Valley Project crossed his desk. The challenges and scope of an enterprise the size of the CVP, offered the perfect opportunity for Ickes to display his natural flair for promotion. Ickes soon made himself known as an "outspoken

8. Coate, *Water, Power, and Politics in the Central Valley Project, 1933-1967*, 53; U.S., Department of Interior, Bureau of Reclamation, *Bureau of Reclamation Project Feasibilities and Authorizations*, (Washington, D.C.: United States Government Printing Office, 1957), 240-7.

champion" of the CVP.[9]

His support for the Central Valley Project found its greatest public forum on November 5, 1939, when a piece of Ickes hyperbole became a part of CVP legend. At the Friant Dam ground breaking, Ickes spoke before a crowd of 50,000 people gathered on a plateau on the Madera County side of the river, a mile downstream from the dam. In a voice unencumbered by microphones, the Secretary compared Friant Dam to the elaborate French defense system, the Maginot Line, as both structures stood to "preserve and enhance our civilization." The *San Francisco Chronicle* picked up on the theme of his address the following day: "Cannon boomed on America's Maginot Line today," a reference to the blasts of dynamite signaling the start of construction. The fates of both engineering wonders held separate futures, as the Maginot Line had only six months of invincibility left. Fortunately, Friant Dam held longer, spared from any threats poised by the German *Wehrmacht.*[10]

Ickes also admonished those against Federal involvement in California's irrigation future, unaware of the promise of Friant Dam, "If the citizens of California who are kept busy moving from one such celebration as this to another would sit down with pencil and paper and strike an account of what the Federal Government has done with and for this great State, I venture to say that they would be amazed." That autumn, with construction at Shasta well under way, and activity on the San Joaquin just starting, one Reclamation engineer estimated, "The Federal Government is spending $44 every minute of 24 hours in California."[11]

A month before Ickes' call to arms, Griffith Company and Bent Company of Los Angeles were awarded the Friant Dam construction contract on a low bid of a little more than $8.7 million. Under contract terms, the firms had 1,200 days from October 1939 to finish the job. Griffith and Bent would perform all work and supply labor and equipment. The government furnished cement and steel, obtaining the necessary machinery through competitive bidding.

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9. Coate, *Water, Power, and Politics in the Central Valley Project, 1933-1967*, 96.
10. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Central Valley Project*, Vol. 2, 1939, 110; Robert W. de Roos, *The Thirsty Land: The Story of the Central Valley Project*, (Stanford, California: Stanford University Press, 1948), 9.
11. Harold L. Ickes, "Friant Dam Construction Started Central Valley Project," in *The Reclamation Era*, (November, 1939): 290; *California Highways and Public Works*, (December, 1939): 4. Walker Young made the estimate of Federal spending in California.

The Bureau also signed 28 contracts for clearing 3,552 acres of trees and brush in Millerton Lake. Some 300 entrepreneurs from the small towns of Madera and Fresno Counties, including Native Americans from the local Wacksache tribe, removed pine, oak, manzanita, and brush. Additionally, eight cemeteries were relocated, and the remains of 60 people, including many Native Americans, were reinterred before the lake could be filled. Overseeing the Bureau's activity as the Friant Division's Construction Engineer was one-time Assistant Commissioner of Reclamation, Roy B. Williams. H. Stanley Bent served as the contractor's project manager.[12]

On a fifty-acre parcel near the town of Friant, a camp town of more than 50 houses, an office building, and two 48-man dormitories opened in January 1938. Landscaped yards, modern utilities, and paved streets distinguished this camp from many of the ramshackle affairs often found near Central Valley construction sites. The camp, however, was not big enough to house all the workers necessary for the Friant job. Many laborers had to live in the surrounding towns of Fresno, Clovis, and Friant, driving or riding the bus to work. Friant needed laborers, and the prospect of any kind of job during the Depression had, in Reclamation's words, "caused a large influx of job seekers and others." The image of honest, toiling laborers was important to the Bureau as the national public relations stake on CVP grew higher by the day. Early as 1936, Construction Engineer Walker "Brig" Young asked the state of California "to deny liquor licenses in the vicinity of the project's construction camps," in order to attract sober, clear-headed employees.

Officialdom at all levels feared a repeat of the squatter's camp situation near the Shasta Dam. Complaints of stretched county relief budgets and unwanted squatters, had Reclamation seeking to avoid a duplication at Friant. A. R. Hines, the Friant Division's safety engineer, believed the forbidding peaks of the Sierras would prevent "the problem of encroachment by the mushroom growth of boom towns with the attendant undesirable consequences encountered at many large construction projects." Prejudice against Americans labeled "Okies" and "Arkies" compelled many of those indigent, poor whites seeking a construction job, to live off what they

12. "Friant Dam Contract Awarded," in *The Reclamation Era*, (November, 1939): 293; D. L. Brechner, "Indians Clear Reservoir," in *The Reclamation Era*, (April, 1942): 86.

could find at the site, and congregate in the shanty towns. Their arrival drove Reclamation, the police of two counties, and the Madera County health department to prohibit squatter's camps near the dam. Hines believed, the "contractor's practice of employing a large proportion of permanent San Joaquin Valley people" created "a well-regulated construction community which is very desirable."[13]

Powerful blasts from small powder charges helped remove over 1.2 million cubic yards of loose material during foundation excavation. On two occasions in 1940 and 1941, Reclamation's engineers diverted the San Joaquin River to place the dam's concrete. The river's course was first channeled through a 36-foot timber flume in July 1940, so workers could excavate and pour concrete. Diversion was delayed by the discovery of a 150-foot wide fault seam in the left abutment. The seam dipped approximately 60 degrees downstream, but was too old geologically to menace the structure. At strategic locations along the seam, workers dug shafts 10 feet wide by 15-to-25 feet long and 50 to 100 feet deep, backfilling the gouges with concrete in 10-foot lifts to reach the foundation. The shifting geology of the valley still produces a network of seams along the dam's abutments.[14]

In the spring of 1941, with the foundation in place, engineers moved the "river in a box" back to the spot where the timber flume was first located to continue concreting. Crews blasted an upstream cofferdam out the riverbed, throwing a barrier of earth and rock across the temporary channel leading to the flume. Shifts worked around the clock, racing to avoid spring flooding. However, early in the diversion process, flood waters dumped mounds of silt, destroying the forms. Concreting was briefly delayed to clean up the mess. As the dam rose from the riverbed, all flow traveled through three diversion conduits at the base of the structure.[15]

Reclamation's first extensive use of a powdery substance known as pumicite transpired at Friant. Pumicite reduced cement content and heat generation, avoiding surface cracking.

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13. A. R. Hines, "Friant: A Modern Construction Community," in *The Reclamation Era*, (December 1940): 327, 329; *San Francisco Chronicle*, 12 May 1936, p. 15.
14. "How Friant Dam is Being Built," in *Engineering-News Record*, (August 1, 1940): 44.
15. "Concrete Placement at Friant Dam Central Valley Project, California," in *The Reclamation Era*, (May, 1941): 146; "Friant Dam Progress," in *The Reclamation Era*, (July, 1941): 207; Edward Hyatt, "Three Central Valley Milestones," in *California Highways and Public Works*, (August 1940): 3; *San Francisco Chronicle*, 10 November 1940, p. A-1.

Obtained from a local deposit, pumicite was added to mass concrete in amounts equal to 20 percent by weight of the cement. All material went to the concrete mixing plant, which at top speed, could produce 6,000 cubic yards of aggregate in an hour. The concrete aggregate came from a deposit three miles downstream from the damsite owned by the Madera Irrigation District. In the course of gathering gravel for concrete, scattered through a thirty foot deep deposit on the San Joaquin River's left bank, the government and contractors struck gold. Under a supplemental contract between Reclamation and the contractor, Griffith and Bent were allowed to recover the metal and divide the profits with the Government. After a $24,000 deduction covering the expense of installing the recovery plant, the net proceeds from 5,428 ounces of reclaimed placer gold amounted to $176,000.[16]

The use of absorptive form lining was another innovation for Reclamation in Friant Dam's construction. On most sites, concrete hardened in place with the help of lumber forms. At Friant, the contractors used lightweight, highly absorbent fiberboard, commercially known as Celotex, similar in appearance to ordinary wallboard. The side of the lining placed against the concrete was lightly impregnated with sticky, bituminous paint. Requiring 24 hours to set, the fiber lining eliminated air bubbles and water holes and giving the dam a rough face with a pattern of small indentations.

The summer heat at the damsite could reach 116 degrees, so both parties agreed not to place concrete in temperatures exceeding 70 degrees. Griffith and Bent installed ice making machines, nicknamed "the ice cream plant" by workers, that kept the concrete cool during hot weather. In addition, the pumicite/cement mixture decreased setting and reduced heat generation within the concrete. Construction Engineer Williams predicted the concrete placement schedule would be "an extremely fast one," as he set a maximum rate goal of 170,000 cubic yards poured each month. To reach that target, all four mixers in service had to dump every four minutes, 24

16. Eric B. Kollgaard, and Wallace L. Chadwick, eds., *Development of Dam Engineering in the United States*, (Elmsford, New York: Pergamon Press, 1988), 131; "How Friant Dam is Being Built," 44; "Gold Recovered From Friant Dam Aggregate," in *Engineering News-Record*, (March 18, 1943): 11.

hours a day, 30 days a month, allowing no time for breakdown, repairs or delays.[17]

At 2 o'clock on the afternoon of July 29, 1940, Block 17 near the south abutment received the first concrete. The gargantuan amount of concrete necessary to complete the dam demanded a premium on economy in all stages of manufacture and placement. Thanks to an unusual method of placing and transporting concrete, soon after the first pour, the structure's crest was as long as eight city blocks. In order to form Shasta Dam, buckets of concrete swung by cable across the canyon. Down at the other end of the Central Valley, at Friant, things moved at a quicker pace. Four small, diesel-electric cars ran on two tracks each transporting 4-cubic-yard buckets. The cars were lifted from the track by two 30-ton gantry cranes and lowered on to the forms.

Steel trestles standing 210 feet high, and 2,200 feet long, supported the track system. The web of steel helped to accomplish Williams' goal of maximum concrete placement with a minimum amount of interference related to handling forms and clean-up. Along the trestle ran two huge hammerhead cranes with 300-foot arms and a "whirley" crane with a 125-foot boom. Supplementing the hammerheads and revolving derricks were a pair of stiff-leg derricks with a 180-foot booms. By March 1941, with the dam almost a quarter of the way complete, 5,500 cubic yards of concrete were placed each day. The contractor switched brands of commercial cement from a high to a low alkali content once the dam's completion was in sight. The change resulted in lighter colored sections and more visible cracking. All derricks assisted in placing concrete, handling steel, pipe and other materials. During the peak of placement, it was not unusual to find all four cranes handling concrete. In order to keep up the demanding pace, and reduce lost time, halfway up the 3,800-ton steel trestle, eighteen flush toilets and cool drinking water were made available to workers.[18]

In 1940, workers at Friant were unionized, joining laborers employed on Federal projects

17. Donald S. Walter, "Engineering Innovations at Friant Dam," in *The Reclamation Era*, (December, 1941): 309; *SEED Report on Friant Dam*, 11; U.S., Department of Interior, Bureau of Reclamation, *Memorandum to Board of Consultants, Friant Dam, R. B. Williams*, (Friant, California: Feb. 1, 1940), 5.

18. "Friant Dam – Contractor's Program and Construction Progress," in *Western Construction News*, (April, 1940): 130; "How Friant Dam is Being Built,' in *Engineering News-Record*, (August 1, 1940): 40, 43; "Flush-Type Lavatory," in *Engineering News-Record*, (August 15, 1940): 76; Hyatt, "Three Central Valley Project Milestones," 5.

at Shasta and Delta. Wages at Friant were slightly higher than Shasta's, as skilled laborers received $1.00 to $1.50 an hour; semi-skilled laborers, 75 cents to $1.12 an hour, and common laborers, 68 cents to 90 cents an hour. That year, also saw tragedy, as five fatalities -- more than any single year during production -- were recorded. Despite California industries hiring more people on the belief war would soon arrive, in the summer of 1941, 1,500 people -- 1,300 engaged by the contractor and 200 Bureau employees -- comprised the largest work force at Friant.[19]

The progress made throughout 1941 came to a halt in the spring of 1942 by order of the War Production Board (WPB). Due to the stringency of critical materials, Friant and other elements of the CVP, were classified non-essential to the war effort. In spite of the suspension of operations until further notice, the final cubic yard of concrete was placed on June 16, 1942. Finished just six weeks short of two full years after the first pour, 2,130,480 million cubic yards of concrete ranked Friant as the fourth largest dam in the world behind Boulder, Grand Coulee and Shasta Dams. After the completion of a few remaining components, the government classified the dam as ready for service in November 1942.[20]

The stop work order did slow installation of the spillway gates and control valves, drilling of grout holes in the foundation, and clean-up of the site. In May 1943, the WPB ordered a partial about face, determining the completion of the Madera Canal and the installation of valves at the Friant Dam, necessary for war-time food and fiber production. In order to comply with the re-start directive, two control valves needed at Friant Dam were temporarily borrowed from Boulder Dam. Without those valves for regulation, the San Joaquin River flowed unrestrained through the Friant Dam's permanent river outlets. After little over a year off, it took time to draw people back to work. Workers of all types, especially carpenters, were scarce until after VJ Day. Producers around the dam also had trouble finding people to harvest fruit. In June 1944, the labor situation was so bad, some workers in the area Reclamation office spent their

19. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Central Valley Project*, Vol. 3, 1940, 82, 124; "Concrete Placement at Friant Dam Central Valley Project, California," in *The Reclamation Era*, (May, 1941): 146; *Engineering News-Record*, (November 16, 1939): 13.
20. *Engineering News-Record*, (July 2, 1942): 57.

nights in the canneries and their vacations in the fields to get the harvest completed. It was only after both theaters of war closed by the fall of 1945, that the first waves of returning veterans filled the available common labor and craftsmen jobs. One task many of those returnees involved the regrouting of contraction joints. Water seeping through cracks in the dam's joints left white calcium carbonate deposits and dark blemishes on the structure's downstream face. For touch ups at most dams, air and water jets were standard, but crews at Friant used sandblasting equipment to remove the stubborn deposits off the dam's face.[21]

Reclamation designed Friant's spillway to pass flood water into Millerton Lake. Flow over the spillway is controlled by three 100-foot-wide by 18-foot-high drum gates operated by buoyancy. The capacity of the spillway is 83,020 cfs at elevation 578.0. The gates rise by flotation when water enters each gate chamber. The watertight gates are in the recess of the spillway forming a portion of the crest when lowered. Engineers designed the foundation drainage holes at a 5-inch diameter to reduce the number of required clearing and redrilling intervals caused by water-deposited sediments. Due to frequent drought cycles in central California over the past fifty years, water seldom spilled at Friant. Millerton Lake first stored water on February 21, 1944, and continues to provides storage, flood control, and, in wet years, recreation. It can hold 520,528 acre-feet of water, has a surface area of 4,900 acres and is approximately 15 miles in length. The lake's 45 miles of shoreline varies from gentle slopes near the dam to steep canyon walls farther inland.[22]

On the Friant Division, there are three separate river and canal outlets: the river outlet works, one for Friant-Kern Canal, and one for Madera Canal. The river outlet works are four 110-inch diameter-steel pipes through Friant Dam controlled by four 96-inch diameter hollow-jet valves at the outlet ends, and a corresponding chute and stilling basin. The capacity of the four hollow-jet valves is 16,400 cfs, however, the flow through the valves seldom exceeds 100 cfs. Small releases to the river flow through two 24-inch diameter steel pipes branching from

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21. *Engineering News-Record*, (October 7, 1943): 73; "Stop and Starts by War Production Board," in *Engineering News-Record*, (May 27, 1943): 7.
22. *SEED Report on Friant Dam*, 13-4.

Penstocks 3 and 4. Releases are controlled by two 18-inch diameter needle valves at the outlet ends.

The Friant-Kern Canal outlet works are located on the left side of the spillway, consisting of four 110-inch steel pipes through the dam controlled by four 96-inch diameter hollow jet valves at the outlet ends, and a stilling basin. Traveling in a southerly direction over 152 miles, the canal carries water from Millerton Lake to the Kern River four miles west of Bakersfield. Peter Kiewit and Sons Company of Omaha submitted the low bid of $1.1 million, receiving the contract in July 1945, and starting excavation a month later. Sprawled over three counties, as many as 292 people worked on the canal. The canal's initial diversion capacity is 5,300 cfs which gradually decreases to 2,500 cfs at its terminus. A 24-foot, 3-inch tube siphon conveys the canal five feet below the riverbed and under a railroad over a distance of 3,000 feet. The siphon is 30 miles south of the dam at the juncture with the Kings River.

Reclamation bragged "no other canal in history has been built through such a highly developed area," and some of the conveniences of modern technology disrupted in the contractor's wake confirms that boast. More than 350 overhead and underground telephone, telegraph, power, oil and gas lines were moved to higher elevations or relocated. Heavy crawler tractors and bulldozers, equipped with attachments to cut roots below the surface, burrowed through vineyards and orchards. Along a 113-mile reach between the dam and the White River, more than 500 different structures, including overchutes, drainage inlets, irrigation crossings, and turnouts were built. During construction, placement of concrete lining was aided by the use of a traveling gantry. Almost 85 percent of the canal is concrete-lined. In those sections, the canal's maximum top width is 128 feet, decreasing to a bottom width of 24 feet, with water depths dropping from 19.9 to 11 feet. Canal bottom width ranges from 64 to 40 feet with varying water depths in the earth-lined sections.[23]

On July 9, 1949, 2,500 people watched a former Reclamation location engineer and a citrus grower from the town of Lindsay usher in the first delivery of water. The system became

23. U.S., Department of Interior, Bureau of Reclamation, *Friant-Kern Canal, Technical Record of Design and Construction*, (Denver: 1958), 2, 63.

fully operational on June 29, 1951, when the Delta-Mendota Canal was completed. Before Delta-Mendota went on-line, releases from Friant Dam went to "exchange contractors" downstream. Those contractors held San Joaquin River rights exchanging for a substitute supply from the Delta-Mendota Canal. Reclamation estimated it cost water users $15 an acre foot to receive water from Friant-Kern. That rate compared to the $28.50 an acre foot for water pumped from underground. Eventual cost for all aspects of the Friant-Kern Canal totaled $60.8 million. Excepting the Delta-Mendota Canal, the Friant-Kern is the largest lined canal in the West.[24]

On a map, Friant-Kern's twin, the Madera Canal, looks like the division's short right arm. Situated on the dam's right side, the Madera Canal is 36 miles long and terminates at the Chowchilla River. The canal's capacity is 1,275 cfs at the head, dwindling to 625 cfs at the terminus. The outlet works features two 91-inch-diameter steel pipes controlling releases through two 86-inch-diameter interior differential needle valves at the outlet ends. The needle valves discharge into a stilling basin marking the starting point of the Madera Canal. The canal bottom width varies from ten to eight feet with a water depth of nine to seven feet in the concrete-lined sections. Canal bottom width varies from 24 to 20 feet with water depths from 9 to 7 feet in the earth-lined sections. Approximately, 79 percent of the canal is earth-lined. Water ran for the first time through the entire length of Madera Canal on June 10, 1945, and deliveries were made a month later. The construction of smaller distribution canals still had to proceed in order for the canal to be fully used. Water did not come to individual farmers, before the system came along, but ran down six water courses in the area to raise the water table.[25]

The construction pace of the furious forties culminated with the completion of the Friant Division in the early 1950s. The cost allocation and repayment for Friant totaled $146,094,000. The main beneficiaries, the growers, soon reaped revenues way beyond that amount, as the state estimated that each year agriculture exceeded the total value of all the gold mined in California

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24. U.S., Department of Interior, Bureau of Reclamation, *Central Valley Project, Tulare Basin District, Final Report – Friant-Kern Canal*, (March 18, 1948), 7-8; *San Francisco Chronicle*, 10 July 1949, p. 15. The final report on the Friant-Kern Canal was written by Reclamation Engineer H. A. Jensen.
25. U.S., Department of Interior, Bureau of Reclamation, *SEED Report on Friant Dam*, (Denver: July, 1984), 16; "Central Valley Project – Canals Come Next," in *Engineering News-Record*, (March 20, 1947): 92.

since 1848.[26]

## Post Construction History

The alkali carried by the San Joaquin River has left its mark on the face of Friant Dam. Parts of the crest and other supplementary fixtures, described as "excellent-looking" in the late 1960s, have developed long, wide cracks. Areas most severely weathered did not receive the mixture of aggregate and pumicite. Concrete expansion is visible along the top six feet of the crest, the chute surface, and the reinforced concrete portions of the structural framing around the outlets. In 1984, Reclamation predicted deterioration and seepage had not yet jeopardized the safe operation of the dam, it will eventually do so. An engineers safety report recommended that after 44 years of service, a modification study to prevent the concrete's continuing decay was needed. Other than required overhauling of the valves for maintenance, both the Friant-Kern and Madera Canal operate without any major problems.[27]

The Madera Diversion Dam (later renamed the John A. Franchi Diversion Dam) on the Fresno River is operated by the Madera Irrigation District. Built by Reclamation and completed in 1964, the earth and sheet steel piling dam supports the Madera Canal. Franchi stands 15-feet-high, spanning 263 feet across the Fresno River. In the mid-1950s, Reclamation provided two local irrigation districts pumping plants, the Delano-Earlimart and the Lindsay-Strathmore. They provide their respective districts with water pumped from underground.[28]

## Settlement of Project

Between 1935 and 1940, the population of the San Joaquin Valley exploded: Tulare County increased by 38.4 percent, Kings County by 38.5 percent, and Kern County by 63.6 percent. It was not fun in the sun enticing newcomers, but the slender promise of a job. Migratory labor after the war remained the domain of "midwestern and southern farmers and farm laborers" following the first generation that came to the valley in the mid-1930s. By mid-

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26. U.S., Department of Interior, Bureau of Reclamation, *Repayment of Reclamation Projects*, (United States Government Printing Office, Washington, D.C., 1972), 70.
27. *Development of Dam Engineering in the United States*, 132; U.S., Department of Interior, Bureau of Reclamation, *SEED Report on Friant Dam*, 6-7.
28. *Project Data*, 197.

century, the total number of Southwesterners living in the San Joaquin reached 255,000, approximately 22 percent of the population. In 1948, in the San Joaquin Valley, the ethnic background of migrant farm laborers was more than three-quarters Anglo-American. Reacting to a war-time demand, cotton became California's "outstanding crop" by the mid-1940s, displacing citrus. The lands of the Friant Division were no different, as cultivating and picking cotton drove each of the four counties economies. Almost a half-century later, by the 1990s, approximately 15,000 small farms, averaging 63 acres each were spread throughout the Division. However, that figure is deceiving, as the average size of a farm in Kern County is 1,473 acres. Two generations later, many descendants of the Okies are respectable, well-off representatives of California's post-war prosperity. But other groups wait for their turn.[29]

The muscle needed to turn the valley's economic turbine is now provided by Southeast Asians and Hispanics. Escaping the aftermath of the Vietnam War, Hmongs, Vietnamese, Cambodians, and Laotians are the latest groups trying to make a living in the valley's fields. A 1991 study of economic conditions in Tulare, Fresno, and Kings Counties established that the men, women and children working in "America's garden" often go hungry. The California Rural Legal Assistance Foundation found 60 percent of those laborers were Hispanic and under the age of eighteen. Their study of the lives of the modern migrant laborers concluded, "Families work – and work hard – yet they remain poor." This happened in a year (1990) when the CVP's total agricultural income topped $17 billion.[30]

The transformation from farmtown to city in communities like Fresno has further reduced irrigated agriculture acreage, again increasing pressure on ground water and existing surface water facilities. Superfluous use of toxins to kill insects and stimulate crop yields, pushed the U.S. Geological Survey to conduct a multi-year study to detect the kinds of chemicals in the river and their point of origination. For better of worse, Friant will continue to serve as a laboratory for central California's social and political experiments in labor, land use and pollution.

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29. Johnson, Haslam, and Dawson, *The Great Central Valley: California's Heartland*, 161.
30. Johnson, Haslam, and Dawson, *The Great Central Valley*, 200, 204.

## Uses of Project Water

In the time frame between the end of World War II and the first days of the Korean War, farming, witch hunting, and "red-baiting" grew in popularity throughout the Central Valley. Swept up by the suspicious mood of the times, a coterie of growers attacked Reclamation for practicing "communism," claiming the Bureau exercised "dictatorial powers" over the public. The source of their ire was the most sacred tenant of Reclamation law, 160-acre limitation, and the creation of "tax-free power plants and tax-free power lines in competition with non-tax-free companies," such as the giant Pacific Gas & Electric Co. In the succeeding decades, issues like pollution, protection of endangered species living along the river, and acreage reform has created additional outlets for the growers resentment to fester.[31]

Environmental issues, so provocative elsewhere on the CVP, have just recently come to a boil at Friant. In the late 1930s, the San Joaquin's salmon run was considered less important than the water and flood control protection offered by the Friant Dam. Contracts between the irrigators and the Friant Division have no provisions to release water for fish or other instream uses. The run does not extend beyond the damsite, so no provisions were made to accommodate fish passage. After the dam was finished, amazed workers witnessed salmon trying to jump over the dam, but downstream dewatering eliminated many remaining salmon and steelhead habitats.

In 1947, a group of riparian landowners sued the federal government under terms of the California Fish and Game Code, claiming Friant Dam deprived them of commercial and recreational uses related to salmon spawning and fishing. The state attorney general, Edmund G. "Pat" Brown, concluded the United States was not required by state law to allow enough water to pass the dam to preserve fisheries below the damsite. The issue of fish flows found new life in 1988, when first contracts for the Friant Division came up for renewal. Fifteen environmental groups sued the Federal government that year, arguing contract renewals should be subject to environmental review under provisions of the National Environmental Policy Act (NEPA) and

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31. U.S., Department of Interior, Bureau of Reclamation, *Westlands Unit, San Luis Division, Central Valley Project, (Ultimate Plan): Appendix A*, 32; U.S., Department of Interior, Bureau of Reclamation, *They Subdued the Desert*, (August, 1947), 102. The interviews contained in *They Subdued the Desert* were gathered by Reclamation's Chief Information Officer in the mid-1940s, Barrow Lyons.

the Endangered Species Act (ESA). After much legal parrying and thrusting between all parties, a U.S. District Court in late 1992 decided not to dismiss the case. Environmentalists now believe the dam will have to provide flows for fish in the future. Passage of the CVP Improvement Act of 1992, reallocating up to 800,000 acre-feet of CVP yield for the restoration of valley fisheries will undoubtedly impact the Friant Division. The environment is now a factor in the future of the CVP, on an equal footing with irrigators and municipalities.[32]

The assembly-line methods practiced by Henry Ford in the auto factories of Michigan were adapted into "food factories" created by central California growers. In 1990, on 837,079 acres irrigated by the Friant Division, growers gathered $1.9 billion in revenue from more than 90 different varieties of crops. Fruits alone provided a $1.3 billion contribution to that total. At the start of the nineties, the following crops were the most profitable of their class on the Friant Division:

**Most Profitable Crops - Friant Division, 1990**

| | Acres | Yield per acre | Total Yield | Value per acre | Total (in $ mill.) |
|---|---|---|---|---|---|
| Fruits: Oranges and Tangerines | 92,519 | 271.88 cwt | 25.1 million cwt | $4,783.60 | $442.5 |
| Nuts: Almonds | 69,861 | 1.35 tons | 94,182 tons | $1,755.46 | $165.3 |
| Misc. Field Crop: Cotton, Lint (upland) | 119,063 | 2.72 bales | 323,287 bales | $1,029.98 | $122.6 |
| Vegetables: Early Potatoes | 20,564 | 355.00 cwt | 7.3 million cwt | $3,240.21 | $66.6 |
| Forage: Alfalfa Hay | 64,535 | 8.94 tons | 576,701 tons | $932.40 | $60.1 |
| Cereals: Wheat | 22,146 | 90.04 bushels | 1.9 million bu. | $324.69 | $7.1 |

(Source: U.S., Department of Interior, Bureau of Reclamation, *1990 Crop Production Report*, 369-72).

On the way to creating these factories, California's political and business forces bent the spirit and the letter of Reclamation's acreage limitation rule. Forty percent of the total water supply of Kern and Kings Counties is annually gulped by corporate farmers tilling expanses well beyond the 960 acre limitation specified in the Reclamation Reform Act of 1982. The petroleum conglomerate, Chevron USA, controls 37,793 acres of farmland in both counties, followed by other non-traditional gardeners like Getty and Shell Oil, and the Southern Pacific Land

32. McClurg, "San Joaquin River," 8.

Company.[33]

Over the final years of the twentieth century, landscaped suburbs and blocks of pavement marched out from the valley's towns and cities, blotting out acres of prime agricultural land. In a frenetic half decade between 1976 to 1981, 50,000 acres of farm land near Fresno was replanted with tract homes and strip malls. A *vaquero* who lived long enough to see Kern County change from rangeland to sub-divisions, Arnold Rojas, lamented in the mid-1980s, "Some day we will have to plow up the malls to plant something we can eat." The suburban boom would not stop, disregarding California's worst drought in centuries, as storage in Millerton Lake dropped to 178,000 acre-feet by 1994. Nature's pendulum swung again in 1995, as heavy rains conveyed scenes of water lapping the dam faces of gorged reservoirs. Rampant growth and long cycles of drought interrupted with an occasional lone season of heavy moisture are duplicated all across the West; where urban bumps up against rural, in a world where more people need more food. In California, those contradictions are seen first, and felt more deeply, before rippling eastward across the nation.[34]

## Conclusion

As California faces new problems, the power of water has created a world where people's beliefs collide, and nothing is quite the way some say it is. The only thing more impressive than the speed of construction and structural immensity of the Friant Dam is its record of service and the agri-business complex it created. Friant's role will change in the new century, but its contribution to feeding and clothing late Twentieth Century America will prevail as the Division's legacy.

## Suggested Readings

"Friant Dam -- Contractor's Program and Construction Progress."*Western Construction News*. (April 1940): 127-30; "How Friant Dam is Being Built." *Engineering-News Record*. (August 1, 1940): 40-4; Stephen Johnson, Gerald Haslam, and Robert Dawson. *The Great Central Valley: California's Heartland*. Berkeley, California: University of California Press, 1993.

33. Gerald W. Haslam, *The Other California: The Great Central Valley in Life and Letters*, (Santa Barbara, California: Capra Press, 1990), 16.
34. Johnson, Haslam, and Dawson, *The Great Central Valley*, 236.

## About the Author

Robert Autobee holds a Masters degree in History from the University of Northern Colorado. The Colorado Historical Society published his thesis, *If You Stick With Barnum: A History of a Denver Neighborhood*, as part of their *Essays and Monographs in Colorado History* series in 1993. He has reported for several different Colorado newspapers, and for *Western Resources Wrap-Up*, based in Washington, D.C.

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