Attachment 1

# GIBRALTAR LAKE
# RESTORATION PROJECT

## FINAL REPORT

Submitted to

U.S. Environmental Protection Agency

"Clean Lakes Program"

Prepared by

The City of Santa Barbara

Public Works Department

Water Resources Division

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## EXECUTIVE SUMMARY

This report presents the results of the Gibraltar Lake Desiltation Project under the Clean lakes Act.

The reclamation program was proposed by the City of Santa Barbara in May 1977 to the U. S. Environmental Protection Agency's Clean Lakes Program. A Clean Lake EPA Grant to restore Gibraltar Lake was awarded to the City of Santa Barbara on May 15, 1978. This funding and desiltation method of Gibraltar Lake was the first of its kind in the United States.

Within three years from the initial construction of the desiltation project, approximately 445 acre-feet of wet silt had been dredged from the lake at a total cost of $4,197,316.84.

Gibraltar Lake is a 273.6 acre reservoir located within the rugged Santa Ynez Mountains about seven miles north of Santa Barbara City. The reservoir provides an average of 35% of the City's drinking water supply in conjuction with the other supply sources such as Lake Cachuma 53%, and the City's 12% ground water source.

The lake's water capacity has been decreasing since the completion of the Gibraltar Dam in 1920 and subsequent enlargement in 1948, because of siltation. The reservoir formed by the damming of the Santa Ynez River had an initial maximum capacity of 14,500 acre - feet and a subsequent capacity of 22,500 acre-feet in 1948. The lake's last capacity measurement in 1986 was reported to be reduced to about 8,241 acre-feet or 37 % of the total volume of 22,500 acre-feet. Over this 66 year period between 1920 through 1986, 14,259 acre-feet of silt entered Gibraltar Lake at an average rate of 216 acre-feet of silt per year.

The purpose of the Gibraltar Lake Restoration Project was to safely attempt to reclaim a portion of the reservoir's lost water capacity. The construction and dredging operations took nearly three years to complete. The actual project length satisfied the proposed 36 months originally stated in the Federal Assistance Application.

**EXECUTIVE REPORT** (continued)

EPA and representative of the Federal Government are to receive "thanks" from the citizens of Santa Barbara for participating in this grant. The purpose of the "Clean Lakes" Grant has been fulfilled and this report is documentation of that participation between the agencies (EPA and the City of Santa Barbara).

1978 GRANT NO. S804814-010 (later S009344-013, 1983)

**ENVIRONMENTAL CONCERNS**

1. The City of Santa Barbara Water Supply -"Gibraltar Reservoir"- has benefitted from the grant by both sustaining 3 years of dredging and by entering into a Watershed Management Agreement with the U. S. Forest Service.

2. A special "Pneuma Pump" was employed as the dredging equipment to be both tested and operated during the period of the Grant. This pump handled mercury contaminated silt removal with no degradation or disruption to the City of Santa Barbara's water supply.

3. Construction of a silt retention dam within lands owned and controlled by the U. S. Forest Service caused no habitat disruption to either man or animal.

**PROJECT COST SUMMARY**

| | (EPA) (City) | |
|---|---|---|
| 1. | PHASE I - PHASE "A" - | The initial Research and Development Phase including construction of the initial retention dam; mobilization/ demobilization and pumping of approximately 220,000 cubic yards of liquid silt or 92,000 of bottomsilt for--------$2,255,000. |
| 2. | PHASE II - PHASE "B" - | Continued testing and purchase of the Pneuma Pump and raising retention dam 38 feet for----------$ 718,611. |
| 3. | PHASE II - PHASE "C" - | Operational costs of "Pneuma" equipment using City personnel for a sustained period of 18 months for----------$ 1,223,705. |
| | | TOTAL COST $ 4,197,316. |

NOTE: Authorized EPA Grant = $4,225,000.

## DREDGING COSTS

| EPA GRANT PHASE | CITY PHASE | ACTUAL COSTS | TOTAL LIQUID* PUMPED C.Y. | BOTTOM SILT** WET C.Y. | COST PER CUBIC YARD (C.Y.) |
|---|---|---|---|---|---|
| Actual | | | | | |
| I | "A" | $2,255,000 | 230,000 | 92,000 | $24.51 |
| II | "B" | 718,611 | 420,000 | 168,000 | $ 4.28 |
| | SUBTOTAL | $2,973,611 | 650,000 | 260,000 | $11.44 |
| II | "C" | 1,223,705 (648,674 O&M COSTS) | 1,145,260 | 458,000 (284 AF) | $ 2.67 |
| | TOTAL | $4,197,316 | 1,795,260 | 718,000 (445 AF) | $ 5.85 |

Phase "A" included construction of initial silt retention dam, R&D and planning, environmental and engineering/inspection costs.

Phase "B" including raising initial retention dam 38', pumping and purchasing equipment.

Phase "C" PUMPING costs only for 18 months sustained dredging.

* Liquid slurry is the pumped liquid which is composed of 40% wet silt and 60% water.
** Wet silt is composed of 40% dry silt and 60% water.

## LONG TERM PROBLEMS AND COSTS

The Desilting Project, during its three years in operation, was able to mitigate the impact of annual siltation at Gibraltar Reservoir. Water yield of the reservoir was sustained during that period of time. However, it is recognized that the long term will bring about continued siltation. Watershed management measures are being undertaken by the U.S. Forest Service, with financial support by the City of Santa Barbara. This will help mitigate watershed erosion and reservoir siltation to a certain extent. In the long term, however, significant erosion/siltation will continue.

The current silt basin has been filled with approximately 445 acre feet (AF) of wet silt dredged from Gibraltar Reservoir. There is still remaining in the basin the equivalent storage capacity for a final 275 AF of wet silt from the reservoir. It has been calculated that to complete the filling up of this silt basin will require portions of two additional years of operations and will cost some $450,000 in operation and maintenance cost. The long-term gain in average water yield by completing the dredging to the extent made possible by the remaining 275 AF of wet silt storage in the existing silt basin would be about $700/AF. This is the incremental yield over the yield available if no further dredging were to be done.

The removal of 445 AF of wet silt by the dredging operations of Phases A, B and C have been estimated to provide a long-term incremental yield over the base conditions of no dredging program of some 100 AFY at a unit cost of $4,470/AF (please see backup calculations in Addendum "A"). The long-term yield of completing the dredging over the base condition is 150 AFY with a unit cost of $3210/AF. (See table below.)

Investigations are continuing into the possibility of obtaining silt storage capacity elsewhere, above or below Gibraltar Reservoir.

PROJECT WATER YIELD COSTS

| Description | Cost ($000) | Wet Silt Removed (AF) | Incremental Average Water Yield (AFY) | Yield Cost ($/AFY) |
|---|---|---|---|---|
| Phase A, B, & C | $4000 | 445 | 100 | 4470 |
| Complete Dredge Project * | 450 | 275 | 50 | 700 |
| Total* | 4450 | 720 | 150 | 3210 |

* Projected Figures