MARIN COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

PRELIMINARY DESIGN

BEL AIRE FLOOD CONTROL ZONE No. 4
EAST DITCH AND PUMP STATION

NHA ENGINEERING COMPANY
San Francisco, California

NHA
ENGINEERING
COMPANY

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9 July 1974

Department of Public Works
County of Marin
P. O. Box 4186, Civic Center
San Rafael, California 94903

Attention: Mr. Chuck Murphy

Subject: BelAire Flood Control Zone No. 4 of the Marin County Flood Control and Water Conservation District

Gentlemen:

The enclosed Preliminary Report summarizes the results of our studies and presents the basis for the conceptual design shown of the two attached drawings. This recommended design would protect the study area from flooding due to a 50-year return period storm occurring during a six-foot tide.

The recommended project may be built in the following two stages:

Stage 1. Construct pumping station on west side of East Ditch on north side of Tiburon Boulevard; and improve East Ditch for first 150 feet upstream from Tiburon Boulevard.

Stage 2. Improve balance of East Ditch up to Cecilia Way.

Their total estimated costs, including administrative, legal, engineering, land and construction costs, and an allowance for contingencies are:

Stage 1	$ 194,000
Stage 2	85,000
TOTAL . .	$ 279,000

Department of Public Works
County of Marin

9 July 1974

These estimated costs reflect price levels anticipated for early 1975.

We will be pleased to meet with you at your convenience to discuss this report.

Very truly yours,
NHA Engineering Company

Richard J. King

RJK/scs
Enclosure

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SECTION I

INTRODUCTION

This report discusses the conceptual design for the following facilities in BelAire Flood Control Zone No. 4 of the Marin County Flood Control and Water Conservation District:

1. The reach of the East Ditch extending from the outlet of the Cecilia Way box culvert to the entrance of the culvert under Tiburon Boulevard.

2. The pumping station discharging into the East Ditch located at the southeast corner of the shopping center parking lot.

These facilities are defined and called for in the "Master Drainage Plan for the BelAire Flood Control Zone" prepared by the Marin County Department of Public Works in fiscal year 1969-1970.

This report and conceptual design represent the first of the two phases of our contract (Preliminary Design). This phase included such engineering work as was required to determine the type and size of facilities needed, the approximate right-of-way requirements, and the estimated project costs. The work included a soils investigation, a topographic survey of the project area and a review of previous hydrologic and hydraulic calculations.

Contingent upon approval of the Preliminary Phase, the Final Design Phase will consist of finalizing right-of-way requirements and preparing contract plans, technical specifications and cost estimates for construction bidding.

SECTION II

EXISTING CONDITIONS

A. WATERSHED

The 260-acre watershed tributary to this project extends from the culvert under Tiburon Boulevard just east of the Cove Shopping Center to the top of the main divide of the Tiburon Peninsula. It includes all of the area tributary to the Karen Way pipeline, Bel Aire School, the shopping center and the intervening residential areas. The terrain varies from undeveloped to fairly intensive residential and commercial.

All of the watershed drains by gravity into the East Ditch. The Ditch discharges into two 60-inch corrugated metal pipes (CMP) passing under Tiburon Boulevard and Greenwood Cove Drive. These pipes drain into the Greenwood Cove Section of San Francisco Bay.

B. PRESENT FLOODING

The west bank of the East Ditch has an elevation of approximately 5.0 feet above Mean Sea Level (MSL) at the low end of the Cove Shopping Center parking lot. San Francisco Bay tides frequently reach this elevation. Many times a year they reach +6.0 MSL and occasionally above, flooding part of the parking lot.

The top of the curbs at the low spot on Cecilia Way are at elevation +6.4 MSL, in the range of the very highest tides. When runoff occurs during high tides (as in the assumed design condition) water levels in the upstream area raise above this elevation causing additional flooding of the low-lying development.

C. SOILS AND FOUNDATIONS

An exploratory boring was drilled at the pumping plant site and four "grab" samples were taken of the near-surface soil along the East Ditch. Representative soil samples from the boring were tested in the laboratory to evaluate their engineering properties. Sampler blow counts were recorded.

Subsoil conditions at the pump station site consist of 28 feet of soft silty clay (Bay Mud). Some traces of peat were found in the clay layer. The soft clay is underlain by 1-1/2 feet of stiff silty clay containing rock fragments and traces of sand. Below the clay layers, starting at depth 29-1/2 feet, a weathered and fractured claystone layer containing traces of weathered sandstone was encountered in the boring. The claystone layer extended to at least the depth of 35-1/2 feet, at which point the boring was terminated. The soft clay undoubtedly underlies the entire site and varies only in thickness. These soft clays are very weak and compressible. The overall area is continuing to settle and subside under the weight of soil above the water table.

Along the East Ditch, the surface soils consist essentially of silty clays. A weathered shale was found in parts of the channel above Station 11+50.

Any movement in the nearby hill slope might induce damages in the channel. Investigation of the slope stability was not part of this study. However, from a visual observation of the slope, it appears to be stable in its present state except for localized sloughing.

D. DRAINAGE FACILITIES

The reach of the existing East Ditch from Cecilia Way to Tiburon Boulevard has a bottom width varying from 6 to 11 feet and a depth of from 5 to 6 feet. The side slopes vary from 0.9:1 to 1.3:1 (horizontal to vertical). It curves along the base of a steep hillside to the east. A double 4-foot wide by 3.5-foot high reinforced concrete box culvert (RCB) passes under the easterly extension of Cecilia Way.

The East Ditch discharges into two asphalt lined 60-inch corrugated matal pipes (CMP) passing under Tiburon Boulevard (State Highway 131), Greenwood Cove Drive, and a drainage easement to Greenwood Cove. The California Department of Transportation (Caltrans, formerly Division of Highways) owns and maintains the upstream 120 feet of these pipes while the Zone is responsible for the lower 270 feet. Dist.

These existing outfall pipes are showing signs of deterioration and Caltrans has indicated their willingness to participate in the replacement of these pipes in about five years. It is anticipated that the replacement structure will be a reinforced concrete box culvert (RCB) with a hydraulic capacity equivalent to two 60-inch and one 72-inch fully paved CMP's in like-new condition. The East Ditch and pumping station project included in our scope of work were therefore designed to meet these anticipated future rather than present existing conditions.

Just below Cecelia Way, a 12-inch CMP enters the Ditch from the two catch basins at Leland Way and Cecilia Further down another 12-inch CMP enters the ditch from the catch basin at the end of Harriet Way. A 6-inch CMP and a 15-inch CMP enter the ditch from the east side. It is not clear where the 6-inch pipe comes from, but the 15-inch pipe comes from Circle Drive on the top of the east hillside.

The pipeline running down the center of the block bounded on three sides by Claire Way continues south to Cecilia Way where it divides into two parallel pipes. These two pipes continue south through the shopping center parking lot to a junction box about forty feet from the edge of Tiburon Boulevard. A 36-inch CMP leads from this junction box east to the East Ditch.

E. UTILITIES

1. Water - The Marin Municipal Water District (MMWD) 14-inch water main along the north side of Tiburon Boulevard crosses the two 60-inch outlet drainage pipes. Just east of the East Ditch this main enters a pumping station. The lowest portion of this pumping station site is at elevation +6.2 and is subject to occasional minor flooding. The frame building in this low area contains wall-mounted control units but no pumps or motors. The pumps and motors are located in the higher portion of the pumping plant site at a ground elevation of about +10 or +11.

   A 3/4-inch copper water service runs from the vicinity of the water meters in the shopping center parking lot along the southerly side of the nursery fence to a water meter. A 1-inch copper water line from this meter across the creek to the pumping station was recently abandoned. The 10-inch cast iron pipe visible in the invert of the ditch next to Tiburon Boulevard headwall is an abandoned water main.

2. Sanitary Sewer - An 8-inch cast iron Richardson Bay Sanitary District (RBSD) sewer main crosses the East Ditch at the upstream end of the nursery property. It is suspended from a steel I beam spanning between two concrete anchor blocks. This is the only sanitary sewer line in the area where construction will be likely.

3. Gas - A 6-inch wrapped steel Pacific Gas and Electric Company (PG&E) high pressure gas main parallels the south edge of the nursery property. It supports its own weight as it spans the East Ditch.

4. Electricity - An overhead PG&E power line runs along the north side of Tiburon Boulevard. A line running north into the shopping center takes off from a pole just west of the East Ditch.

5. Telephone - Overhead Pacific Telephone and Telegraph (PT&T) lines follow the same routes as the above-mentioned power lines. In addition, there are some underground telephone lines in the parking lot area.

SECTION III

HYDROLOGY

In accordance with Exhibit 'A' of our contract, the 50-year return period storm as computed by the Rational formula was used as the design storm for this project. Precipitation data used was that developed by District IV of the California Department of Transportation (Caltrans, formerly Division of Highways). Marin County Flood Control standards were used for the runoff coefficients. The time of concentration was taken as the sum of a five minute overland flow time and a travel time taken from the Caltrans nomograph for the Kirpitch formula.

The following estimated 50-year flows are recommended for final design:

Point	
Inflow to Pumping Station	35 cfs.
East Ditch at Cecilia Way	370 "
East Ditch just above Pumping Station	370 "
East Ditch at Tiburon Boulevard	405 "

In confirming the anticipated peak flows for the section of the East Ditch included in this project, we calculated a peak flow of 276 cfs. for which it was designed, and verified the consistency of design for the two facilities.

SECTION IV

HYDRAULICS

The basic objective of the project is to deliver the runoff from the 50-year storm to San Francisco Bay during a six-foot tide without any flooding within the Zone. The outfall for this portion of the Zone is the two asphalt lined 60-inch CMP's under Tiburon Boulevard, Greenwood Cove Drive and the drainage easement to Greenwood Cove. Since it is anticipated that these two pipes will be replaced in about five years, it was considered more appropriate to design the system for the larger replacement outfall rather than the existing CMP's. The replacement structure was assumed to be equivalent hydraulically to two 60-inch and one 72-inch fully paved asphalt-coated CMP's in like-new condition.

Pressure flow in the steel pump discharge pipes was calculated by the Hazen-Williams formula using C = 100. Losses at pipe bends were taken as $0.5\ h_v$ where h_v is the velocity head.

All other flows were calculated by the Manning formula using the following values for 'n':

Concrete pipes	.014
Concrete box structures	.014
Fully lined corrugated metal pipe	.013
Corrugated metal pipe	.024
Trowelled air-blown mortar	.014
Earth	.025
Rock slope protection	.035

Backwater profiles were run on the energy gradeline. Acceptable freeboard for open channel flow was taken as $0.2\,H_e$ where H_e is the energy head (depth plus velocity head).

SECTION V

PROPOSED IMPROVEMENTS

A. GENERAL

The proposed improvements are shown on the enclosed drawings and consist of a pumping station on the west side of the East Ditch just north of Tiburon Boulevard and improvements to the East Ditch from Tiburon Boulevard to Cecilia Way. They could be built in two stages:

1. Pumping station plus lower 150 feet of East Ditch improvements.

2. Balance of East Ditch improvements up to Cecilia Way.

B. PUMPING STATION

1. General - To pass the design flow through the Tiburon Boulevard culvert under design conditions, the upstream water level in the East Ditch must be 7.55 feet above Mean Sea Level. This is as much as two feet above the lowest portion of the Cove Shopping Center parking lot and a foot above the tops of the Cecilia Way curbs at the low point between Blackfield and Harriet. The most appropriate solution is the construction of a dike and a pumping station on the west side of the ditch just north of Tiburon Boulevard. The dike would protect the low-lying areas both from flows coming down the East Ditch and from Bay water backing up through the Tiburon Boulevard culvert. The pumping station would lift the runoff from the low-lying areas up to the East Ditch without backwater flooding.

2. Foundations - On the basis of the soil investigation performed under this contract, treated timber bearing piles are recommended to support the pumping station. A mat footing was found to be infeasible due to the low bearing strength of the Bay mud soils. Excavation will be fairly expensive as the conditions will require braced steel sheet piling and a three-foot gravel mat at the bottom of the hole.

Provision must be made for the probable settlement of surrounding soils with respect to a pile-supported pumping station. The inlet pipe should be asphalt coated CMP with flexible seals at the station entrance and at the outlet of the first structure upstream. The discharge pipes, which will be supported by the pumps (and station) should also be supported near their outlets by a pile-supported concrete wall. Continued settlement of the ground around the pumping station may cause the surface of the shopping center parking lot to settle below the top of the pumping station. Since the station roof will be designed to be a portion of the lot it may be necessary for asphalt concrete to be added around the edges of the station from time to time to allow such use to continue. The responsibility for such work should be established during right-of-way negotiations.

3. Sump - The pumping station is designed to pass a peak flow of 35 cubic feet per second (cfs) which is 15,700 gallons per minute (GPM). The sump is a reinforced concrete structure sized to provide proper submergence for the pumps and to store above that level a volume of water equivalent to 35 cfs for two minutes. This volume is necessary to allow the station to pass any inflow from a trickle to the full 35 cfs without excessive switching on and off of pumps, which can overheat motors reducing their useful life.

4. Pumping Station - The three main pumps were selected to to operate over a range of total dynamic head (TDH) from eight feet to fourteen feet and to deliver a total of at least 15,700 GPM at minimum head. Propeller (axial-flow) pumps are the most appropriate. Sizes selected were 10" x 10HP, 14" x 20HP, and 20" x 30HP. In addition, two 2HP sump pumps were selected.

   The sump structure, as shown on the conceptual drawing, is divided into three cells, each having one of the three main pumps. Runoff initially flows into the first cell passing through a trashrack. Cell 1 contains the 10HP pump (Pump 1) and one of the sump pumps (Pump 4). Cell 2 has the 20HP pump (Pump 5). Cell 3 is on the far side from Cell 1 and has the 30HP pump (Pump 3). There is an overflow weir between Cells 1 and 2. Cells 2 and 3 are completely interconnected.

The sump pumps and Pumps 1 and 2 are driven by electric motors. Pump 3 is driven through a right-angle drive by an internal combustion engine, probably natural gas or Diesel fueled.

5. Operation - In discussions with County Flood Control staff, it was agreed that it would be appropriate to assume that during the 50-year storm all three main pumps would be operational and electric power service would be uninterrupted. This is justifiable on two bases: Power outages are infrequent in the vicinity of the pumping station and the simultaneous occurrence of an outage along with the 50-year storm would have a recurrence interval greater than fifty years. Nonetheless, power outages may occur and in such an event, the 30HP pump's engine drive will provide 50 percent of the plant's capacity.

The sump should be kept as empty of water as possible to minimize odors and to prolong the life of the main pumps.

The sump pumps (Pumps 4 and 5) are intended to keep the sump as empty as possible. During the dry summer months the small amount of water Pump 5 cannot remove from Cells 2 and 3 should evaporate. There will probably always be at least a trickle of runoff entering Cell 1. This is due to groundwater infiltration through cracks in pipe joints and runoff from yard watering, car washing, etc. Pump 4 will operate periodically to remove this water keeping the pool as low and fresh as possible.

As the rate of inflow entering Cell 1 increases at the start of a storm, the water level will rise as the capacity of Pump 4 becomes inadequate. At a specified elevation Pump 1 will come on and Pump 4 shut off. (An override will be provided in the control panel so that the sump pumps will be automatically shut off when any of the main pumps are running.) If Pump 1 cannot handle the flow, the water rises until it spills over the weir into Cells 2 and 3. When the water rises to a predetermined height, Pump 2 will be turned on. If it cannot handle the flow, the water will continue to rise and Pump 3 will also come on. With all three main pumps on their combined capacity will meet the design flow of 15,700 GPM. As the water levels in the Cells drop, the main pumps will turn off at preset levels. Once all three main pumps are off, the sump pumps will come on and drain the sumps.

If the electric power supply is interrupted during a storm, the water level in Cell 1 will rise until either the power comes back on, starting Pump 1, or the water spills over the weir into Cells 2 and 3. If the water level in Cells 2 and 3 rises high enough, Pump 3 (internal combustion engine powered) will be turned on using the battery generator provided.

6. Controls - Control is based on water level in the sump. One of the most important functions of the controls is to keep each pump from operating at too low a submergence which could lead to impeller cavitation. Pendant-float type sensors are suggested. In these the chemical resistant float casing contains a mercury switch and is suspended from the roof by its own cable. As the water rises to the level of the float, the float tips over on its side closing the switch. Second choice would be a bubbler system. They are quite reliable but a standby power source is required to maintain air pressure during a power outage.

7. Shelter - The shelter is to protect the pumps, controls and equipment from the elements and tampering by unauthorized personnel. Wood-frame construction is proposed with fire ratings as and where required by the County Building Department. An exterior of dark brown stained board and bat siding and a composition shingle roof would be used to match the buildings of the shopping center. The walls should have screened louvered ventilation openings as shown. The roof should be removable in sections over the pumps to allow their removal, if necessary. Fire and intrusion alarms should be considered.

8. Maintenance - Sump maintenance should include regular inspection, clearing of the trashrack and cleaning of the sump. Pump and control maintenance should be in accordance with the recommendations of the manufacturers of the equipment.

C. EAST DITCH

1. General - The portion of the existing East Ditch from the outlet of the existing Cecilia Way RCB to the existing Tiburon Boulevard culvert is covered by this contract.

2. Present Capacity - The two present low spots in the banks of the East Ditch are at the lower end of the shopping center parking lot (El. +5.0) and just downstream from Cecilia Way (El. +9.1). The low spot at the shopping center is below the level of many high tides so flooding of this area cannot be eliminated during these periods regardless of the flow in the East Ditch unless the low bank is raised. If a dike were built at the parking lot to eliminate this low spot, the Ditch's capacity would then be limited by the Cecilia Way low spot. At this point the capacity is 260 cfs with the recommended freeboard or 380 cfs with no freeboard at all. In the reaches between these two points of constraint, the existing channel is adequate to pass the design storm discharge with the recommended freeboard.

3. Interim Improvements - An appropriate first stage of construction would include the pumping station and a dike along the west side of the Ditch through the downstream low spot. At that time the east side of the Ditch should receive some regrading in the pumping station area. This interim measure would increase the Ditch's capacity to 260 cfs with the recommended freeboard or 380 cfs with no freeboard. (The 50-year flow is estimated to be 370 cfs.)

4. Recommended Improvement - The constraints on increasing the East Ditch's capacity between Cecilia Way and the pumping station dike are the low spot in the west bank at Cecilia Way and the proximity of the steep upslope to the east. Cecilia Way passes through the center of the low spot so raising the west bank would not solve the problem unless the street were raised approximately one foot at this point. Such a measure could be taken if and when Cecilia Way is extended to the east or the Cecilia Way RCB is replaced by a larger structure. If this is not done, then capacity may be increased most economically through deepening and lining as shown on the drawing.

   Rock slope protection is recommended from Station 10+00 to Station 11+50 because some of these soils are of the Bay Mud type and may settle further in the future. Such movement would damage a rigid lining. Due to tidal effects and the type of soil in this reach the groundwater level will vary greatly behind any lining. Rock slope protection over a graded filter will safely relieve any pressures caused by such variations. The cross-sectional area of the channel is quite large at this

point so frictional losses will be small in spite of the roughness. This reach should be built as part of the first stage if construction is used.

Between Stations 11+50 and 16+25 a great deal of shale has been exposed by the channel excavation. This ground is stable enough that an air blown mortar lining (such as "Gunite") may safely be applied directly to it. Such a lining should be well trowelled to minimize friction. This section and the one upstream may be built as a later stage of construction.

From Station 16+25 to the Cecilia Way RCB the channel passes through clayey soils which should present no settlement problem. If a rigid lining is used, however, a filter should be installed behind it to provide drainage and protect the lining from excessive groundwater pressures. To reduce the frictional resistance of the channel and reduce maximum water levels at Cecilia Way this reach should be lined with trowelled air blown mortar. The last 25 or 50 feet of this section will have to be rebuilt if the Cecilia Way RCB is constructed at a later date.

5. Maintenance - Whether or not a section of the East Ditch is improved, it should be cleaned of debris regularly to maintain its hydraulic capacity.

D. SPECIFICATIONS

Due to the proximity of saltwater it is recommended that concrete contain not less than seven sacks of Type V Portland Cement per cubic yard.

As of July, 1974, propeller pumps and electric motors need to be ordered nine months in advance of the desired delivery date. In addition, manufacturers are reluctant to quote any price other than "price at time of delivery". It is recommended that the County advertise for bids for the pumps, motors and controls separately from, and well in advance of, the construction contract. The construction contractor would then be bidding only his price to install this "County furnished equipment" which would also arrive sooner. The contractor also would not have to increase his bid to protect himself from the price increases which will most likely take place during the period during which the equipment is on order.

E. RIGHTS-OF-WAY

The East Ditch presently runs through a 20-foot wide drainage easement from Cecilia Way to the southeast property line of Lot 24 on Harriet Way. From there, it runs through Cove Shopping Center property with no easement. The present top of the east bank appears to be typically from five to ten feet beyond the east easement line indicating that the present easement is already too narrow. The attached drawing shows the recommended new easement lines, the minimum width being 35 feet.

SECTION VI

ESTIMATED COSTS

Estimated construction costs included in Tables I and II are based on recent construction bid prices and have been escalated to represent price levels which may be anticipated in early 1975. These are provided for budget guidance only and are based on the best information available. However, with the unpredictability of costs in the construction industry today, there is really no way to obtain precise figures for future construction. Right-of-way prices are based on appraised land values obtained from the Marin County Assessor's office (Appraised = 4x Assessed). These are considered conservative as only an easement is being acquired, not the land.

All of the lands through which easement is required are subject to flooding. The project's accomplishment would be facilitated if the owners of these lands were to either donate the required easements or sell them at a nominal price. Of the required land, only the portion of the parking lot which would be occupied by the pumping station and the dike are presently being used. Even then, upon completion, much of the pumping station sump roof would be available for parking.

TABLE I

COST ESTIMATE

STAGE 1 - Pumping Station and Lower 150 Feet of East Ditch

Dewatering and Shoring	LS		$ 40,000
Structure Excavation	620 CY	$ 5.00	3,100
Gravel Blanket	130 CY	9.00	1,200
Furnish Timber Piling	540 LF	3.50	1,900
Drive Timber Piling	18 Ea.	350.00	6,300
Backfill	60 CY	10.00	600
Structure Concrete	120 CY	160.00	19,200
Reinforcing Steel	18,000 Lb.	0.60	10,800
Pump Shelter	264 SF	20.00	5,300
Pumps, Motors & Controls	LS		30,000
Pipelines	LS		5,000
Channel Excavation	470 CY	4.00	1,900
Embankment	210 CY	4.00	800
Graded Filter	120 CY	20.00	2,400
Rock Slope Protection (Facing, Method B)	125 CY	15.00	1,900
18" RCP	50 LF	10.00	500
36" CMP Bituminous Coated	10 LF	20.00	200
Catch Basin	1 Ea.	800.00	800
Junction Box	1 Ea.	1,000.00	1,000
12" Flap Gate	2 Ea.	200.00	400
3/4" Steel Water Line	130 LF	2.30	300
Relocate 6" H.P. Gas Main	180 LF	25.00	4,500
Reinstall 6' C.L. Fence	50 LF	4.00	200
Subtotal			$ 138,300
Contingencies @ 10%			13,700
Subtotal			$ 152,000
Administration, Engineering and Legal @ 15%			23,000
Land and R.O.W.			19,000
TOTAL CAPITAL COST			$ 194,000

TABLE II

COST ESTIMATE

STAGE 2 - Upper 550 Feet of East Ditch

Diversion and care of channel	LS		$ 5,000
Channel Excavation	690 CY	$ 4.00	2,800
Embankment	120 CY	4.00	500
Graded Filter	36 CY	20.00	700
Trowelled Air Blown Mortar	170 CY	300.00	51,000
Reinforcing Steel	6,800 Lb.	0.60	4,100
Subtotal			$ 64,100
Contingencies @ 10%			6,900
Subtotal			$ 71,000
Administration, Engineering and Legal @ 15%			11,000
Land and R.O.W.			3,000
TOTAL CAPITAL COST			$ 85,000

SECTION VII

CONSTRUCTION SCHEDULE

A. PHASED CONSTRUCTION

The recommended work may be accomplished in two stages:

1. Pumping station and East Ditch from Station 10+00 to Station 11+50 (plus very minor work between Station 11+50 and Cecilia Way).

2. East Ditch from Station 11+50 to Cecilia Way.

B. CONSTRUCTION SCHEDULE

The following schedule reflects the seasonal rainfall pattern, the work to be performed, its order, and the soil and ground-water conditions of the site.

1.	Advertise for bids for pumps, motors, and engine.	October 1974
2.	Award contract for pumps, motors and engine.	November 1974
3.	Advertise for bids for construction.	January 1975
4.	Award construction contract.	March 1975
5.	Construction	April-September 1975

The early advertising and award for the pumps, motors and engines is to assure their delivery by August 1975 so they can be installed, tested and ready to operate throughout the winter of 1975-1976. The first heavy rain of the season is usually in late September.