

TESTIMONY OF DANTE JOHN NOMELLINI, SR.
BEFORE THE
STATE WATER RESOURCES CONTROL BOARD CDO HEARINGS
MAY 5, 2010

I reside on Middle Roberts Island (RD 524) at 6767 Wolfinger Road, Stockton, California, where my wife and I through our revocable trust own a home and the adjoining approximately 36 acres. We also have ownership interests in entities which own property on Lower Roberts Island (RD 684) and on Lower Jones Tract (RD 2038). For a number of years I owned an undivided one-third (1/3) interest in land at the westerly boundary of Honker Lake where I engaged in farming pasture and raising cattle. I am familiar with the subject parcels and the surrounding area. My professional work in the vicinity of the subject parcels includes serving as Secretary and Counsel to Reclamation District No. 684 (Lower Roberts), Reclamation District No. 2038 (Lower Jones Tract), and Reclamation District No. 17 (Mossdale); as Counsel for Reclamation District No. 2040 (Victoria Island) and as Special Counsel to Reclamation District No. 404 (Boggs Tract). I also work for numerous other reclamation districts in the Delta.

The subject parcels are all swamp and overflowed lands patented into private ownership by the State of California. Such lands were acquired by the State of California from the Federal Government by virtue of the Act of Congress of September 28, 1850 (9 U.S. Stats. at Large, p. 519), generally known as the Arkansas Act. In accepting the grant from the Federal Government the State is bound to carry out in good faith the objects for which the grant was made and thereby assumed an obligation to reclaim the lands.

“The object of the federal Government in making this munificent donation to the general States was to promote the speedy reclamation of the lands and thus invite to them population and settlement, thereby opening new fields for industry and increasing the general prosperity.” See Kimball v. Reclamation Fund Commissioners (1873) 45 Cal. 344, 360.

Critical to the economic viability of the subject parcels and economic support of the levees and drainage necessary to reclaim and sustain the reclamation is the ability to cultivate various crops including the timely application and utilization of water for surface and sub-irrigation. Consistent with its obligation to the Federal Government the State has encouraged the private investment in the reclamation of the Swamp and Overflowed Lands and enjoyed the benefit of the general prosperity resulting therefrom. The State has monitored the irrigation and use of water on lands in the Delta and has for many years recognized the Delta lowlands including the subject parcels as enjoying riparian water rights. See Central Valley Project, Delta Lowlands Service Area Investigations Report Area DL-9, Stockton to Middle River and Vicinity, January 1964 (a copy of the report is Exhibit 9A). Included in said excerpts is “Table 8. Unit Consumptive Use of Water In Sacramento-San Joaquin Delta” (copy attached) which shows that for every use there is a net savings of water over “Tule and Swamp” which is the

unreclaimed condition. It is generally accepted that on average the savings due to irrigated agriculture versus “Tule and Swamp” in the Delta is about 2 acre feet of water per acre per year. In addition to the general prosperity resulting from reclamation, the State has gained water supply.

Because the subject parcels are “Swamp and Overflowed Lands,” their productive use was and is clearly dependent upon reclamation requiring construction, operation and maintenance of levees and drains. In order to fund such reclamation, economically viable agriculture was and is required. Clearly a Grantor of a parcel being separated from a waterway would receive no benefit from depriving the separated parcel of a riparian water supply. If the separated parcel could not economically bear the burden of its share of the cost of reclamation, then a greater burden would fall on the Grantor. Additionally, the water consumption resulting from unreclaimed land “Tule and Swamp” is clearly higher than that from irrigated cropland. Due to the high water table and/or inundation, the abandoned land would return to swamp or a waterbody. For swamp and overflowed lands the intent to convey riparian water rights with the land should be clear and only a clear expression to the contrary should be viewed as negating such intent.

The intent of the State and the Delta landowners was to reclaim the Swamp and Overflowed Lands for farming including the use of surface and sub-irrigation where required. Sluice-gates sometimes referred to as floodgates were used to both drain and irrigate the land. For drainage, the gate or gates would be closed to prevent the incoming or flood tide from raising water levels within the area and would be opened during portions of the ebb tide to lower the water level. For irrigation, the process was reversed and water levels within the interior sloughs, ditches and canals were raised to facilitate surface and sub-irrigation. See attached excerpts from History of San Joaquin County, California, Thompson & West (1879), page 43, first column. (A copy of said history is Exhibit 9B.)

The intent of both the United States and State of California in conveying Swamp and Overflowed Lands into private ownership was to facilitate reclamations and production of food. The Delta was ideally suited for this purpose because of its location at the confluence of numerous river systems. During the late spring and summer of the early years prior to major upstream water development, the Delta enjoyed exceptional availability of fresh water for growing crops. If one tributary watershed suffered dry conditions, others would have ample flow. Snow melt and accretions to the rivers from full groundwater basis provided additional water supply reliability. See attached excerpts from History of San Joaquin County, California, Thompson & West (1879), page 42. (Exhibit 9B)

Early reclamation essentially followed the natural features of the Delta. The serpentine alignment of exterior and now interior levees and various ditches and canals is the result of following the meanders and contours of the historic sloughs. Historic maps, soil surveys and the later aerial photographs show the location of the major channels and the hundreds of lesser meandering sloughs. As water overflowed, the channels heavier soil particles were deposited

closest to the channels thereby creating elevated banks or natural levees. These elevated areas rimmed the swamps with a gradient falling away from the channels. The gradient has over time increased due to loss of elevation of the organic soils comprising the tule swamp. Oxidation, deflation due to drainage, compaction, burning and wind erosion all contributed to such loss of elevation. (See Exhibit 3J, The Settlement Geography of the Sacramento-San Joaquin Delta, pages 290-294.)

Levee construction generally followed the meanderings of the elevated banks of the larger natural channels. Branching or intersecting channels were dammed and typically equipped with floodgates sometimes referred to as tidegates, sluiceways or culverts. These facilities were usually constructed of wood, brick, clay pipe and in some cases metal. Flap gates or other control mechanisms were used to manipulate the water levels in the slough by either trapping the high tide for irrigation or letting drainage escape on the low tide. As an example or confirmation of the extent of these culverts or floodgates, see Exhibit 9C which includes estimates for work to be done on Union Island and describes the filling of sloughs and installation of flood gates. For Roberts Island, we have the Report of the Commission of Public Works, California, 1895, which references the damming of “ten sloughs of various sizes” during reclamation work. (See Exhibit 9D.)

The use of floodgates, sloughs, ditches and canals for both irrigation and drainage was practiced extensively in the past and continues today.

“Some irrigating had been done earlier, but the practice does not appear to have become a common part of delta farming until the 1870's. Flood irrigation had been tried on small grain by 1871, but was given up because of the excessive weed growth that resulted. For other crops land soaking before planting or flood irrigation were practices in use during the 1870's. Subirrigation prior to plowing and planting dates from the same decade; it was originally used for beans and potatoes or to encourage the growth of a volunteer hay crops. Since then subirrigation has been used on all growing crops.

Irrigation water was delivered to the backswamp land through tidal gates and drainage ditches in the 1870's. Filled mains backed water into field ditches of two- to four-foot depth; from these the water spread along the six-inch- to two-foot-deep laterals (“spud ditches”) which were spaced at intervals of 65 to 85 feet. Seepage occurred in the peat soils. Water levels were controlled with dams across the ditches.

Water delivery systems independent of drainage ditches were in use by the latter 1870's. These systems were maintained by the farmer, only the drainage system being the responsibility of the reclamation districts. Water wheels, windmills, and low-head pumps were used on the higher alluvial banks where furrow and check irrigation were the rule. Gravity flow and siphons after the 1900's were used on the lower tracts. . . .” (Exhibit “3J,” The Settlement Geography of the Sacramento-San Joaquin Delta, pgs. 310 - 312.)

In the late 1950's I worked during the summer as an irrigator on Venice Island. The Reclamation District drainage pumps were turned off to raise the water level in the main drainage canal to irrigate the field corn crop. The four-foot ditches which otherwise provided drainage were blocked with temporary wooden dams at higher locations to direct seepage and siphon flow into spud ditches which were spaced advantageously throughout the field about forty (40) feet apart. During this same period, I was responsible for the irrigation and weeding of an asparagus seed bed. Irrigation water was applied through quick connect lengths of aluminum pipe with fixed rainbird-type sprinklers. The water was pumped from a partially blocked four (4) foot ditch with water periodically recharged by way of siphon from the river.

On Victoria Island (RD 2040) irrigation was regularly accomplished by allowing drainage canals to fill and using ditch pumps to apply the water to the various fields.

In Reclamation District No. 684 (Lower Roberts) where I serve as Secretary and Counsel, the District has since 1898 owned the East Branch of Black Slough from the south line of Section 3 to the San Joaquin River and the West Branch from the south line of Section 34 to the San Joaquin River. See attached Indenture from John Ferris to Swampland Reclamation District Number 684 and recorded August 26, 1898, at _____, page 188.

The dam at the intersection of Black Slough and the RD 684 levee along the San Joaquin River contained a large floodgate which was operable for both irrigation and drainage. Although the floodgate was then equipped with a screw-type gate valve, water continued to flow along or around the structure and due to flood safety concerns was removed in 1980. Removal revealed that the floodgate was originally a box-type culvert constructed with wood which had deteriorated and was at some stage repaired and modified to accommodate a screw-type gate valve. After removal, siphons were installed for irrigation to replace the floodgate. The drainage feature was not restored. Due to flood safety concerns, Reclamation District No. 684 and the landowners therein have embarked upon the removal of all floodgates through the main levees and replacement with siphons or pumps where the conduits pass through the levees above the 100-year flood elevation. Attached hereto is a copy of a May 1927 map of Reclamation District No. 684 which shows the locations of thirty (30) floodgates. In my opinion, this is representative of the common use of floodgates during the early days of farming the Delta. Attached hereto are copies of photos which I recently took of currently operating floodgates in the vicinity of the subject parcels. Photo One shows the wooden box type floodgate at Holt in Whiskey Slough/Trapper Slough near the BNSF Railroad. The flap gate on the end closest to the railroad allows the farmers within the Honker Lake and some adjoining area to automatically trap the incoming tide water within what I will call a portion of Trapper Slough to provide a stable and higher average level of water from which to distribute water for irrigation. This same portion of Trapper Slough receives the drainage from the area within Honker Lake being irrigated. During periods of irrigation, this portion of Trapper Slough is used for both irrigation and drainage with recycling. When not used for irrigation, the flap gate is raised and held in an open position to allow the water level to fluctuate more normally with the tide. Photo Two shows the other end of the same floodgate which no longer is equipped with a flap gate. This end used to be equipped with a flap gate which allowed for tidal pumping for drainage purposes.

This floodgate controlled the water level in Trapper Slough along the property which I owned and farmed at the westerly edge of Honker Lake. Photos Three and Four show the tide gate at the southerly end of Trapper Slough. The tide gate currently consists of a corrugated metal pipe with a screw gate valve on the Middle River end. The screw gate is manually opened and closed to regulate the water level within Trapper Slough. This portion of Trapper Slough is sufficiently leveed on both sides to contain water elevations resulting from the normal tides. During flood periods, the gate is closed. I recently revisited the area where Duck Slough intersected Middle River. This location has two (2) irrigation pumping plants diverting water to the north. One provides water for the irrigation system following the alignment of what was formerly Duck Slough. At this location there are a number of old pilings which could have been part of an old flood gate controlling the water in Duck Slough.

Getting back to the early construction of levees, some of the larger sloughs were not dammed but were leveed for water transportation. The construction of levees or other embankments required borrow material which was at that time taken from areas along the levee or embankment.

The borrow areas particularly in the Delta lowland area resulted in an enlargement, extension or creation of a watercourse. In the case of Duck Slough, use of the floating steam shovel dredge Samson required enlargement of the watercourse to 30 feet wide by 7 feet deep just to float the steam shovel dredge. See Exhibit 3J, The Settlement Geography of the Sacramento-San Joaquin Delta by John Thompson, December 1957, pages 266 and 267. See also attached picture of a Samson Type Dredge taken from the publication The Tule Breakers by John Thompson and Edward A. Dutra.

The passage of time has tended to mask the existence of historic sloughs. Meandering roadways and property lines have been straightened, sloughs have been filled and replaced by ditches and pipelines and floodgates have been removed to reduce the threat of levee failure. Farmers have “squared up” and leveled their fields. In many cases, the upper portions of the slough sediments were removed and exported or mixed with adjoining soil to make farm field soils more uniform.

In addition to the subject parcels’ continued riparian connection to the sloughs and rivers is the connection to the Delta pool. The Delta pool is like a lake. Even without river flow the lands within the tidal range are riparian to the pool. DWR and USBR defined Delta Lowlands to be those lands below five (5) feet above mean sea-level and in the 1956 Cooperative Study Program assumed the same to have riparian status. Tide elevations without river flow periodically exceed the five (5) feet above mean sea-level and what is of equal importance is the connection of the lands to water in the channels because of the high water table. The interconnection of the water in the surrounding channels to the water table beneath the Delta lands is evidenced in Exhibits 3V, Reclamation District 544 Seepage Monitoring Study 2000-2001, Exhibit 9E Estimation of Delta Island Diversions and Return Flows, DWR, February 1995; Exhibit 9F DWR’s January 30, 2009, letter to MWD, et al. re proposed Delta Wetlands water transfer; Exhibit 9G Excerpts from DWR’s 2009 Webb Tract Transfer Pilot Study and

Office Memos; and Exhibit 9H Investigation of the Sacramento-San Joaquin Delta Report No. 4, Quantity and Quality of Waters Applied to and Drained From the Delta Lowlands, Department of Water Resources, July 1956.

Additionally, I have attached Photos Five and Six which show seepage into Woodward and McDonald Island resulting from the June 2004 flooding of the Jones Tracts. This seepage was the result of Delta pool water elevations during a period of low river flow.

Even without a direct application of water, there is always some consumption of water from the channels due to capillary action transmitting water to the surface and/or natural vegetation. Without the operation and maintenance of drains and levees and constant suppression of vegetation, even the Delta lands above high tides will vegetate and consume water from the channels. An impervious encapsulation of the Swamp and Overflowed Lands of the Delta is not a real possibility.

The continued connection between the Delta lands and the water in the surrounding channels precludes there being any real severance of the land from the waters.

The inference that a parcel in the Delta no longer abutting a major channel is severed from the water in the channel is an artificial construct with no real benefit.

The evidence is clear that irrigation of the Delta lands consumes less water than “tule swamp”, that irrigation of Delta lands removes and stores salt during the irrigation season and that continued productivity contributes to the operation and maintenance of reclamation works in furtherance of the obligation of the State to reclaim the Swamp and Overflowed Lands which it accepted from the United States.

TABLE 8. - UNIT CONSUMPTIVE USE OF WATER IN SACRAMENTO-SAN JOAQUIN DELTA

In acre-feet per acre

Classification:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.:	Total
<u>Pasture</u>													
Sudan	<u>.05</u>	<u>.05</u>	<u>.10</u>	<u>.10</u>	.15	.30	.30	.25	.20	<u>.10</u>	<u>.10</u>	<u>.10</u>	1.8
Miscellaneous	<u>.05</u>	<u>.10</u>	<u>.15</u>	<u>.40</u>	.50	.65	.70	.70	.50	.20	<u>.10</u>	<u>.10</u>	4.15
<u>Alfalfa</u>	<u>.06</u>	<u>.08</u>	<u>.10</u>	.30	.40	.50	.65	.55	.50	.20	<u>.10</u>	<u>.07</u>	3.51
<u>Rice</u>	<u>.05</u>	<u>.05</u>	<u>.10</u>	.15	.90	1.15	1.25	1.20	.35	<u>.09</u>	<u>.10</u>	<u>.10</u>	5.49
<u>Field Crops</u>													
Beans	<u>.06</u>	<u>.08</u>	<u>.08</u>	.16	.20	.14	.24	.58	.37	<u>.09</u>	<u>.07</u>	<u>.05</u>	2.12
Corn and Milo	<u>.04</u>	<u>.04</u>	<u>.04</u>	<u>.08</u>	.10	.24	.70	.60	.40	<u>.10</u>	<u>.10</u>	<u>.07</u>	2.51
Grain and Hay	<u>.04</u>	<u>.04</u>	<u>.07</u>	<u>.40</u>	.60	.30	.14	.23	.21	.14	<u>.07</u>	<u>.05</u>	2.29
Peas	<u>.10</u>	<u>.10</u>	.20	.30	.10	.05	.14	.13	.11	<u>.09</u>	<u>.10</u>	<u>.10</u>	1.52
Safflower and Sunflower	<u>.05</u>	<u>.05</u>	<u>.10</u>	.30	.40	.50	.20	.13	.11	<u>.09</u>	<u>.10</u>	<u>.10</u>	2.13
Sugar Beets	.06	.08	.08	.13	.32	.51	.61	.53	.20	.13	<u>.10</u>	<u>.07</u>	2.82
<u>Truck Crops</u>													
Asparagus	<u>.05</u>	<u>.05</u>	<u>.05</u>	<u>.05</u>	.08	.14	.40	.68	.55	.42	.12	<u>.10</u>	2.69
Celery	<u>.04</u>	<u>.04</u>	<u>.04</u>	<u>.08</u>	.10	.10	.10	.20	.25	.30	.20	<u>.05</u>	1.50
Onions	<u>.04</u>	<u>.04</u>	<u>.08</u>	.13	.27	.49	.43	.20	.16	.13	<u>.10</u>	<u>.07</u>	2.14
Potatoes	<u>.06</u>	<u>.08</u>	<u>.08</u>	.16	.15	.38	.52	.30	.15	<u>.09</u>	<u>.07</u>	<u>.05</u>	2.09
Tomatoes	<u>.05</u>	<u>.05</u>	<u>.10</u>	<u>.10</u>	<u>.10</u>	.25	.35	.60	.45	.35	<u>.10</u>	<u>.10</u>	2.60
Seed and Misc.	<u>.06</u>	<u>.08</u>	<u>.08</u>	<u>.10</u>	.25	.50	.50	.50	.35	.10	<u>.10</u>	<u>.07</u>	2.69
<u>Fruit and Nuts</u>													
Assorted	<u>.04</u>	<u>.04</u>	<u>.04</u>	.18	.32	.50	.57	.40	.23	<u>.07</u>	<u>.07</u>	<u>.05</u>	2.51
Grapes	<u>.04</u>	<u>.09</u>	<u>.04</u>	<u>.09</u>	.20	.35	.50	.35	.22	<u>.05</u>	<u>.07</u>	<u>.05</u>	2.05
<u>Native Vegetation</u>													
Lush	.12	.14	.21	.31	.40	.59	.68	.57	.39	.29	.20	.12	4.02
Medium	.12	.16	.22	.28	.31	.40	.45	.38	.28	.24	.19	.13	3.16
Dry	.13	.17	.23	.24	.22	.21	.22	.20	.17	.18	.18	.14	2.29
<u>Other</u>													
Fallow and Bare	<u>.04</u>	<u>.04</u>	<u>.04</u>	<u>.08</u>	.10	.13	.14	.13	.11	<u>.09</u>	<u>.07</u>	<u>.05</u>	1.02
Idle Crop Land	<u>.06</u>	<u>.08</u>	<u>.08</u>	.16	.20	.26	.28	.24	.16	.13	<u>.10</u>	<u>.07</u>	1.82
Duck Ponds	<u>.05</u>	<u>.05</u>	<u>.10</u>	<u>.10</u>	<u>.10</u>	<u>.05</u>	.14	.13	.60	.60	.30	<u>.10</u>	2.32
Urban	<u>.06</u>	<u>.08</u>	<u>.08</u>	.16	.20	.20	.21	.20	.16	.13	<u>.07</u>	<u>.05</u>	1.60
Tule and Swamp	.13	.18	.34	.51	.70	.79	.87	.77	.64	.49	.27	.13	5.82
Levee and Berm	<u>.10</u>	<u>.10</u>	.15	.20	.25	.30	.35	.35	.30	.20	<u>.10</u>	<u>.10</u>	2.50
Water Surface	<u>.06</u>	<u>.10</u>	.20	.33	.50	.58	.65	.57	.44	.27	<u>.12</u>	<u>.06</u>	3.88

NOTE: Figures underlined (.05) represent estimated consumptive use by weeds and soil evaporation before planting or after harvesting.

HISTORIA

OF

SAN JOAQUIN COUNTY,

CALIFORNIA.

WITH ILLUSTRATIONS DESCRIPTIVE OF ITS SCENERY,

RESIDENCES, PUBLIC BUILDINGS, FINE BLOCKS AND MANUFACTORIES.

FROM ORIGINAL SKETCHES BY ARTISTS OF THE HIGHEST ABILITY.

THOMPSON & WEST,
OAKLAND, CAL.
1879.

TABLE OF CHANGES IN SAN JOAQUIN COUNTY.

NAME.	NO. OF COLLETS	WEEK ORIGINATED.	HEAD-QUARTERS.	NO. OF CONC. MEN.	REMARKS.
San Joaquin	3	April 14, 1874.	Trey.	40	
Collegville	184	March 18, 1874.	Collegville.	17	
Stockton	70	Aug. 12, 1873.	Stockton.	166	
Castro	64	Aug. 5, 1873.	Dr's School.	40	
Elliot	183	March 18, 1874.	Elliot.	40	Disorganized.
Liberty	60	Sept. 11, 1873.	Acampo.	53	
London	56	Aug. 28, 1873.	London.	56	
Lookout	181	Jan. 12, 1874.	Lookout.	56	
Loft	92	Aug. 26, 1873.	Loft.	51	
Rosie	24	Sept. 20, 1873.	Wendbridge.	56	Disorganized.
Wendbridge		Sept. 30, 1873.	Wendbridge.		
Wildwood	228	Nov. 12, 1873.	Wildwood.	56	Dis. Ap. 1, '76.
Washington		Aug. 12, 1873.	Washington.	56	Prepared.
Alameda		Oct. 28, 1873.	Alameda.		Disorganized.
Furnington		March 20, 1874.	Furnington.		Disorganized.

CHAPTER XV.

SWAMP LAND RECLAMATION.

United States Grant to the State—First State Grant in 1842—Nature and Formation of the Land—Methods of Reclamation—Dates, Issues—Reclaimers' Interest—Benefits—Stockton Island—Acampo River—Banks of Reclamation.

September 9, 1850, California was admitted into the Union. On the 28th of this same month, a grant was made by Congress to the States of the Union of all the swamp and overflowed land within their boundaries.

May 1, 1851, the State made the first attempt at utilizing this gift. The Legislature passed a law that held out the following inducements to two citizens, by name, John F. Booth and David Calloway. By the Act, not to exceed 640 acres of swamp and overflowed land was conveyed, in fee, to these parties, provided they paid \$1.25 per acre for it,—the money to be used for school purposes in the district where the land was located. They were to reclaim the same by ditches and levees, so that it could be cultivated; all within three years from the date of survey, or the Act was void. The land was an island and was described in the Act as "lying between, and bounded by the Sacramento river and Merritt's slough."

The results already achieved from the unpretentious beginning have been great. What the future may have in store is not hidden behind a shadow, yet its extent is incalculable. We find in the *Stockton Independent*, an article upon swamp lands in this County, which, after thorough investigation, we find so accurate and comprehensive as to warrant us in copying it nearly in full, adding thereto a few facts:

"THE SWAMP AND OVERFLOWED LANDS—THE MEANS EMPLOYED FOR THEIR RECLAMATION—WHAT HAS BEEN ACCOMPLISHED—THE FUTURE GLEAMING SPOT OF THE STATE—EXTENSIVE ENTERPRISES.

"The overflowed or swamp lands of the San Joaquin and Sacramento valleys are now attracting considerable attention and are destined speedily to become an important feature of the wealth of the State. The San Joaquin and Sacramento rivers, with their tributaries, have their sources far away in the mountains of the Sierra Nevada range, and are the recipients of the rainfall of an immense watershed. The discharge of this vast catchment area with the return of each rainy season, and subsequently, when the winter's accumulation of snow in the distant Sierras succumbs and melts before the searching rays of the summer sun, carries with it a large percentage of alluvial matter, which, on the river leaving its banks and finding the velocity of its current, is deposited over the adjoining lowlands. Upon this sedimentary deposit, a rank growth of water plants has luxuriated, which decaying with the return of winter or reduced to slush by periodical fires, has mixed with the alluvial matter and produced a composition of the sturmiest fertility. Naturally the deposit referred to, has been greatest on the banks of the upper portion of the river, and following the river's course has been greater on the immediate banks than farther into the interior. The wonderful fertility of these lands has long been appreciated, and on the higher spots along the river banks, where no great outlay was necessary to insure comparative immunity from risk of flood, settlers have been tilling with wonderful results and success. During the last few years, however, more attention has been given to these lands, and now capital and energy are rapidly developing the capabilities of the land, and adding constantly to their appreciation in value and productive power. The reclamation has been undertaken hitherto entirely by private individuals, or districts associated under the swamp land act for co-operative action. Very considerable enterprise and perseverance have already been demonstrated in the handling of various tracts, not only on Union and Roberts Islands in the San Joaquin river, Shasta Island in the Mokelumne, Sherman and Grand Islands in the Sacramento, etc.

"On a matter so important as the effective reclamation of the land, a variety of opinions and theories have been advanced. On the upper portions of the rivers where the material on the immediate river banks is of an entirely sedimentary nature, the task has been comparatively easy, as the foundation is solid and the material easily handled. The mistake was made by the pioneers in the reclamation of these lands of locating their levees on the very edge of the rivers, to get the benefit of the slightly higher level that has

been occasioned by the deposit of the heavier particles, as soon as the current lost its velocity by leaving the river banks. A more intelligent appreciation of the requirements of the case has, however, been secured, and now the levees are nearly everywhere seen located with due regard to scientific principles and known hydrostatic and hydraulic laws, so that the meanderings of the rivers are not, as heretofore, slavishly followed, but a more direct line is traced out, treacherously undermined concaves are avoided, sharp sandy points cut off and the flood water of the river induced by other lines and ample space on each side of its normal bed to run swiftly off instead of banking up, and apparently reemerging at its restraint. The slopes adopted by the most thoroughly qualified engineers for this entirely sedimentary material are almost uniformly three to one, that is, three feet of width at the base for every one foot of height of the embankment. These sedimentary banks are found down the San Joaquin river some twelve miles below the city of Stockton, and to easily distinguished points on the other rivers. Below this, the material inside the banks gradually merges into a more thoroughly vegetable or peaty character, the best possible material for levee purposes, being probably that happy mixture of the two, consisting largely of alluvium with sufficient fibrous matter to knit and retain it in a compact sod.

"The post proper, while possessing risks of its own, is as infinitely better material for levee construction than might be supposed, its decayed fibrous nature being proof against any erosive action of current or wave. Weight is the great element lacking in post, from a levee builder's point of view. It is therefore found desirable to abandon entirely the section given to the sedimentary levee where the flat slopes were designed with a view to avoid and counteract the cutting action of moving water, and to dispose of material in a more compact manner. With this object in view, then, viz., to concentrate the weight as much as possible, and at the same time to expose a minimum of surface to the desiccating influence of the atmosphere it has been found convenient to build up the side into walls as nearly vertical as possible. In descending the banks of the rivers it is found that in proportion as the vegetable matter increases, the underlying strata becomes less dense, and the distance to the heavy bluish clay, locally termed hard pan, that underlies all this formation, becomes greater.

"Feeling convinced that this solid foundation had to be reached before the levee had finally finished settling, it has now become the practice to make trial borings along the proposed line of levee, to ascertain correctly the consistency of sub-strata, and hence determine the proper width to give the levee to permit of the necessary additions being made as the levee subsided. The danger from par-

ful destruction by fire, attached to post levees, added to which there is liability (in the event of an overflow of the land surrounded by them and the water reaching on both sides of the levee nearly or quite to the top) of portions of the levee being flooded out of their proper position and swept securely away. To remedy these dangers, efforts have been made to coat the post levees with a dressing of sand or sediment from the river bed. In a proper combination of these two materials probably lies the secret of successful handling of the lower lands, and more than one proprietor is at present engaged upon the problem how best to accomplish the end.

"The numerous creeks or ditches running from the main rivers into the interior, though necessitating expensive treatment to them when essentially at or near their outlets, are admittedly beneficial features of the land, constituting as they do main arteries for drainage, irrigation and navigation. Where nothing but the light post and was available for their construction, these dams were in earlier days a source of very great perplexity and trouble, and the annals of all the earlier reclamation schemes report the loss of one or more expensive efforts. Profiting by past experience, however, very splendid successes have recently been accomplished, and the feasibility demonstrated of closing any channel, no matter how formidable in size.

"Intentionally constructed tidal gates as an adjunct to the dams, regulate and control the egress or ingress of water from or to the lands according as draining or irrigation is temporarily desired.

"A comparison of the merits of the lands respectively adjacent to the San Joaquin and its tributaries, and the Sacramento and its tributaries, gives undoubtedly a decided preference to the former as being at once more easily and cheaply reclaimed, and enjoying a greater immunity from ravaging floods than the latter, the fluctuations of the water-level immediately below Stockton between ordinary low water and extreme flood height having been only seven feet during the past season as against twenty-six feet at Sacramento.

"To particularize all the reclamation-work accomplished up to the present time, would necessitate too great an encroachment on our space, and we must therefore limit ourselves to a slight notice of the work accomplished on a few of the better-known islands.

"UNION ISLAND.

"Union Island, lying between the old and middle channels of the San Joaquin, containing in round numbers some 45,000 acres, originally owned by General T. H. Williams, has been the great field of experiment and research in swamp-land practices, and great interest has necessarily attached to the progress and development of the work carried on there.

"Wherever practicable, i. e., wherever the material employed was entirely sedimentary, the levees have been built entirely by means of horse scrapers. General Williams has thoroughly recognized the fertility of any half-measure, and the sedimentary levees at the head of Union Island are probably the most thorough, or nearly so, of any work done in the state. One line has been given a crown-width of eight feet, with a slope of three to one on either side and a height varying from seven to ten feet. The extreme crown-width has been intended to furnish a roadway for the island-traffic; a perfectly bare-lean, indeed, probably commendable practice in dry weather, but one open to grave challenge in winter-time, and now, we believe, entirely voided in Holland and the vicinity of the Mississippi.

"Below the sediment line, General Williams' procedure has been entirely original, and whilst variously criticized by outsiders, certainly, we believe, the solution to the question, How to levee in post lands?

"Double retaining walls, carefully built up of post-soda, have been carried along the line, and the space between them filled with mud pumped from the river bed. The machines used for this purpose were of different construction, the principle of one, the invention of Mr. Deinson, being a vacuum pump, the vacuum being obtained by the usual steam jet and condenser, and the other, designed by Od. Von Schmidt, a large centrifugal pump with an auger attachment, working at the bottom of the suction pipe. The only point of objection to either of these machines is that their effective working is limited at present to mud, to the rejection of clay or more refractive material. The experiments of the past winter, however, show that the mud is by no means the treacherous material when thus employed that skeptics had been disposed to think it, and if we might venture to criticize the combination levee on Union Island, we would say that it comes nearer to entire success than anything heretofore attempted, and could only have been improved upon by preparing a post foundation for the mud, and, perhaps, being careful to carry them up as a uniformly well-banded, homogeneous mass.

"The lower end of Union Island was overflowed this year; not as we believe from any defect in General Williams' work, but entirely owing to the obnoxious-action of some adjoining proprietors who refused anything like co-operative action.

"ROBERTS ISLAND.

"Roberts Island, separated from Union Island by Middle river, and lying between Middle river and the San Joaquin proper, contains some 64,000 acres of land.

"The largest individual owner is Mr. Morton C. Fisher, who owns

some 15,000 acres of the upper end of the island, and who owns the controlling interest and is the managing director in the Glasgow California Land Co., owning some 40,000 acres in the lower division.

"The reclamation of the upper portion was completed two years ago, and cost \$140,000 for the 22,000 acres reclaimed, making an average of \$6.50 per acre. The lower end reclamation works that have been in progress for the last year are completed. 38,000 of the 42,000 acres in the lower division have been reclaimed by them, at a total expense of \$360,000 or about \$10 per acre. This is considerable more than the cost of the upper half, as there were more and greater obstacles to overcome, the dams on one along, costing \$28,000. Here, as on Union Island, the entire sedimentary work was done by horse-scrapers, the levee being carried to a nine-foot grade with slopes respectively of three and two to one.

"As the material becomes more vegetable in character, the slope is gradually reduced, until in the post formation at the lower end of the island, the sides of the levee are nearly vertical, but the width of crown is increased to from twenty-five to thirty feet. The nine-foot fill ruled strictly all round the island, so that a very massive and expensive levee was the result.

"We believe the proprietors here it in contemplation to proceed now to give all the peaty levee a coating of from two to three feet of sediment and clay from the river-beds. Material is to be disintegrated with a species of pug-mill, and sufficient water added to allow of its being forced, as in the Von Schmidt machines, through pipes on to the levee. The expense of submerging the soil and saturating the tule roots is about equal to that of reclamation; so that when the lands were fitted for cultivation it was found that the upper and lower divisions cost about \$12 and \$30 the acre respectively. A bird's-eye view of the division is given in this work, from which an idea of the magnitude of this work can be gathered.

"BOULDER ISLAND.

"Boulder Island, above referred to, contains 8,497 acres of land, of which about 4000 are in cultivation this year (1878). It lies at the junction of the Mokelumne with the San Joaquin river, in San Joaquin County. The land yields two crops per year, one of grain and one of potatoes; of the former (harley) from fifty to sixty bushels, and of potatoes one hundred and fifty to two hundred meals per acre.

"It is owned by the members of the Pacific Distillery Co. of San Francisco, who have this year completed a very excellent and well-planned reclamation. The scheme of the proprietors is to devote a large portion of the island to growing potatoes for distillery purposes, potatoes yielding on these lands a certain crop.

COMPARED

This Indenture, Made the 20th day of

George John W.
D.D.

December in the year of our Lord, one thousand eight hundred and ninety six 1896

Edward Bond Reclamation
New District Number
689. (a corporation)

Between John W. Morris, of the City and County of San Francisco, State of California, the party of the first part, and Edward Bond Reclamation District Number 689, a corporation, of California, and having also by part of the second part,

Witnesseth: That the said part of the first part, for and in consideration of the sum of Two (\$2.00) Dollars lawful money of the United States of America, to him

in hand paid by the said part of the second part, the receipt whereof is hereby acknowledged, has granted, bargained and sold, conveyed and confirmed, and by these presents does grant, bargain and sell, convey and confirm,

unto the said part of the second part, and to all ^{successors} heirs and assigns forever all that certain lot, part or parcel of land situate, lying and being in Robert Island County of San Joaquin State of California, and bounded and particularly described as follows, to-wit: Commencing at the intersection of the east bank of Black Slough with the San Joaquin River; thence meandering along said bank up stream to its intersection with the south line of section number three (3), Township number one (1) north range number five (5) East, Mount Diablo base and meridian, thence west to the west bank of said Black Slough; thence meandering said west bank of said Black Slough down stream to its intersection with the east bank of the west branch of Black Slough; thence meandering said east bank up stream to its intersection with the south line of section number thirty four (34), Township number two (2) north, Range number five (5) East above. Together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining and the reversion and reversions, remainder and remainders, rents, issues and profits thereof.

(State Seal blank)
cancelled

To have and to hold, all and singular the said premises, together with the appurtenances, unto the said part of the second part, and to all ^{successors} heirs and assigns forever.

In witness whereof, the said part of the first part has hereunto set his hand and seal the day and year first above written.

Signed, Sealed and Delivered in the Presence of

John W. Morris
James L. King
STATE OF CALIFORNIA
COUNTY OF SAN FRANCISCO

STATE OF CALIFORNIA

On this 20th day of December A.D. 1896, hundred and ninety

before me James L. King a Notary Public in and for said City and County, residing therein, duly commissioned and sworn, personally appeared John W. Morris

known to me to be the individual described in, whose name is subscribed to the within instrument, and acknowledged to me that he executed the same

In Witness Whereof I have hereunto set my hand and affixed my official seal, in the City and County of San Francisco, the day and year last above written.

Test: James L. King Notary Public in and for the City and County of San Francisco, State of California. Filed for records, at the Request of R. P. Lane Aug. 26, A.D. 1899, at San Francisco, Cal.

Black Slough, San Joaquin River, Township number one (1) north range number five (5) East above. Together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining and the reversion and reversions, remainder and remainders, rents, issues and profits thereof.

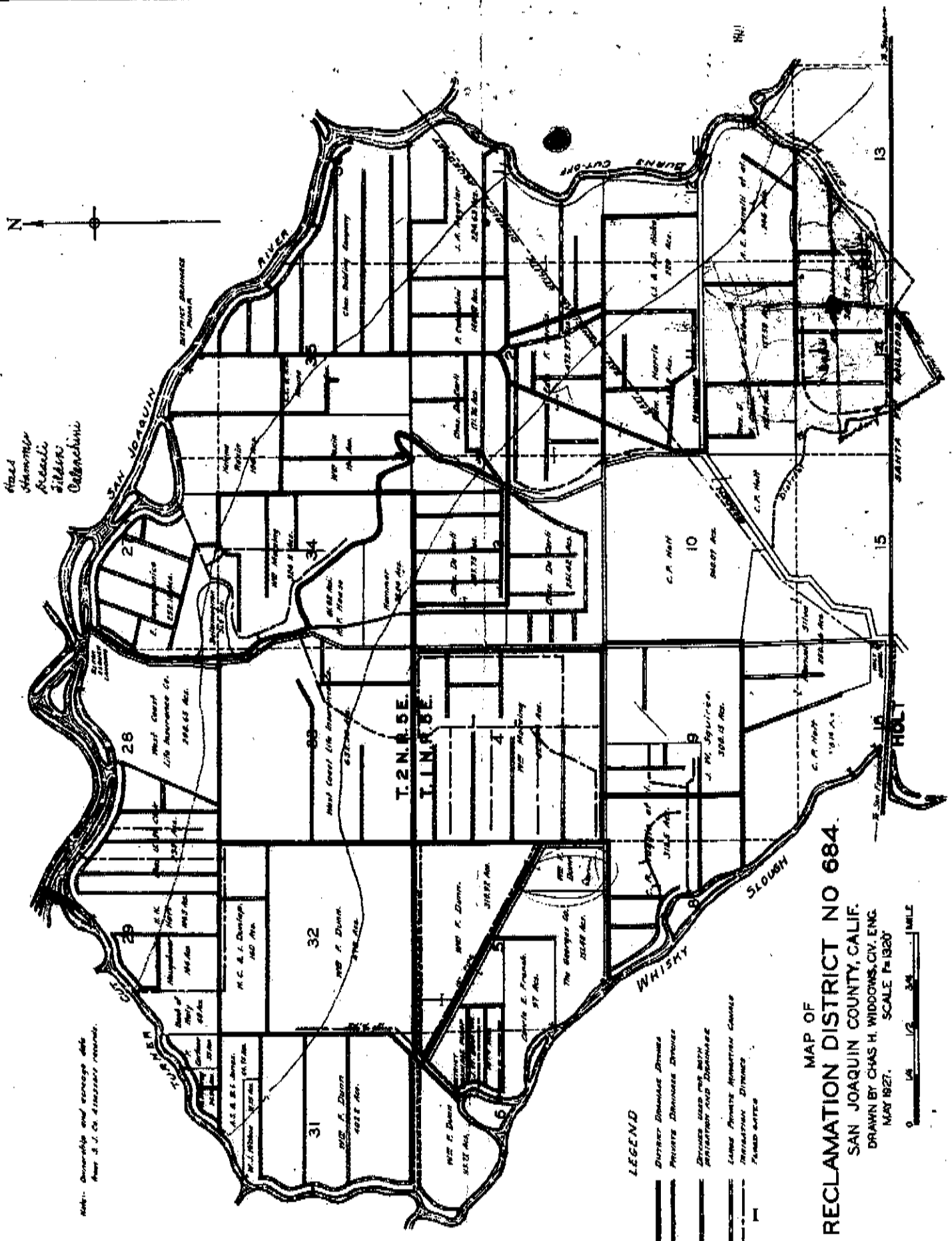
Filed for records, at the Request of R. P. Lane Aug. 26, A.D. 1899, at San Francisco, Cal.

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Note: Ownership and acreage data from S. J. O. Alexander records.

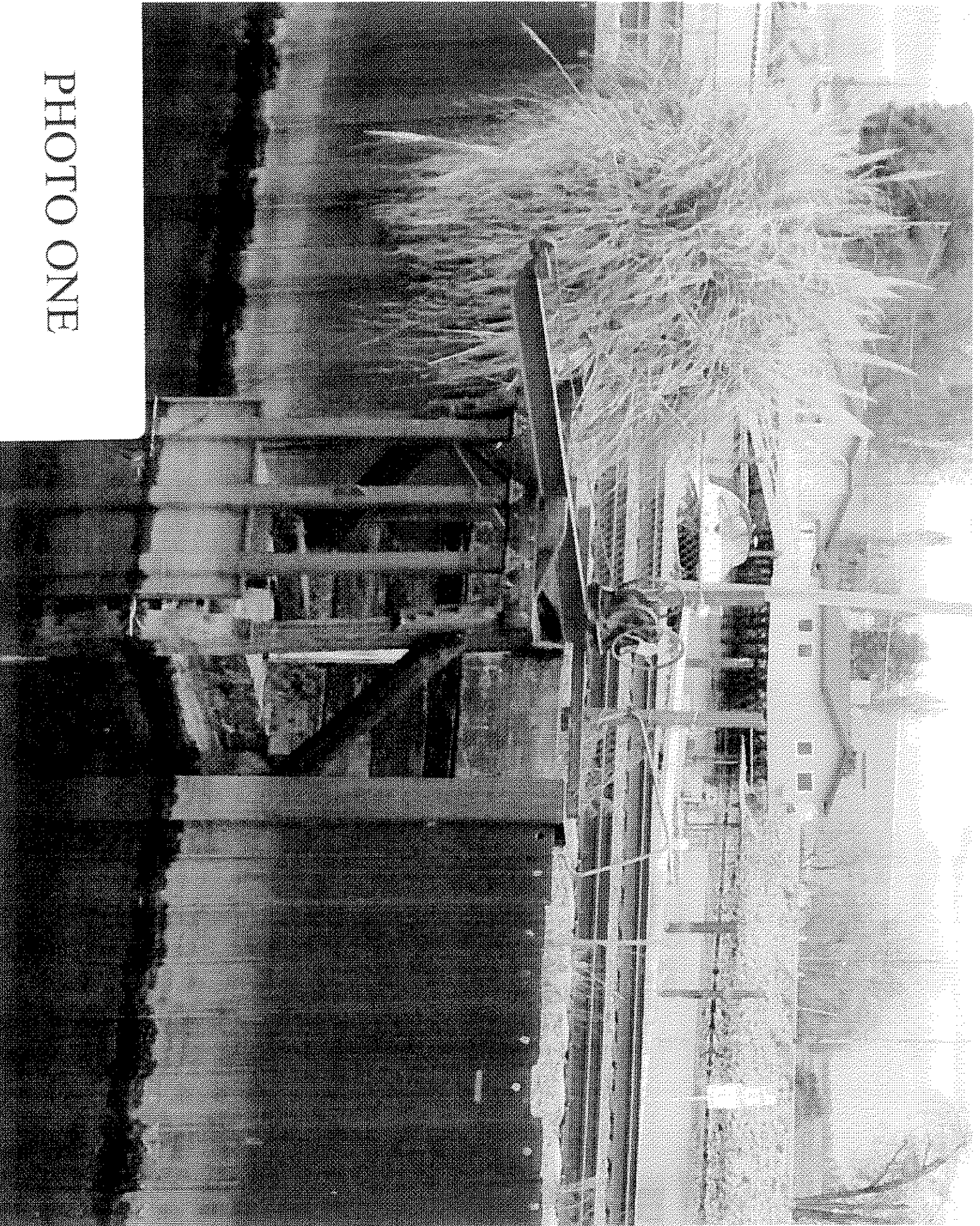


LEGEND

- Drainage Ditches
- Private Drainage Ditches
- Ditches used for both irrigation and drainage
- Levee Private Irrigation Canals
- Irrigation Ditches
- ROAD BRIDGE

MAP OF
RECLAMATION DISTRICT NO 684.
 SAN JOAQUIN COUNTY, CALIF.
 DRAWN BY CHAS. H. WIDDOWS, CIV. ENG.
 MAY 1927. SCALE 1" = 1/2 MILE

PHOTO ONE



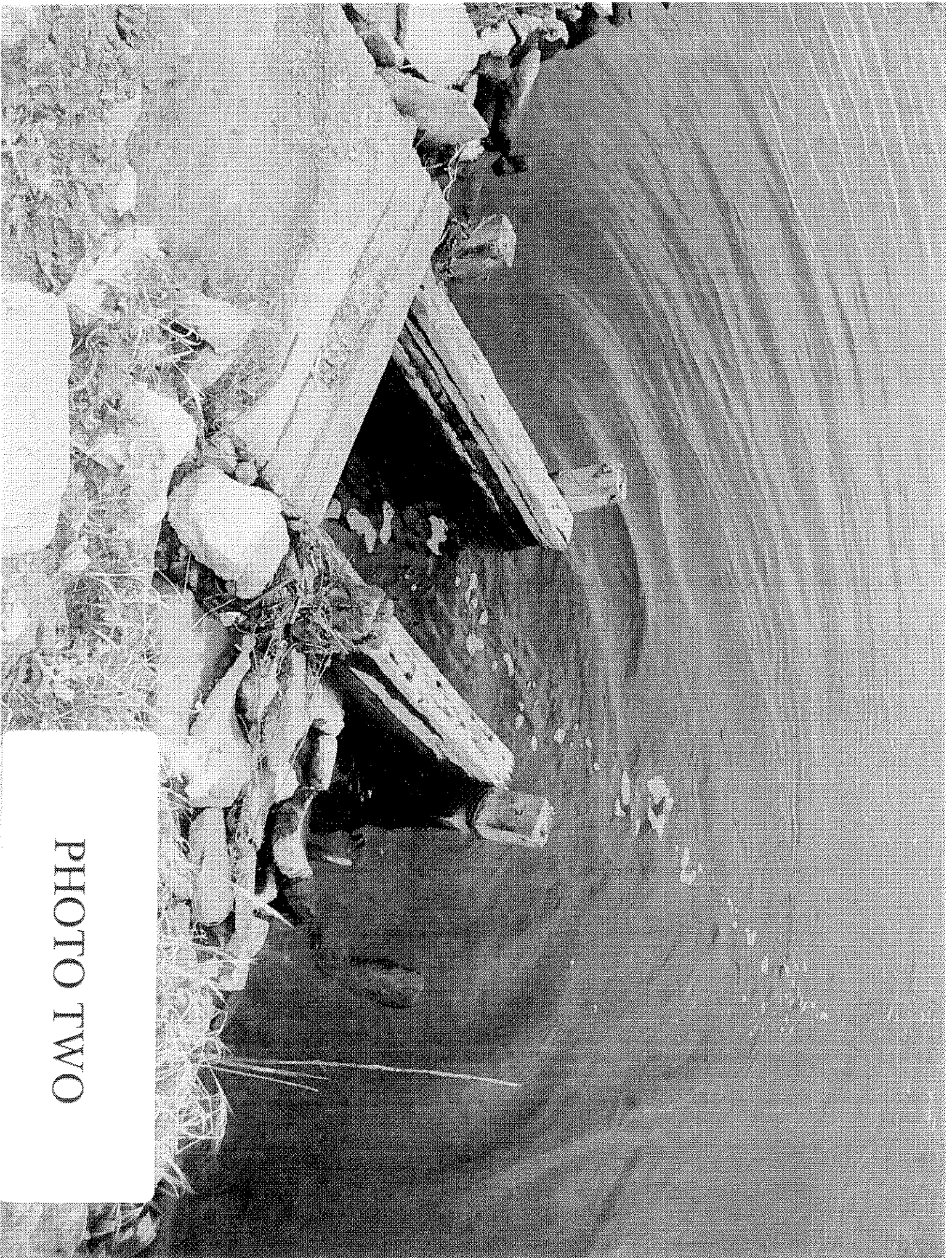


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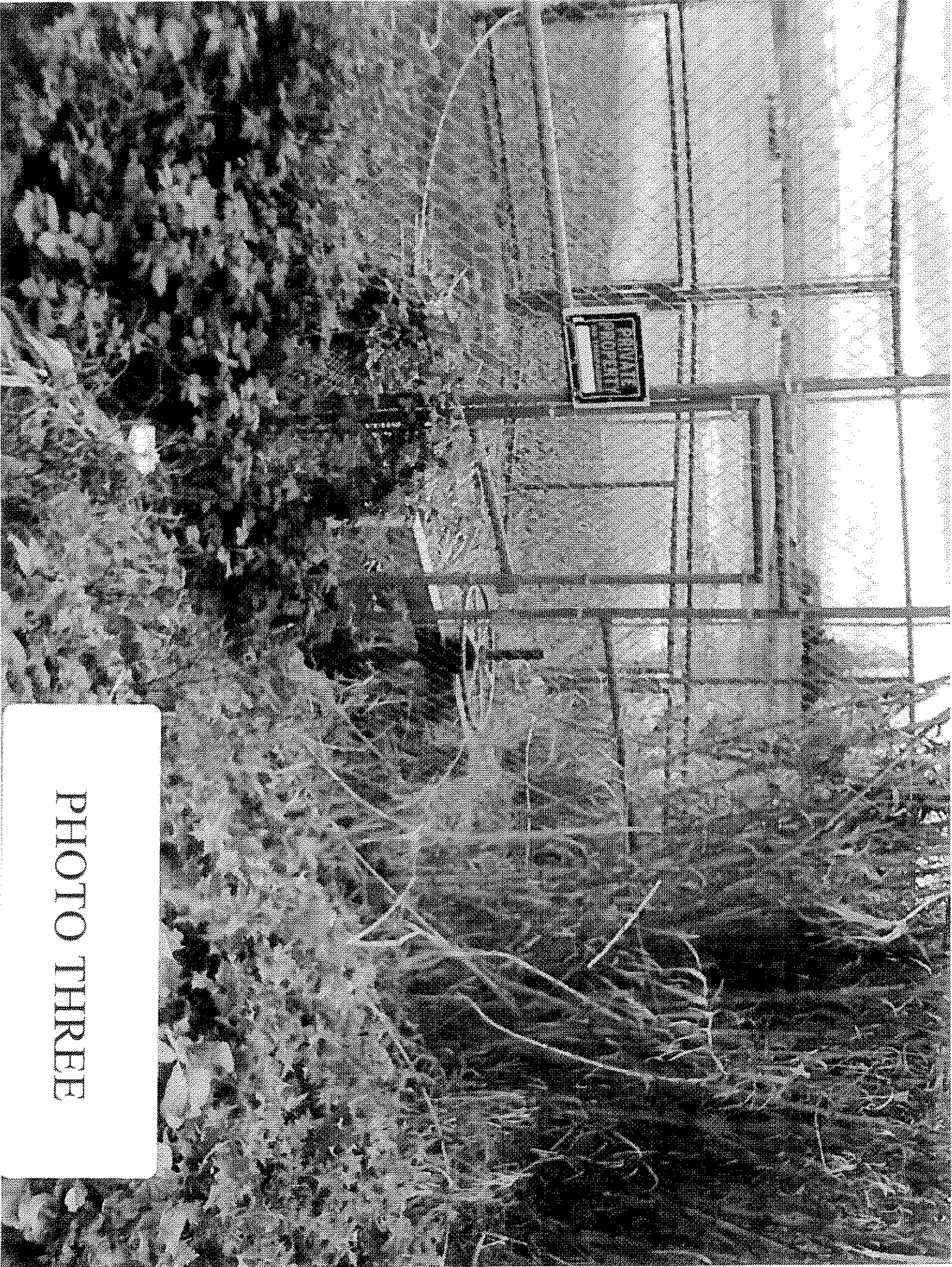


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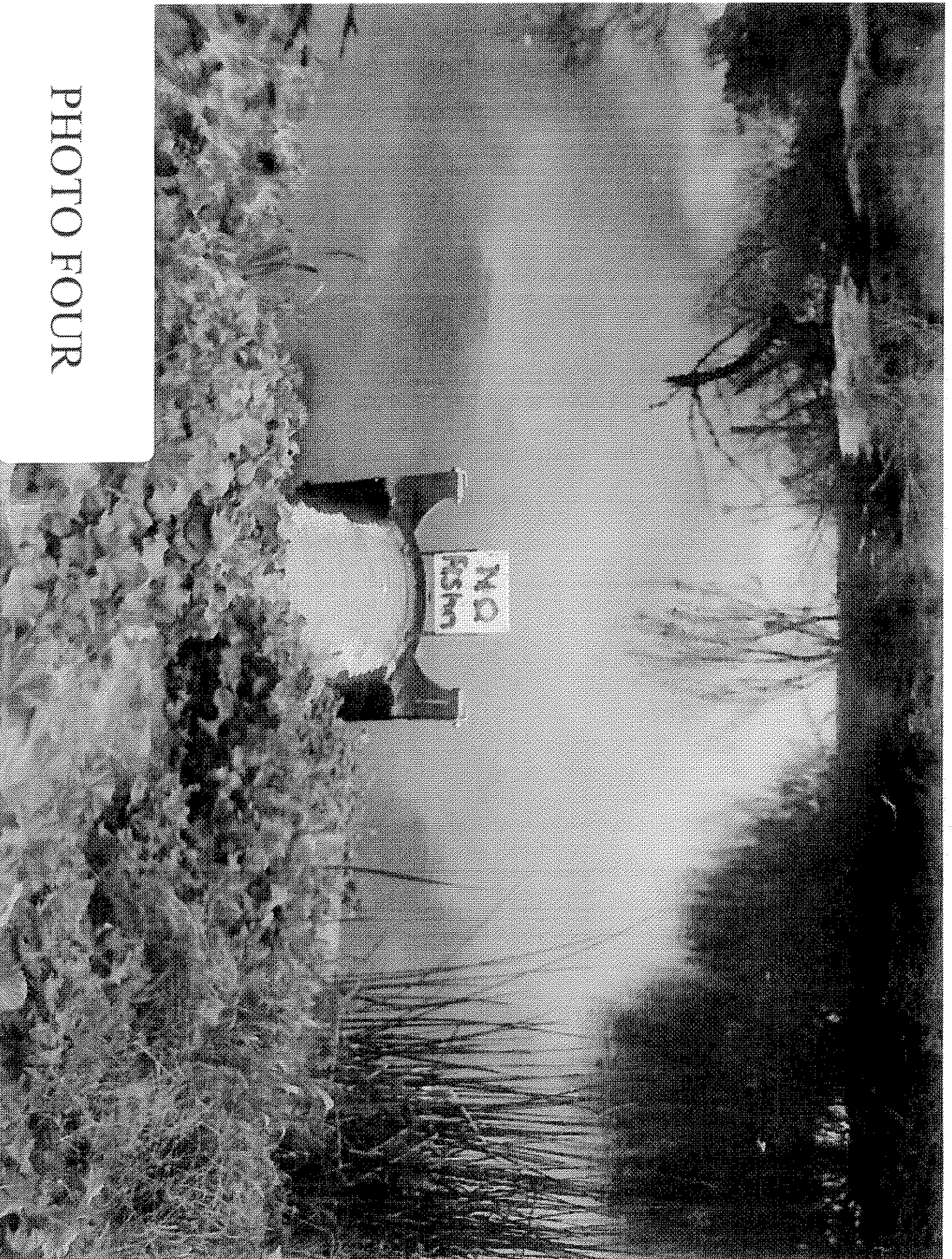


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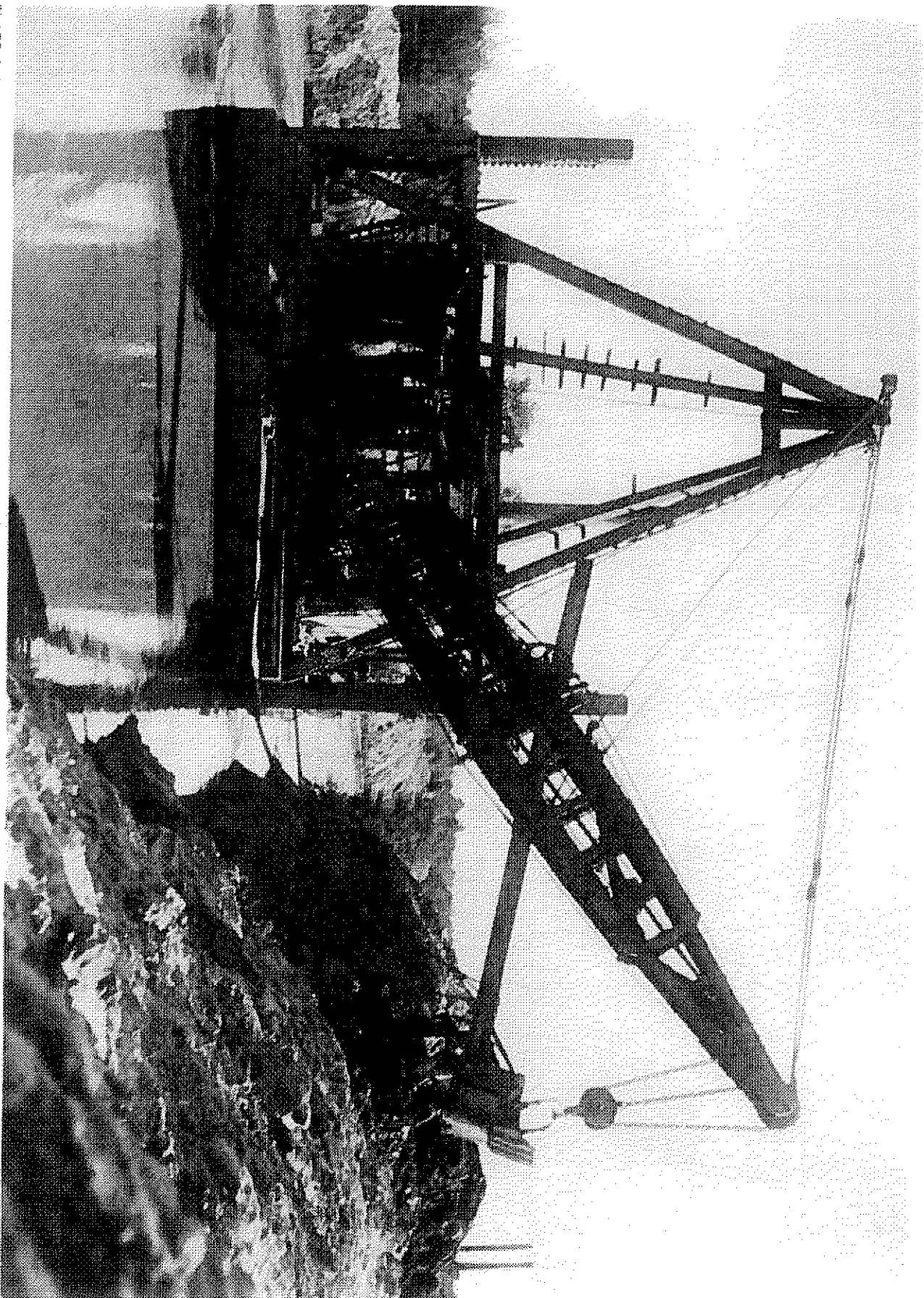


PLATE 2-2. A SAMSON-TYPE DREDGE WORKING NEAR STOCKTON

The dipper dredge was ordered in 1875 to build levees at Roberts Island, but also did contract dredging for flood control and navigation improvement at Stockton. This view depicts a flood-control project. It shows to good effect the dipper, handle, and boom, and the overhead turntable and support system. The limitations of her reach are well illustrated.

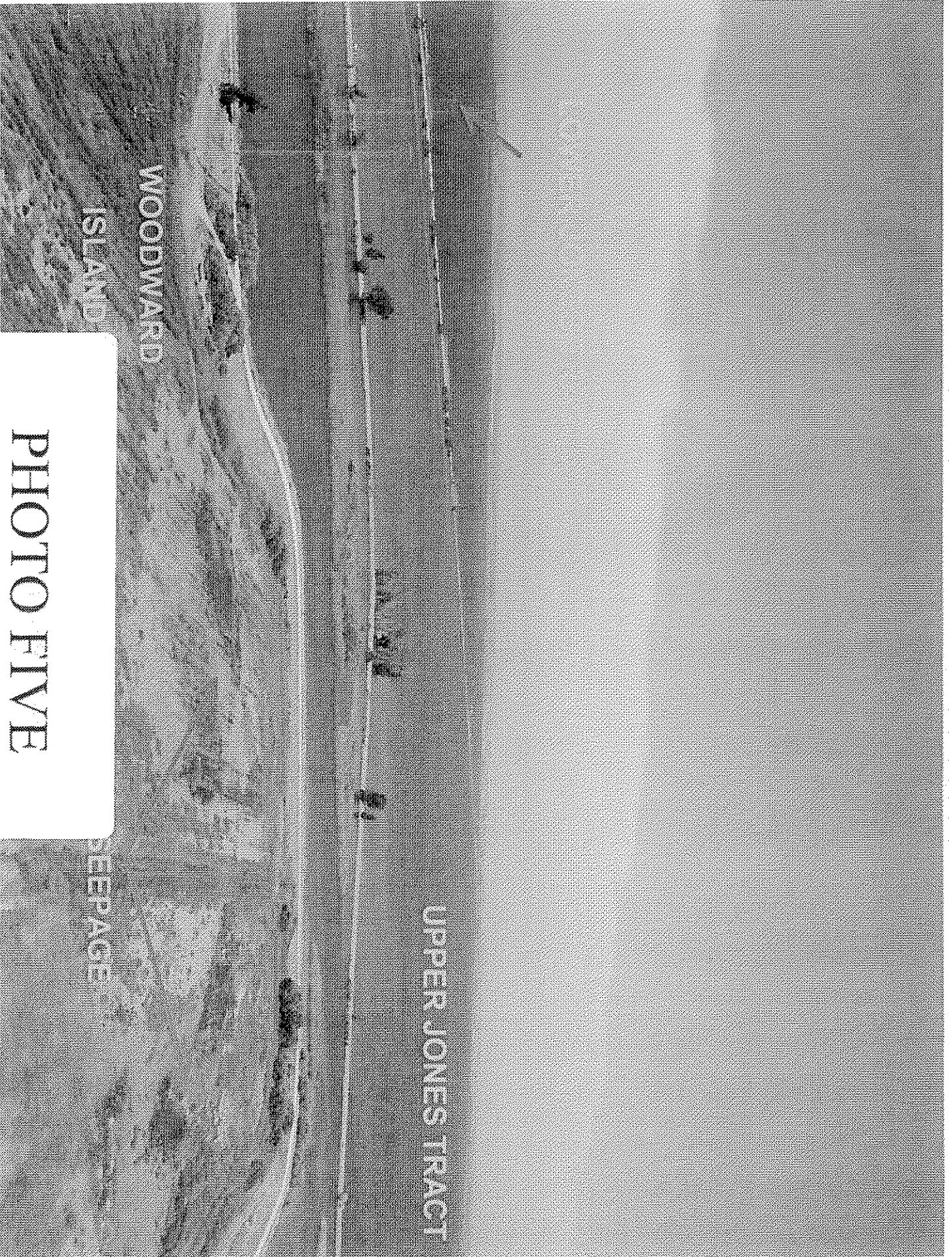
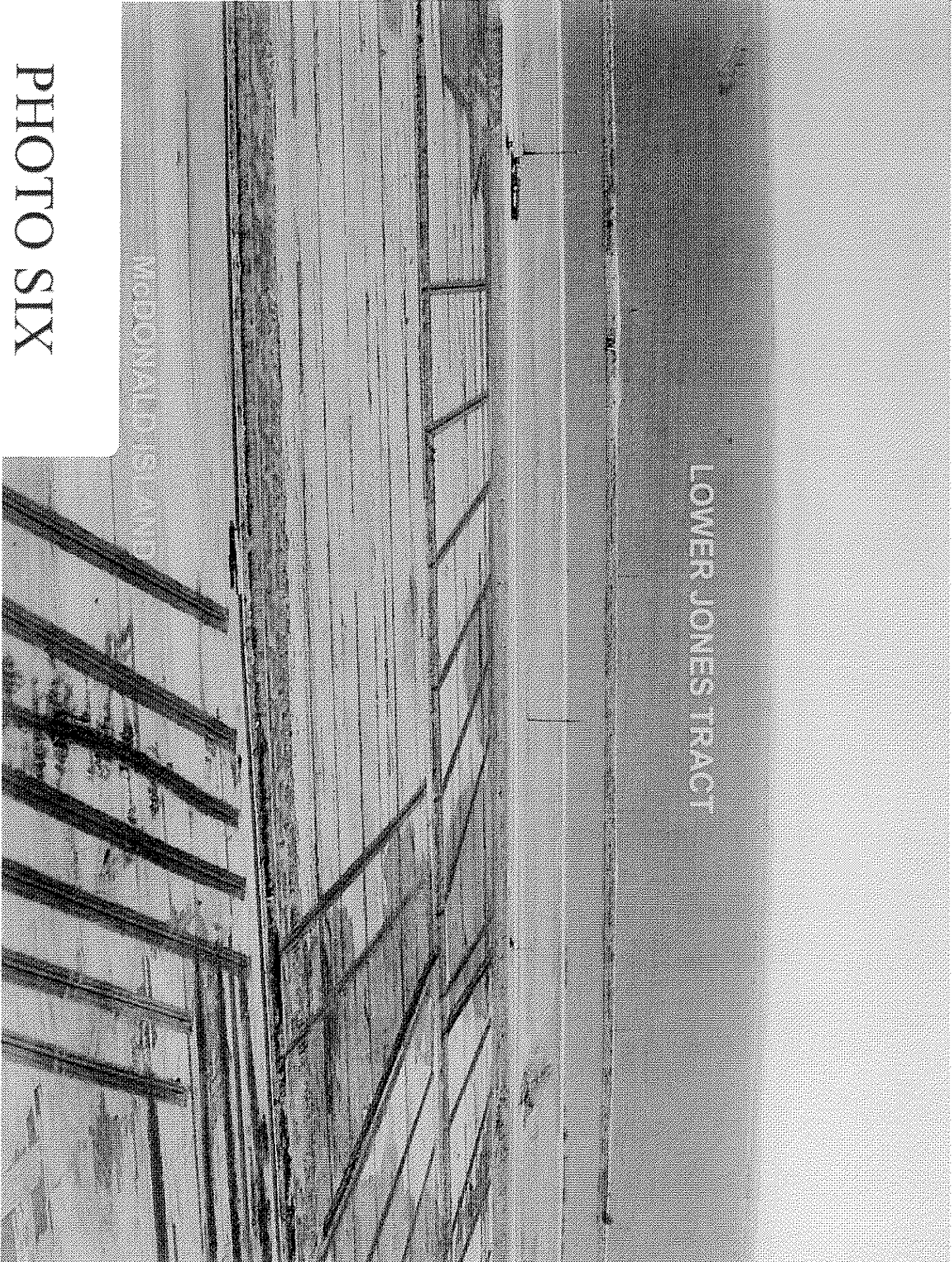


PHOTO FIVE



LOWER JONES TRACT

PHOTO SIX