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**OFFICE OF ENVIRONMENTAL
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Manager and Chief Engineer

Mr. Gary Gill, Director
Office of Environmental Quality Control
State of Hawaii
220 South King Street
Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Final Environmental Assessment (FEA) for the Booth Road Water
System Improvements Project, Pauoa, Oahu, TMK: 2-2-41: 01, 03;
2-2-39: Portion 07; and 2-2-40: Portion 05

We request the subject FEA be published in the December 23, 1995 OEQC Bulletin as a Negative Declaration. Please find the completed OEQC Bulletin Publication Form and four (4) copies of the document attached for your use.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,


RAYMOND H. SATO
Manager and Chief Engineer

Attachments

1995-12-23-0A-*FEA-Booth Road Water System Improvement Project*

DEC 23 1995

FILE COPY

***BOOTH ROAD
WATER SYSTEM
IMPROVEMENTS***

Final Environmental Assessment

Honolulu Board of Water Supply

630 South Beretania Street

Honolulu, Hawaii 96843

BOOTH ROAD WATER SYSTEM IMPROVEMENTS

Pauoa Valley, Oahu, Hawaii
TMK: 2-2-41: 01,03; 2-2-39: por. 07; 2-2-40: por. 05

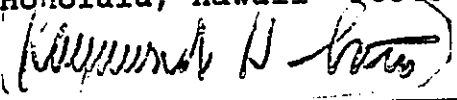
FINAL ENVIRONMENTAL ASSESSMENT

This Environmental Document is Submitted
Pursuant to Chapter 343, HRS

PROPOSING AGENCY:

Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

RESPONSIBLE OFFICIAL:


Raymond H. Sato
Manager and Chief Engineer

DEC 13 1995

Date

ACCEPTING AUTHORITY:

Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

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INTRODUCTION

Background History

In December 1994, a small landslide carried away a section of the Booth Spring 6-inch cross-country main that is the sole feed to the upper Booth Road area. This relatively isolated service area consists of approximately 35 residences, served by 20 water services. Soon after the main was repaired however, the BWS started to receive complaints of dirty water from the residents in the area. Continuous flushing and disinfection of the system has failed to totally eliminate the problem as intermittent water quality (mainly color) complaints are still being received. To this date, there has been no determination on the exact cause of the problem. So far, the most plausible theory is that the problem is attributable to the age, condition, and material type of the main.

Records indicate that it is at least 40 years old, but more likely closer to 65 years old and made out of cast iron that has heavy external corrosion. Typically, pipes in this condition are also known to have excessive amounts of internal pitting and buildup of deposited material. It is possible that during the landslide, the pipeline was jarred to the point where this material started to break loose. Extensive flushing would normally resolve the problem, however this has not been the case.

In addition, slightly higher levels of chlorine have been added to the system so that microbiological standards are met. An increase in bacterial counts are often associated with this type of dirty water situation. However, this could be part of the problem as the higher doses of chlorine may have increased the water's aggressiveness to the point where it is causing even more of the material to break loose. Basically, this has led to a type of "Catch-22" situation.

Alternatives

The logical solution of course would be to replace the cross-country main. The main, which is approximately 6,000 feet in length, starts at the booster station at the Pacific Heights 578 Reservoir, traverses the western face of Pauoa Valley, and ends at Booth Spring. Approximately 800 feet before Booth Spring, there is a tee connection for 2-inch and 3-inch pipes that span Pauoa Stream. On the other side of the stream, the pipes connect to the distribution system at an abandoned BWS chlorinator station.

The portion that would be replaced, however, from the Pacific Heights 578 Reservoir to the pipe crossing, is laid along a 1 to 2 feet wide trail with nearly vertical cliffs on either side. In places, the main is suspended over small gullies or off the side of the trail. The logistics and hazards involved in bringing in material and installing the main make this a completely impractical solution.

Another option evaluated entailed expanding the existing 578 system. A booster station would be constructed at the upper limit of the system in the lower Booth Road area. Water would then be boosted to upper Booth Road. However, this option is more likely part of a long term solution as there are numerous problems with land acquisition and the inadequacy of the 578 system. It is possible though, that should these problems be resolved in a timely manner, this may still be a viable alternative.

To construct a booster station, a site of approximately 5,000 square feet (s.f.) would be required. Several residents have come forward indicating an interest in allowing the station to be placed in their front yard. While an interesting concept, zoning laws will have to be examined to see if it is permissible. A more plausible scenario will be the acquisition of a piece of land currently owned by the Evangelical Lutheran Good Samaritan Society. It is identified as TMK: 2-2-40: portion 05. This could be done either by condemnation or negotiations. While negotiating a fair price would be the preferred method, condemnation procedures could always be implemented if negotiations reach an impasse. Condemnation procedures will take approximately four to six months, which will slightly delay the estimated start of construction.

Resolving the hydraulic problems will be slightly more difficult. The biggest stumbling block will be to locate a site low enough within the 578 system along Booth Road for the booster station. This is necessary so the suction side of the pumps have adequate flow, pressure and not cause excessive cavitation in the main when operating. The aforementioned site, if obtained, will marginally meet this criteria.

In addition, a separate main will have to be installed between the booster station and new reservoir. A direct connection to the existing distribution system would not be feasible since it would subject it to higher pressures than it was designed for. This in turn would probably cause numerous main breaks and excessive pressure problems for services off this system. While this new main will help reduce pressures (due to a lower head loss factor), provisions will still need to be made for installing pressure reducing valves (PRV) for services in the lower elevations of the new system. Also, some services at the end of the 578 system in the vicinity of the booster station may be subject to fluctuating line pressures and flows as the pumps operate. Therefore, as a preventive measure, these services will be switched over to the new system and PRVs installed. This booster station option will be slightly more expensive than the preferred (proposed) plan mainly due to the additional length of main. Should this alternative be pursued, the exact costs will be determined when the design plans are finalized.

A final option considered was to bring Booth Spring permanently back on line as the sole source for the system. Booth Spring which has been operated by the BWS since 1953, has produced up to an average annual maximum flow of 0.167 mgd. However, flows were variable, and no flows occurred for months in dry years. For this reason, Booth Spring has only been used sporadically during the past years, and mainly as a supplement to the feed from the 578 system. This alternative was quickly discarded due to the undependable and inconsistent flows and the prohibitive costs associated with future EPA required treatment and monitoring of surface influenced sources.

Proposal

To resolve the problem, the BWS proposes to replace the water system that currently serves the upper Booth Road area with a new small system. This will entail the drilling of a shallow well and construction of a small steel tank and control house. It also requires the installation of 4-inch influent and 2-1/2-inch effluent lines connecting the well, reservoir, and existing distribution system. In addition, it will be necessary for a section of existing 2-inch galvanized iron distribution pipe to be replaced by a portion of the new 2-1/2-inch effluent line.

The new system will be constructed on the eastern side of Pauoa Valley on BWS and State property. Starting at the end of the paved portion of Booth Road, the project will essentially follow the existing gravel access roadway leading to Booth Spring. It will extend mauka for approximately 1,300 feet and end in the vicinity of Booth Spring.

However, if for some reason the well system fails to materialize as a viable alternative, then the booster station option will be the next choice. Of course, there will be a slight delay in the start of construction due to revising the design plans and obtaining the land to site the booster station.

This alternative will call for the construction of a booster station consisting of the pumps and control house. It will target the same reservoir proposed as part of the well system. A 4-inch main will connect the pumps and the new reservoir. The booster station will be sited on the makai portion of the Lutheran Church's property that the BWS would obtain. The 4-inch main will be laid in Booth Road (both paved and gravel portions) for its entire length. It will terminate at the new reservoir which will be located in the vicinity of Booth Spring.

SECTION 1

DESCRIPTION OF THE PROPOSED PROJECT

The BWS proposes to replace the water system that currently serves the upper Booth Road area with a new small system. This will entail the drilling of a 100 feet deep well and construction of a 20,000 gallon steel tank and control house. It also requires the installation of 800 feet of 4-inch influent and 1,300 feet of 2-1/2-inch effluent lines connecting the well, reservoir, and existing distribution system. In addition, it will be necessary for 500 feet of existing 2-inch galvanized iron distribution pipe to be replaced by a portion of the new 2-1/2-inch effluent line. (See figures 1 and 6)

As previously mentioned however, if the well system fails to prove a viable solution, then the booster station alternative will be pursued. This option proposes the construction of a booster station at approximately the 460 foot elevation along Booth Road. It will consist of a "pump pad" large enough to hold two vertical 55 gpm submersible pumps housed in their casings. A control house will also be constructed to contain the motor control center that will regulate the operations of the pumps and reservoir. In addition, approximately 3,400 linear feet (l.f.) of 4-inch main will be laid in Booth Road connecting the pumps and the new reservoir. In essence, under this option, the reservoir remains the same while the boosters and the 3,400 l.f. of 4-inch main replaces the well and all its associated piping, respectively. (See figure 1)

A. Technical Characteristics

Well

The shallow well will be located immediately adjacent to and mauka of the abandoned BWS chlorinator station. The station is located approximately 500 feet from the end of the paved portion of Booth Road along the gravel road leading to Booth Spring. Drilling of the well will entail clearing an area of approximately 500 square feet (sf) and bringing in a drilling rig. The type of rig is unknown at this time, however, it would probably be of the cable tool type. The well will be approximately 100 feet deep and solid cased to at least 50 feet. It will attempt to tap into perched groundwater associated with lava and cinders from the Tantalus flows. This stratum overlies older alluvial material which in turn are superimposed on Koolau Basalt. This is the same water that feeds both Booth and Kahuawai Springs.

After the well is drilled, a series of test pumpings will be done to determine if the quality and quantity of water is suitable for development. The first will be yield-drawdown tests performed at rates between 50 and 150 gpm. This will provide a preliminary indication of the rate at which the well can be pumped for sustained periods. A long term constant rate test will then be performed for several days to check the results of the yield-drawdown test. Based on the long term test, adjustments will be made to the final sustainable yield established for the well.

Booth and Kahuawai Springs are capable of producing approximately 0.17 mgd and a conservative 0.2 mgd, respectively, based on recorded flows. The expected yield of 0.1 mgd (equivalent to 100 gpm) is therefore not unreasonable. If this amount of water is found, then a permanent pump, controls, and appurtenant piping will be installed.

An application is currently pending before the CWRM for the well construction, pump installation and water use permits. It is anticipated that these permits will be approved since Booth Spring has existing uses greater than the requested withdrawal amount. In addition, there is the legal grant to Kahuawai Spring's water rights in favor of the BWS. This further establishes the BWS position in terms of the right to develop the proposed well.

Reservoir

The reservoir will be sited at approximately the 720 feet elevation on the relatively level ground above Booth Spring at the end of the gravel access road. An area of about 1,200 sf will need to be cleared to accommodate the reservoir, footing and perimeter drainage system. The concrete footing and reservoir will be approximately 16 and 14 feet in diameter, respectively. Essentially, the reservoir will consist of a small steel tank with a glass lining and a capacity between 18,000 and 20,000 gallons. It will be brought in by sections and fabricated on site. The final spillway will be around 740 feet. This design will only allow the system to meet average day demands and minimum pressure requirements. It will not be able to satisfy all BWS Standards such as fire flow and max day demands. However, it should suffice as a "stop gap" measure to temporarily resolve the water quality problems until a permanent solution is devised.

Control House

A control house will be constructed at the well site. It will be large enough to contain the motor control center and chlorination equipment. Although the design has not been finalized, it will probably have roughly 100 sf of floor area. The building will consist of a concrete slab on grade with hollow tile walls and a concrete roof. A 6-foot high chain link fence will be installed along the perimeter of the control house and well head site.

Booster Station

The booster station site will be located on the makai property of the Evangelical Lutheran Good Samaritan Society's property identified as TMK: 2-2-40: por. 05. The ground elevation of the proposed site is approximately 460 feet which meets the hydraulic criteria for passable operation of the system. It will contain the two booster pumps and a control house for the motor control center.

The boosters will be of the submersible type to practically reduce all operating noise and have a rating of 55 gpm. A vertical installation will probably be used as this reduces the wear and tear on the pump's bearings and eases the maintenance procedures. In this type of setup, the boosters are housed in solid casings with suction and discharge fittings at the bottom and top, respectively. The "supply side" main from the 578 system will be connected to the suction side and the new 4-inch influent/effluent main will be connected to the discharge side. A concrete pad will be constructed that will be large enough to hold these two boosters and several manholes used to access the systems valving setup.

The control house will probably be very similar to the one described for the well system scenario. It will have roughly 100 s.f. of floor area, which should be large enough to hold the motor control center, and be constructed entirely of concrete. A 6-foot high chain link perimeter fence will also be installed around the station.

Pipelines

Separate influent and effluent lines will be installed to connect the well, reservoir, and distribution system. The influent main connecting the well and reservoir will be 4 inches in diameter and approximately 800 feet in length. The design also calls for it to have a standard 2-1/2 feet of cover. Although PVC is the most likely material choice for the main, ductile iron could also be used. The alignment will follow the gravel roadway as this is the easiest direct route.

The effluent pipe will connect the reservoir and the existing distribution system. It will consist of a 2-1/2-inch copper pipe with a total length of slightly over 1,300 feet. The standard design for this pipe calls for 1-1/2 feet of cover. Starting at the reservoir, it will parallel the 4-inch influent line as far as the well. From this point, it will run past the chlorinator station and then be installed within an existing pipeline easement. It will extend as far as the chain gate where the connection to the existing 2-inch copper pipe will be made. The existing 2-inch galvanized iron pipe that runs from the chlorinator station to the chain gate will be abandoned in place within the easement. The 2-inch and 3-inch pipes that feed the 2-inch galvanized pipe will be cut and capped and also abandoned in place.

In the booster station option, a single 4-inch main will be installed between the booster pumps and the new reservoir. It will be approximately 3,400 l.f. in length and act as both an influent and effluent main. Similarly to the well option, it will have a standard 2-1/2 feet of cover and consist of either PVC or ductile iron material. The alignment will be along Booth Road for its entire length, with 2,100 l.f. within the paved portion and 1,300 l.f. within the gravel/dirt portion.

At some point along the first 2,100 feet which is yet to be determined, a connection will be made to the existing 2-inch copper distribution pipe. This pipe section which serves the affected area will remain in service. The 2-inch galvanized iron portion however, will be cut and capped off and abandoned in place. PRVs will be installed for those services that will be subjected to pressures in excess of allowable standards. Also, those services around and above the booster station area that might be subject to hydraulic fluctuations will be transferred to the new system. These services will also require the installation of PRVs.

A back-hoe should be sufficient for all trenching and pipe laying work associated with this phase of the project.

Utilities

Electricity will be needed to run the well pump and appurtenant equipment. As there is no service to the site, an electrical feed from Hawaiian Electric will have to be brought in. The exact setup is uncertain at this time since only after a formal request for service is submitted to HECO will they evaluate the situation. A determination will then be made on whether the line will be brought in overhead, underground, or in some combination of these two methods. HECO will be responsible for the design and installation of the entire service. The electrical service installation, well station design, and all connection work will be coordinated between the BWS, HECO, and DLNR.

B. Economic and Social Characteristics

The cost of the project is currently estimated at \$710,000 and is expected to take 1 year to complete. It is budgeted at \$1,000,000 as Item 96-81 in the BWS Research and Facilities Improvement Program.

Most of the properties committed to this project are owned by the BWS. The exceptions are the affected portion of Booth Road in which the pipelines will be laid and the reservoir site, all of which is owned by the State of Hawaii.

The proposed project is critically needed to replace the existing water system that serves the upper Booth Road area. The existing system receives its sole water feed through a 6-inch main which is rapidly deteriorating. Due to the mains condition, approximately 35 residences which are served by 20 water services are currently receiving low quality water service. This is characterized by intermittent water service and water with high chlorine and color. Until the system is replaced, the situation will continue to worsen, creating great inconvenience to the residents of the area. The BWS has presently determined the proposed action is the most expedient way to resolve the situation.

SECTION 2

DESCRIPTION OF THE AFFECTED ENVIRONMENT

The new system will be constructed on the eastern side of Pauoa Valley on BWS and State property. Starting at the end of the paved portion of Booth Road, the project will essentially follow an existing gravel access roadway. It will extend mauka for approximately 1,300 feet and end in the vicinity of Booth Spring. Gentle sloping terrain and relatively easy access characterizes the project site.

A. Climate

Climatic conditions can be considered cool and pleasant although the area is quite damp. Rainfall averages 120 inches annually. Relative humidity ranges from lows of 55% during summer months to highs of 85% during the winter. Temperatures range from a low of 59° to a high of 77°F. Winds blow from the northeast quadrant about 90% of the time at speeds between 9-13 mph.

B. Topography and Soils

The project site lies roughly between the 640 and 720 feet elevation. Gentle slopes occur over most of the area where the BWS proposes to construct the physical structures. However, steeper slopes occur on the western side, between the access road and the gulch formed by Pauoa Stream. Slopes in this area average 30 percent over a distance of 120 to 130 feet. To the east of the access road, the topography rises sharply towards Tantalus Drive. (See figure 1)

The U.S. Soil Conservation Service (1972) soil maps indicate two soil types in the project vicinity. Tantalus silt loam, 15 to 40 percent slopes (TAE) exists in the area of the chlorinator and extends approximately halfway to Booth Spring. This is a well drained soil developed in volcanic ash and material weathered from cinders. The runoff potential is classified as medium and the erosion hazard moderate. (See figure 2)

The soil type above the halfway point (between the chlorinator and Booth Spring) and in the vicinity of Booth Spring is classified as Tantalus silt loam, 40 to 70 percent slopes (TAF). The soil characteristics are the same as the TAE, except the erosion hazard is considered severe.

C. Flora

There is a large rose apple tree in the vicinity of the chlorinator station whose dense shade causes the immediate area of the station to be sparsely vegetated. Several small plants of Chinese taro (Alocasia cucullata), Xanthosoma sagittifolium, and Cyclosorus parasiticus can be found along with numerous rose apple seedlings and several moon flower (Ipomoea alba) vines. Further makai, the open canopied forest consists largely of melochia, banana (Musa x paradisiaca), and bamboo (Bambusa vulgaris and B. sp.) with open areas of paragrass and honohono (Commelina diffusa). Scattered Albizia, kukui (Aleurites moluccana), avocado, and Chinese banyan can also be found. Maile pilau (Paederia foetida) and moon flower festoon the smaller trees and climb into the canopies of the taller trees.

The small channel draining the Kahuawai Spring area is overgrown with grasses and honohono. The flow crosses a meadow where farfugium (Ligularia tussilaginea), pennywort (Centella asiatica), purslane (Ludwigia octovalvis) and taro (Alocasia macrorrhiza) have been observed. Further downstream, heliconias, banyans (Ficus benjamina) and ferns (Adiantum hispidulum) and some watercress (Nasturtium microphyllum) occur along the banks of the channel.

Mauka of the spring, the forest is taller, closed canopied and denser, consisting predominantly of rose apple, occasional avocado, Java plum, and monkeypod (Samanea saman). Ginger and malayan ground orchid (Spathoglottis plicata) are the most common ground cover plants. Maile pilau and moon flower occasionally climb into the canopy.

The vegetation at the reservoir site is not dominated by any single species. Although the most common woody species in this area are melochia, guava, mango and bingabing, the most notable features of the vegetation are the eucalyptus, brush box, and Toona. Large clumps of bamboo and several tall silk oak (Grevillea robusta) are also found. The forest here is also high canopied with a relatively open understory. The herb layer consists largely of basketgrass, honohono, ginger and malayan ground orchid.

There are no rare, endangered or threatened plants present.

D. Fauna

A preliminary walk through survey was conducted at the project site. Above Booth Spring, isolated pools contained only tadpoles (probably Rana rugosa) and insect larvae (mostly Diptera, Chironomidae). Below Booth Spring and above Kahuawai Spring a sand bottomed pool had tadpoles and adults of the wrinkled frog (Rana rugosa). Below this point to a small waterfall, smaller pools contained tadpoles, algae (Cladophora sp.) and insect larvae (Diptera). A few crayfish (Procambarus clarki) were observed.

Below the small waterfall, pools in the stream contained more water life. Down to and beyond the confluence of Pauoa stream and the outflow of Kahuawai Spring, swordtails (Xiphophorus helleri), a snail (Lymnaea reticulata), and a shrimp (Atya bisulcata) were found.

In the immediate Kahuawai Spring pool and the small channel which drains it, snails (Melania mauiensis), crayfish, topminnows (Gambusia affinis) and a dojo (Misgurnus auquillicaudatus) were also seen.

Animals (fauna and avifauna) were not observed on the site investigation. However, it is probable that a number of animals and birds frequent the area. The project site and its immediate environs would contain many of the species of animals and birds known to exist throughout the Makiki and Tantalus area. Some identified species would more often be associated with the deeper forest areas, but are mentioned here although their visits to sites closer to urbanized areas are believed to be less frequent.

Animal species would include mongoose (Herpestes auropunctatus), rats (Rattus), cats (Felis cattus), dogs (Canis familiaris), and feral pigs (Sus scrofa).

Bird species would include house finch (Carpodacus mexicanus frontalis), Brazilian cardinal (Paroaria coronata), cardinal (Richmondia cardinalis), white eye "Mejiro" (Zosterops japonica), shama thrush (Copsychis malabaricus), barred dove (Geopelia striata), spotted dove (Streptopelia chinensis chinensis), Chinese thrush (Garrulax canorus), English sparrow (Passer domesticus), and mynah (Acridotheres tristis).

E. Surface Water Hydrology

Kahuawai Spring (Roseapple Spring)

Kahuawai Spring emerges from the ground forming a circular pond, approximately 7 to 8 feet in diameter and between 12 to 18 inches in depth. Overflow from this pond is through a metal weir with a v-notch outlet. Flow through the notch is normally about 6 inches. The bottom of the pond is mostly coarse sand and pebbles with a few larger rocks.

BWS records indicate that Kahuawai Spring can produce a conservative 0.2 mgd. Discharge runs along a poorly maintained channel, parallel and between the access road and Pauoa Stream. Usually only a few inches deep, flow from this channel seeps across several terraces alongside its path. Most of the flow reaches portions of Pauoa Stream a few hundreds yards downstream at a location where the residences begin. Here, a portion of the flow has been diverted by a nearby resident for agriculture purposes.

Booth Spring

Booth Spring which has been operated as a BWS source since 1953, has produced up to an average annual maximum flow of 0.167 mgd. However, flows were variable, and no flows occurred for months in dry years.

It consists of a large concrete cistern with a spillway elevation of 709 feet that partially lies within Pauoa Stream. There is an access hatch with a hinged metal cover and lock on the top of the structure which is level with the west bank of the stream. The cistern has numerous leaks at the concrete joints along its walls. A 6-inch main runs from the cistern, cross-country, along the western face of the valley wall, down to a booster station at the BWS Pacific Heights 578 Reservoir. There is a tee connection approximately 800 feet makai of Booth Spring where 2-inch and 3-inch pipes span Pauoa Stream in the vicinity of Kahuawai Spring. They are connected to the piping at the abandoned chlorinator station and are a part of the upper Booth Road distribution system.

Pauoa Stream

The main body of Pauoa Stream is the accumulation of a series of small tributaries along the western slope of Tantalus. The stream flows over volcanic deposits derived from relatively late eruptions (geologically) of Tantalus, which partially filled the more ancient Pauoa Valley. A waterfall now represents the edge of the uppermost Tantalus lava flow.

Flow in the upper reaches of Pauoa Stream (above Booth Spring) is interrupted. Water which percolates into the basalt and cinder of the Tantalus eruption seeps downward until it encounters the much older and more or less impermeable surface of the alluvial fill of the ancient valley. This groundwater then moves along the point of contact between the older Ko'olau rocks and the younger Tantalus flows, emerging as springs in the valley (Wentworth, 1941).

Nearly all of the permanent flow in Pauoa Stream derives from the several springs in upper Pauoa Valley. The largest spring appears to be Booth Spring - a part of which is capped with a cement cistern and the flow diverted by the Honolulu Board of Water Supply. However, the cistern leaks, and further captures only a portion of the seepage from the yielding stratum which cuts across the width of the stream bed as small disconnected pools. Flow in this section presumably occurs only during and following significant rainfall events. In the vicinity of and downstream from Booth Spring, water flows over a natural bedrock channel in upper Pauoa Valley, then through a lined channel in upper Pauoa Valley, then through a lined channel in a portion of middle Pauoa Valley and around the western side of Punchbowl (Puowaina) cone. The stream empties into Nuuanu Stream just inland from Beretania Street (Wentworth, 1941; Timbol and Maciolek, 1978).

F. Historic Features

There are no recorded historic features in the project area. In addition, the area has been fairly well developed during recent times. This further reduces the possibility that any historic sites remain.

G. Land Use Designations and Ownership

The well, control house, reservoir, and the majority of the pipeline alignment are within the Conservation District as designated by the State Land Use Commission (LUC). The Development Plan Map, City and County of Honolulu, designates this part of the project site Preservation and it is zoned Preservation (P-1). A small section of pipeline (approximately 350 feet) is designated Urban by the LUC, and zoned R-5. (See figures 4 and 5)

The steel tank and about one-half of the new pipelines will be built on State land identified by TMK: 2-2-41: 01. The well, control house and remaining new pipelines will be constructed on land owned by the BWS and identified as TMK: 2-2-41: 03. (See figure 3)

In addition, a 500 feet section of the existing distribution main will be replaced. This main runs through a 5-foot wide easement that adjoins the State owned portion of Booth Road and is granted in favor of the BWS. It is identified in part as TMK: 2-2-39: por. 07 and identified further as Lots B-1 and B-2 as shown on Map 4 of Land Court Application 681 and described in Transfer Certificate of Title 450,487.

Under the booster station option, the reservoir and approximately 950 l.f. of 4-inch main will be within the Conservation District and is zoned Preservation (P-1). The remaining 2,450 l.f. of main and booster station site lie within the Urban District on land zoned Residential (R-5). (See figures 4 and 5)

As indicated previously, the last 400 l.f. of main leading up to the reservoir will be installed on State land designated TMK: 2-2-41: 01. The next 400 l.f. down to the abandoned chlorinator station will lie within BWS property designated by TMK: 2-2-41: 03. Below this point for the next 1,000 l.f., the alignment has not yet been determined. It could follow the existing BWS easements designated B-1 and B-2 (TMK: 2-2-39: por. 07) or the adjoining State owned portion of Booth Road. This will be set during the design phase should this alternative be pursued. The last section of 1,600 l.f. leading to the booster station will definitely be laid within the City and County portion of Booth Road. As with the State owned portion, there is no TMK associated with the road. The booster station itself will be constructed on land designated TMK: 2-2-40: por. 05. (See figure 3)

H. Infrastructure and Utility Services

1. Roads

Access to the site is primarily through Booth Road which is a combination of private, City and County, and State jurisdictions.

The section leading up to the alternative booster station site and continuing on to the start of the State portion is under City and County control. Consisting of A.C. pavement, the 1,600 l.f. between the booster station and the State owned portion is roughly 20 to 30 feet wide.

The State portion, which covers the last 1,000 feet, consists of both paved and gravel sections. About 350 feet before the Forest Reserve Line where the paved portion ends, it is approximately 6 to 8 feet wide. Both sides of the road are overgrown with California grass and Koa haole that further reduces the useable width. Passage is generally limited to one vehicle at a time.

A chain gate separates the end of the paved portion from the start of the gravel section. Beyond this point, the roadway narrows to less than 6 feet in width, and extends about 150 feet past the Forest Reserve Line up to its end at the chlorinator station. A chain link fence gate at the Forest Reserve Line separates the public right-of-way from BWS and State property. Although the roadway officially ends at the chlorinator station, it does continue as a gravel and dirt road up to Booth Spring where it finally terminates. The gravel and dirt portions can become badly rutted or washed out during heavy rain storms. Passable with a car under good conditions, a four-wheel drive vehicle is required during inclement weather conditions.

2. Sewer

The project site is unsewered and cesspools are the primary means of waste disposal for the upper Booth Road area. An existing 8-inch sewer main ends approximately 1,000 feet from the end of the paved portion of Booth Road.

3. Drainage

The area is not served by a municipal storm drainage system.

4. Power and Communication

There is no electrical or telephone service to the project site. Electrical and phone service are available however, up to the end of the paved portion of Booth Road.

5. Emergency Services

Municipal fire and ambulance services are available to the project area. At present existing water supply services do not provide fire hydrants in the immediate project area. The nearest fire hydrant is located about 1,000 feet from the uppermost residence on Booth Road.

6. Water

Domestic water to the upper Booth Road area currently is being fed from the BWS Pacific Heights 578 and 915 system. Water from the 578 system is boosted through a pump station located at the 578 reservoir up to the 915 reservoir. A portion of this water is fed through a PRV setup and then up the Booth Spring cross-country 6-inch main. The main which is approximately 6,000 feet in length, traverses the western face of Pauoa Valley and ends at the BWS Booth Spring source. There is a tee connection approximately 800 feet makai of Booth Spring where 2-inch and 3-inch pipes span Pauoa Stream in the vicinity of Kahuawai Spring. They are connected to the piping at the abandoned BWS chlorinator station and are a part of the upper Booth Road distribution system. Water flowing down from Booth Spring, which is used to supplement the 578 feed, is added to the system at this point. After the crossing, the combined waters then flow down through a 2-inch pipe that services the upper Booth Road area. The 500 foot section from the chlorinator to the end of the paved portion of Booth Road is made of galvanized iron. The remaining portion of 2-inch pipe is made of copper. There are also 3-inch, 6-inch, and 8-inch distribution lines within the lower parts of Booth Road. Easements in favor of the BWS cover the cross-country main, Booth Spring, and the 2-inch distribution pipe.

The BWS Booth Spring source that supplements the system has a spillway elevation of 709 feet. It consists of a large concrete cistern that partially lies within Pauoa Stream. There is an access hatch with a hinged metal cover and lock on the top of the structure which is level with the west bank of the stream. The cistern has numerous leaks at the concrete joints along its walls.

The abandoned BWS chlorinator station is located approximately 500 feet beyond the end of the paved portion of Booth Road along a gravel roadway which leads to Booth Spring. Situated on a fairly flat area at the top of the east bank of Pauoa Stream, it overlooks Kahuawai Spring which lies directly to the west in a 30 to 40 feet deep gulch.

The station consists of a wooden structure built on a concrete slab on grade. The old bathtub style chlorination equipment has been abandoned in place along with some of the appurtenant water piping. The remaining portions of the piping, the majority of which lies above ground, is still being used to feed the upper Booth Road distribution system. A 6-foot high chain link fence surrounds the building proper.

I. Flood/Tsunami

No flood or tsunami dangers are indicated for the project site.

J. Noise

Undesirable noise levels in Pauoa Valley are minimal and when detectable, are traceable to residential activity. Ambient noises at the project site are predominately those naturally occurring in a forested environment.

K. Air Quality

No monitoring stations exist within close proximity to the project site. The closest monitoring occurs at the Department of Health building on Beretania Street, which is an urban environment quite different from the forested surroundings of the project site. The ambient air quality of the project environment is assumed to be generally pristine and free of particulate and hydrocarbon pollution under normal weather conditions, owing to the absence of possible sources.

SECTION 3

RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

A. Applicable Land Use Controls

The project site is subject to the following land use controls:

- . State Land Use District
- . Oahu General Plan (Development Plan/Zoning)
- . Land Use Ordinance

1. State Land Use District

The State Land Use District designation for the major portion of the site is conservation. It is within the resource subzone of the conservation district. The objective of this subzone is "to ensure sustained use of the natural resources of those areas." The remaining portion covering the 350 feet of replacement piping is designated Urban. State law stipulates that such designated lands shall follow the respective County's Development Plan. However, the basic premise for such lands are that they are in urban use and have the potential for future urbanized growth.

2. Oahu General Plan

The existing Oahu General Plan sets forth policy for the long-range comprehensive physical development of the City and County of Honolulu. All development and land use conforms to the General Plan. The General Plan sets the policy used in preparation of Development Plans.

Development Plans were recently adopted by the City Council. The Plan with direct applicability to the project site is the Primary Urban Center plan, which designates the site as Preservation and Residential. Zoning for the site is P-1 (Preservation) and R-5 (Residential).

3. Land Use Ordinance (LUO)

The Land Use Ordinance is established to implement the provision of the General Plan, Development Plans and Zoning designations. The LUO maintains wells, water reservoirs and water control structures as stipulated by State law are permitted uses in the P-1 district. In addition, pipelines are implied permitted uses in the P-1 district. For the R-5 district, pipelines and booster stations are permitted uses.

SECTION 4

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES

The identification of impacts are distinguishable. Short-term impacts are those primarily related to construction activities. Long-term impacts however, are those which relate to operation of the system. They consist of water withdrawal by the proposed well or the noise associated with the booster pump station.

A. Short-Term Impacts

Potential short-term impacts are those which will result from construction activities at the project site. Sitework, pipeline and reservoir installation, well drilling and equipment traffic can be expected to temporarily disturb the forest environment of the project site and the surrounding residences. However, most of the site is already fairly open due to the previous development of the area, thereby limiting the extent of these impacts.

1. Vegetation

The large rose apple tree in the vicinity of the chlorinator will have to be trimmed back to make room for the drilling rig. However, no trees will have to be cut down. Ground cover that will be removed in the grading process consist mainly of rose apple seedlings, ginger and malayan ground orchid plants.

At the reservoir site, a large mango tree approximately 4 feet in diameter will have to be removed. Its extensive root system would pose a severe hazard to the structural integrity of the reservoir and the influent and effluent piping should it remain. Several other large mango and guava trees will have to be trimmed back, but not removed. Ginger, banana and malayan ground orchid plants will be removed in the grading process.

The area to be cleared for the well and reservoir contains mainly grasses and trees, some of which are larger than 6-inches in diameter. However, none are rare, threatened or endangered. They are fairly common throughout the island and most of them are actually introduced species to the area.

2. Stream

Impacts from the well are being mainly addressed by the various required permits before the CWRM. However, it should be noted the proposed withdrawal will not be any greater than the quantity Booth Spring has produced. Overall therefore, no significant effects on Pauoa Stream in general are expected.

It is anticipated however that Kahuawai Spring may be affected. Because of its proximity to the well's cone of influence, flows may be slightly decreased. This will impact a nearby resident who has diverted water from the spring for agricultural purposes. These impacts will be addressed under the Long-Term Impact Section of this document.

Grading activities will occur for the installation of the pump station, reservoir and pipelines. The movement of soil will expose various areas of the project site to runoff under heavy rains. Furthermore, test pumping of the well will create discharges over several days.

Best Management Practices will be followed to minimize any impacts from storm runoffs and the drilling and test pumping of the well. Storm runoff controls will include berms and swales to retain silt laden on-site runoff. For test pumping procedures, the flow velocities of discharges to Pauoa Stream will be dissipated through a baffle system that will minimize any scouring or erosional effects. Care will also be taken to preclude the possibility of flushing any debris or pollutants into the receiving waters. Furthermore, an attempt will be made to schedule all construction activities for the dry months to minimize the aforementioned impacts.

All site work and grading operations will be performed in compliance with City grading ordinances.

3. Surrounding Urban Environment

The immediate surrounding urban environment consists of approximately 35 residences along the upper portion of Booth Road. Construction-related impacts to these residences will occur primarily as noise and temporary traffic inconveniences.

a. Noise

Noise emanating from construction of the water system improvements are not expected to be acute in the area of the residences.

Noise is expected to be generated during all phases of construction by equipment and project-related truck traffic. Equipment noise will be most pronounced during the early stages of construction; site clearance, grading and well drilling. Conventional construction equipment is expected to be used for all phases of the project.

Construction will occur in phases from which distinct noise impacts may be identified. Initially during sitework, noises can be expected from heavy earthmoving machinery such as bulldozers, scrapers, backhoes, dump trucks and jackhammers. In this period, noise levels could reach about 98 dB(A).

Following sitework, noise from trucks, cement mixers, compressors, and other ancillary equipment can be expected. These noises are generally lower in decibel level and frequency than those during sitework.

In general, construction noise will create only temporary nuisances to residences in the area.

Sufficient distance and muffling of noise provided by the dense forest cover should adequately mitigate any potentially disturbing noises due to construction. Primary mitigation of noise will be to restrict construction activities to normal working hours, and to have the contractor maintain all of his equipment in good working condition.

All construction activities are to be subject to compliance with Public Health Regulations. A noise permit may be required by the Department of Health.

b. Traffic

Potential impacts due to traffic generated by the project include the introduction of slower moving trucks and other equipment, especially along the narrow portion of Booth Road fronting the last residences.

Where appropriate, the Contractor will be expected to publicly notify motorists and residents in the immediate vicinity of the project of pending construction. Warning notices, signs and flagmen may also be necessary.

Pedestrian traffic may also be temporarily diverted at times. Barricades around hazardous areas would be required.

c. Air Quality

Impacts on air quality during the construction phase are expected to be the release of dust and exhaust emissions from equipment.

As with noise, impacts on air quality are construction-related and will be associated with sitework when the heaviest equipment are used. While it is inevitable that some air borne dust will be caused by sitework the project area is usually wet enough to substantially reduce the incidence of fugitive dust. When necessary, wetting of the site can further mitigate this possibility.

Exhaust emissions from equipment can be mitigated to a degree by the proper maintenance of equipment.

4. Socio-Economic Environment

The short-term socio-economic impacts of the project are anticipated to be the positive effects of employment for the local construction industry. The availability of work for the industry would enhance benefits to the local economy, especially during prevailing economic conditions.

Projected costs for the entire project have been estimated at \$710,000, the majority of which can be expected to be spent on local labor, materials, equipment and supplies.

B. Long-Term Impacts

Potential long-term impacts of the project include those which could be expected to affect the visual environment of the project site, and localized outflow conditions in the area of Kahuawai Spring.

Beneficial impacts are expected in the long-term use of the new system to provide the local residences with good quality water.

1. Visual Environment

The long-term effect of the project on the visual environment of the area, will probably be the reservoir's visibility from residential areas which overlook Pauoa Valley. In varying degrees and locations, it is anticipated that the reservoir structure will be visible from points on the east face of Pacific Heights, and on the west face of Tantalus. However, it is expected that the naturally dense forest vegetation that presently covers the site will quickly regenerate itself and mitigate any significantly obtrusive visibility of the reservoir structure. Project improvements are not expected to be visible from Booth Road or Pauoa Valley.

2. Stream Environment

The long-term effects of the project on the stream environment are anticipated to be a consequence of possible reduced flow from Kahuawai Spring when water is pumped to the reservoir. Reductions of flow would be most obvious in dry months when there could be slightly reduced flow in the channel leading to Pauoa Stream.

Where Kahuawai Spring water presently flows across terraces to seep into the stream, there could be remote occasions when little or no flow would allow establishment of vegetation overgrowth into the bed of the channel. In addition, a portion of the Kahuawai overflow is used by a local resident for agricultural purposes. The possibility of reduced flow may preclude growing during the drier months.

A stream flow situation similar to what presently occurs below Booth Spring is also possible, though unlikely, for the channel below Kahuawai Spring. Flow could be intermittent causing stream biota to sustain in smaller pools under dry weather conditions. The snail (Melania mauiensis), crayfish (Procambarus clarki), dojo (Misgurnus auguillicaudatus), and topminnows (Gambusia affinis) were identified in the channel. Their species are not expected to be endangered if they are no longer able to survive under intermittent flow conditions.

To mitigate the situation of possible reduced flow from Kahuawai Spring and its associated impact on the nearby resident using it for agriculture, the BWS proposes several measures. The first would occur prior to and during test pumping of the well. Gaging stations will be set up to measure flows and determine the effects of the well pumpage. If no differences are detected, then no further action will be taken. The key argument here is that with combined flows in excess of 0.35 mgd from Kahuawai and Booth Springs, the expected effect of the well withdrawal of 0.1 mgd will be minimal if not insignificant. The BWS is fairly confident that this will be the situation.

However, if reduced flows are detected, the BWS proposes the following options as mitigative measures. The BWS will try to coordinate the operation time of the well pump so as not to run it for long durations. That is, instead of running the pump for 3 to 4 hours straight, it may operate in sets of 1 hour running with 1 hour or more of down time. Hopefully this will allow the spring to maintain a fairly constant flow that meets the water needs of the resident.

Should the previous option not fully meet the water requirements, another option would be to return pumpage from the well to the channel. This option is in line with the final option of diverting Pauoa Stream water into the channel. Although possible, it is not a likely scenario or very feasible due to the associated restrictive DLNR and DOH permits.

Regardless of the situation however, it must be remembered that the CWRM will have the final decision on the matter. As stated previously under Short-Term Impacts, all impacts will be addressed by the permit on water use currently before them.

3. Surrounding Urban Environment

No long-term effects to the surrounding urban environment are expected.

a. Noise

No noise, significantly adverse to disturb residents is expected to be generated from the normal functioning of the project.

In the case of the booster station option, the booster pumps will be of the submersible type. With the motor and pump assembly sealed in a solid casing below grade under a concrete pad, their operation will be almost silent.

b. Traffic

Traffic generated by the project beyond the construction phase of the project will consist of Board of Water Supply monitoring and maintenance crews. The occurrence of such traffic is expected to be minimal and no adverse impact is anticipated.

c. Air Quality

The proposed project will not introduce any emissions to the ambient air of the project site. The location of the chlorinator and its use of chlorine at the site is not of sufficient quantity to pose a threat of adverse impact on air quality.

4. Socio-Economic Environment

The long-term impacts to the socio-economic environment posed by the project are positive and will extend beyond the localized environment of the immediate project area.

The new water system will provide a critically needed service to the 35 residences along the upper portion of Booth Road. Without this project, they will continue to receive deteriorating quality water until a long-term solution involving massive improvements to the lower 578 system is implemented.

Beyond the immediate project area, the project will assist in the continuing effort of the BWS to supply the City with a consistent supply of pristine water. Growing demands and low rainfall periods recently have emphasized the need to efficiently utilize the island's available water sources. The proposed project represents the recapture of a previously "lost" resource, as both Kahuawai and Booth Springs' waters are now allowed to flow away.

SECTION 5

UNAVOIDABLE ADVERSE EFFECTS

Potentially adverse impacts which would be anticipated include those short and long-term impacts identified in previous Sections. There are, however, reasonable limits to the mitigative measures taken, beyond which impacts become unavoidable and do occur. Such impacts include:

- . Short-term construction impacts
 - noise
 - on-site vehicular traffic
 - introduction of exhaust fumes
 - loss of understory vegetation

- . Long-term impacts
 - possible increased incidence of low flow from Kahuawai Spring, especially during dry periods

Notwithstanding the unavoidable impacts cited above, major items in the consideration to proceed with the project include the positive beneficial impacts and the need for the project.

- . Economic employment benefits during construction
- . Increase in the available supply of potable water
- . Better utilization of a natural resource

SECTION 6

ALTERNATIVES TO THE PROPOSED ACTION

Several alternatives, as detailed in the Introduction, have been explored to resolve the problem. They all have positive and negative aspects which include: surface water influence, stream flow effects, impracticability, excessive costs, inadequacy of the existing system, land acquisition problems or more importantly, taking too long to accomplish. Some of the alternatives may be part of a long-term solution. However, the emergency nature dictated by the rapidly deteriorating condition of the existing water system requires immediate action.

Realistically, the proposed installation of a new small system has been determined to be the most practical solution to resolve the situation. Either the well system or booster station option will achieve the results in the shortest possible time with the highest confidence in a workable solution.

SECTION 7

LONG-TERM PRODUCTIVITY VRS. SHORT-TERM USES

The uses to which long-term productivity can be measured against short-term use of the site lies in its utility as a vital resource. In the short-term, the construction impacts and possible reduced flows from Kahuawai Spring are to be considered. Alternatively the long-term productivity and benefits of a consistent, high quality water supply must be recognized.

As a resource, in the short-term and undeveloped state, the water and its inherent value is lost. Developed, the site becomes valuable.

SECTION 8

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The commitment of labor, fuel and materials to the construction of proposed improvements will be permanent. Materials are irretrievable only to the extent that for reasons of economics, deterioration or adaptability, they could not be used again.

Commitment of the site and water production from the project are not irreversible. The on-site improvements could be removed and reforestation would occur rapidly with the site returning to its natural pre-project state. Water is a fairly renewable resource.

SECTION 9

DETERMINATION

In accordance with Chapter 343, HRS, it has been determined that an Environmental Impact Statement is not required for the proposed Booth Road Water System Improvements project. This determination has been made based primarily on the minimal impacts on the environment. There will be some negative impacts, but these can be minimized or alleviated by the suggested mitigative measures. The identified impacts have been determined to be insignificant in comparison to the critically needed benefits to be provided by the new water system.

Therefore, a Negative Declaration is declared for the proposed project.

SECTION 10

LIST OF NECESSARY APPROVALS

The following reviews, approvals or permits are required for construction:

1. Building Permit - Building Department, City and County of Honolulu.
2. Grading Permit - Department of Public Works, City and County of Honolulu.
3. Approval - Department of Transportation Services (Traffic Division), City and County of Honolulu.
4. Conservation District Use Permit - Department of Land and Natural Resources, State of Hawaii.
5. Well Construction, Pump Installation and Water Use Permits - Department of Land and Natural Resources (Commission on Water Resource Management), State of Hawaii.
6. Noise Permit - Department of Health, State of Hawaii.

SECTION 11

BIBLIOGRAPHY

Timbol, A. S., and J. A. Maciolek. 1978. Stream channel modification in Hawaii. Part A: Statewide inventory of streams, habitat factors and associated biota. Office of Biological Services, Fish and Wildlife Service, U.S. Dept. Int, FWS/OBS-78/16, 158 p.

Wentworth, C. K. 1941. Geology and groundwater resources of the Nuuanu-Pauoa District. Board of Water Supply, Honolulu. Unpubl. ms. 223 p.

APPENDIX A

COMMENTS AND RESPONSES ON DRAFT ENVIRONMENTAL ASSESSMENT

Consulted Parties

State of Hawaii

Department of Land and Natural Resources

Department of Health

Office of Environmental Quality Control

City and County of Honolulu

Department of Land Utilization

Planning Department

Department of Public Works

Others

Senate District 13 legislator, Senator Rod Tam*

Nuuanu-Punchbowl Neighborhood Board No. 12*

* No Comments Received

BENJAMIN J. CAYETANO
Governor of Hawaii

NOV 23 1 5 11 PM '95



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. Box 621
Honolulu, Hawaii 96809

950564

Chairperson
MICHAEL D. WILSON
Board of Land and Natural Resources

Deputy Director
GILBERT COLOMA-AGARAN

Aquaculture Development
Aquatic Resources
Boating and Ocean Recreation
Bureau of Conveyances
Conservation and Environmental Affairs
Conservation and Resources Enforcement
Forestry and Wildlife
Historic Preservation
Land Management
State Parks
Water and Land Development

FILE NO.: OA-2781

NOV 16 1995

PE

Honorable Raymond H. Sato
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Sato:

SUBJECT: Comments Received During the 30-Day Public Review
Period - Draft Environmental Assessment for the Booth
Road Water System Improvements Project, Pauoa, Oahu,
TMK: 2-2-41: 01, 03 and 2-2-39: por. 07

Please review the attached agency comments and include them in
the Final Environmental Assessment for this project.

Thank you for your cooperation in this matter. Please call Sam
Lemmo at our Office of Conservation and Environmental Affairs at
587-0377, should you have any questions.

Aloha,

Gilbert S. Coloma-Agaran
for MICHAEL D. WILSON

xc: OEQC

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Commission on Water Resource Management
Honolulu, Hawaii

AUG 31 1995

TO: Mr. Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

FROM: Rae M. Loui, Deputy Director *Rae M. Loui*
Commission on Water Resource Management

SUBJECT: CDUA Well and Appurtenant Facilities for Booth Springs Road
Water System Replacement

FILE NO.: OA-2781

AUG 31 1995
54

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

- We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.
- We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- A Well Construction Permit and a Pump Installation Permit from the Commission on Water Resource Management would be required before ground water is developed as a source of supply for the project.
- The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the CWRM would be required prior to use of this source.

7386

Memo to Mr. Roger Evans

Page 2

AUG 3 | 1995

- Groundwater withdrawals from this project may that affect streamflows. This may require an instream flow standard amendment.
- We recommend that no development take place affecting highly erodable slopes which drain into streams within or adjacent to the project.
- If the proposed project diverts additional water from streams or if new or modified stream diversions are planned, the project may need to obtain a stream diversion works permit and petition to amend the interim instream flow standard for the affected stream(s).
- Based on the information provided, it appears that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.
- Based on the information provided, it does not appear that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.
- An amendment to the instream flow standard from the CWRM would be required before any streamwater is diverted.
- OTHER:

We are currently processing Well Construction, Pump Installation, and Water Use Permits for the above well. We have no provisions in our administrative rules for emergency type wells but are processing them expeditiously as possible.

If the emergency well turns out to be a permanent solution, then we recommend its inclusion into the Oahu Water Management Plan.

If there are any questions, please contact Roy Hardy at 587-0274.

oaca
BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



LAWRENCE MIIKE
DIRECTOR OF HEALTH

RECEIVED
'95 AUG 30 PM 4:28

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to

DEPT
OCEA

August 22, 1995

95-144/epo

TO: The Honorable Michael Wilson, Chairperson
Department of Land and Natural Sources

FROM: Lawrence Miike *Lawrence Miike*
Director of Health

SUBJECT: CONSERVATION DISTRICT USE APPLICATION

Applicant: City and County Board of Water Supply
File No.: OA 2781
Request: Construction of Well and Appurtenant
Facilities for the Booth Springs Road
Water System Replacement
Location: Pauoa Valley, Honolulu
TMK: 2-2-41:01 and 03

Thank you for the opportunity to review and comment on the subject application. Although we do not have any objections to this Conservation District Use Application (CDUA), we would like to offer the following comments:

1. The CDUA indicates that the project will include the development of a new source of potable water (Pauoa Well, State Well No. 2049-01). Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Relating to Potable Water Systems," requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements in section 11-20-29.
2. The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses, performed by a laboratory certified in the State of Hawaii, must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional tests may be required by the Director upon his review of the information submitted.

SL
735

The Honorable Michael Wilson
August 22, 1995
Page 2

3. The CDUA indicates that the shallow well will be approximately 100 feet deep and solid cased to at least 50 feet. It also notes that the well will attempt to tap into the same perched groundwater that feeds both Booth and Kahuawai Springs. Since Booth Springs was noted by the Board of Water Supply as being under the influence of surface water, microscopic particulate analyses must also be performed on the Pauca Well and submitted as part of the engineering report's water quality data.

If you should have any questions, please contact the Safe Drinking Water Branch at 586-4258.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

August 16, 1995

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT
PROGRAM

AQUATIC RESOURCES
CONSERVATION AND

ENVIRONMENTAL AFFAIRS
CONSERVATION AND
RESOURCES ENFORCEMENT

CONVEYANCES

FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MEMORANDUM

LOG NO: 14995 ✓
DOC NO: 9508EJ14

TO: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

FROM: Don Hibbard, Administrator
Historic Preservation Division

SUBJECT: Construction of Well and Appurtenant Facilities for the Booth Springs
Road Water System Replacement, Pauoa Valley, O'ahu (File No. OA-
2781)
Pauoa, Kona, O'ahu
TMK: 2-2-41:001 & 003; 2-2-39; por. 7

A review of our records shows that there are no known historic sites at the project location. However, since no archaeological survey has been conducted it is uncertain if historic sites are present. An archaeological inventory survey conducted approximately one-half mile toward the mouth of the valley from the project area located two agricultural complexes including terraces and 'auwai related to prehistoric cultivation which have been utilized and modified in more recent historic times. The project proposes drilling of a shallow well, construction of a small steel tank and control house and installation of 4-inch influent and 2-1/2 inch effluent lines connecting the well, reservoir and existing system. The area has been previously developed by the existing Board of Water Supply facilities and it is unlikely that historic sites remain in the area of the proposed well and reservoir. Also, installation of the piping will be in the existing gravel road and requires minimal trenching. Therefore, we believe this action will have "no effect" on historic sites.

It is possible that historic sites, including human burials, will be uncovered during routine construction activities. Should this be the case all work in the vicinity must stop and the Historic Preservation Division must be contacted at 587-0047.

EJ:jk

2257

SUSPENSE DATE: 8/9/95

STATE OF HAWAII
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

MEMORANDUM

TO: William Devick, Aquatic Res. & Env. Protection *HP*
FROM: Annette Tagawa, Aquatic Biologist
SUBJECT: Comments Conservation District Use Application
Comments Roger Evans, Office of Conservation
Requested By Environmental Affairs
Date of Request 7/28/94 Date Received 7/31/94

Summary of Project

Title: Construction of Well and Appurtenant Facilities for the Booth Springs Road Water System Replacement

Project By: City and County of Honolulu Board of Water Supply

Location: Pauoa Valley, Honolulu, Oahu TMK: 2-2-41: 01 & 03, 2-2-39: por. 7 (Lot B-2)

Brief Description:

In response to complaints of dirty water from residents in the area, the applicant proposes to replace the existing water system that currently provides water service to the upper Booth Road area with a new small system. This project will entail the drilling of a shallow well and construction of a small steel tank and control house. It would also require the installation of 4-inch influent and 2 1/2-inch effluent lines connecting the well, reservoir, and existing distribution systems. The new system would be constructed on the eastern side of Pauoa Valley on BWS and State properties.

Comments:

The proposed project is not expected to have significant adverse impact on aquatic resource values in the area. However, Pauoa Stream (a tributary of the Nuuanu Stream

system) is adjacent to the project site and harbors a number of aquatic species. In addition to the exotic species normally found in the stream, a few native freshwater species are found in certain areas of the stream system. Construction activities could have short term impacts on aquatic resources such as temporary turbidity, biota displacement and disturbance. In this regard, we suggest the following mitigation measures as conditions to limit or prevent excessive potential adverse impact to aquatic resources during construction:

- 1) site work should be scheduled for periods of minimal rainfall;
- 2) lands denuded of vegetation should be replanted or covered as quickly as possible to control erosion; and
- 3) construction materials, petroleum products and landscaping products should be prevented from falling, blowing, or leaching into the aquatic environment.

Division of Forestry & Wildlife

1151 Punchbowl Street, Rm. 325 • Honolulu, HI 96813 • (808) 587-0166 • Fax (808) 587-0160

July 31, 1995

195 AUG 10 10:34 AM
OCEA
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MEMORANDUM

TO: Roger C. Evans, OCEA

FROM: Michael G. Buck, Administrator *MGB* *SL*

SUBJECT: Construction of Well and Appurtenant Facilities for the Booth Springs Road Water System Replacement

We have reviewed File No. OA-2781 and have the following comments:

- (1) The proposed subject matter is consistent with the requirements of the "R" subzone of the Conservation District.
- (2) Since this is an emergency situation where water quality is being severely compromised by its users, it behooves all permit processors to approve the subject matter.
- (3) The approval of the subject matter, however, does not exempt the applicant from following all county, state, and federal regulations in regard to achieving the objectives of the Clean Water Act.
- (4) The applicant mentioned the use of Best Management Practices in minimizing any impacts from storm runoffs and the drilling and test pumping of the well. It is highly recommended that Best Management Practices be used to minimize any runoff impacts in adjacent streams as well as in the the nearby subdivision.
- (5) Material and debris generated by the construction of the well must be removed immediately after completion.
- (6) A fire contingency plan must be submitted and approved by this office PRIOR to any construction.
- (7) The Division of Forestry and Wildlife must be notified of the starting and completion dates of the project.

cc: Oahu Branch

506

December 7, 1995

Mr. Michael D. Wilson, Chairperson
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Your Letter of November 16, 1995 on the Conservation District Use Application (CDUA) for the Booth Road Water System Improvements Project, File No.: OA-2781, Pauoa, Oahu, TMK: 2-2-41: 01, 03 and 2-2-39: Portion 07

Thank you for reviewing the CDUA for our proposed project. We provide the following responses to the various comments received:

1. We have decided to boost water from our existing system serving the lower Pauoa Valley area instead of pursuing the well project. The booster station alternative may require additional water system improvements but it appears to be a more feasible option at this time.
2. The proposed booster station site is within the Urban District on the south portion of TMK: 2-2-40: 05. The revised plan is to delete the proposed 24-inch pipeline and construct only one 4-inch pipeline in the Conservation District in addition to the 18,000 gallon steel reservoir. We request that the CDUA be amended because the proposed scope is being reduced from the initial submittal.

Commission on Water Resource Management (CWRM)

1. The project will be coordinated with the City Planning Department to include it in all applicable Development Plans.
2. Since the well is no longer the preferred alternative, comments on the well are no longer applicable.

Department of Health

Safe Drinking Water requirements for the well are no longer applicable.

Historic Preservation Division

If any archaeological or historic features are uncovered during construction, all work in the vicinity will be stopped and the Historic Preservation Division will be notified.

Division of Aquatic Resources

1. We will try to schedule construction activities during the drier months to prevent adverse impacts from runoff to the stream.

Mr. Michael D. Wilson
Page 2
December 7, 1995

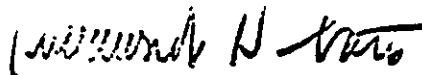
2. An erosion control plan will be included as part of our Best Management Practices. The plan will provide for swales, berms and revegetation as applicable for the situation, as soon as practical.
3. Best Management Practices will be followed to prevent contaminants from entering the stream.

Division of Forestry and Wildlife

1. We acknowledge that the proposed project is consistent with the requirements of the "R" subzone of the Conservation District.
2. Best Management Practices will be implemented to minimize runoff impacts associated with construction of the project.
3. A fire contingency plan will be submitted to your office for approval prior to any construction.
4. We will notify your office of the project's starting and completion dates.

We will transmit the Final Environmental Assessment by mid-December. Upon completion, construction plans will be submitted for your review and approval. If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,



RAYMOND H. SATO
Manager and Chief Engineer

cc: Department of Land and Natural Resources
(Commission on Water Resource Management)
(State Historic Preservation Division)
(Aquatic Resources Division)
(Division of Forestry and Wildlife)
Department of Health

RMA/SM/BU:rk
cc: R. Sato
Community Relations
Field Operations
Plant Operations
Engineering (Design A)
E. Kawata
C. Lao
B. Usagawa

PLN-177, 178, 179, 180, 181/95, 95-3564

953324

BENJAMIN J. CAYETANO
GOVERNOR

RECEIVED
OFFICE OF WATER

Oct 30 1 04 PM '95



GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4186
FACSIMILE (808) 586-2463

October 25, 1995

OCT 30 1995

PE
CC: Mgr
Def

Please return reply for
Manager's signature by
November 13. Thank
you

Mr. Raymond Sato
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Sato,

Subject: Draft Environmental Assessment for the Booth Road Water
System Improvements

Thank you for the opportunity to review the subject document. We
have the following comments.

1. What is the sustainable yield for the perched groundwater from which the water will be withdrawn?
2. What are the existing uses of Booth and Kahuawai Springs? What is the water quantity breakdown of the different uses?
3. A portion of the flow from Kahuawai Spring has been diverted by nearby residents for agriculture purposes. What right or permit do the residents have to use this water?
4. The draft environmental assessment describes impacts to Kahuawai Spring and suggest some mitigation measures. Booth Spring is also fed by the same water. How would this project impact Booth Spring?
5. Would this system supply water to any undeveloped parcels or projects in this area? If so, please provide a list of undeveloped parcels or projects that would draw upon this water supply?
6. The reservoir will be placed on a soil type that is susceptible to erosion. What measures are proposed to reduce the impacts of land movements from endangering the stability of the reservoir.

Mr. Sato
October 25, 1995
Page 2

7. The alternative of expanding the existing 578 system to provide water to this area was considered but not pursued because of land acquisition problems and inadequacies of the 578 system. What are the land acquisition problems and inadequacies of the 578 system?

If you have any questions, please call Jeyan Thirugnanam at 586-4185. Mahalo.

Sincerely,



Gary Gill
Director

November 20, 1995

Mr. Gary Gill, Director
Office of Environmental Quality Control
State of Hawaii
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Your Letter of October 25, 1995 on the Draft Environmental Assessment (DEA) for the Proposed Booth Road Water System Improvements Project

Thank you for reviewing the DEA for the proposed Booth Road water system improvements project.

We provide the following responses to your inquiries:

1. We will be able to determine the sustainable yield for the perched groundwater after test pumping of the exploratory well.
2. See attached "Hydrogeologic Fact Sheet for Pauoa Valley" for the breakdown of existing uses.
3. The residents' right to use Kahuawai Spring is addressed in the State Water Code under existing use, where new water use cannot affect existing water use, as determined by the State Water Commission.
4. The proposed withdrawal will not be any greater than the quantity Booth Spring has previously produced. The proposed project should be considered as a replacement for Booth Spring which previously provided water to upper Booth Road.
5. The water system improvements would not supply water to any undeveloped parcels or projects in the area. The water system will provide water service only to the existing water users in upper Booth Road.
6. Erosion concerns will be addressed in the grading plan that will be submitted

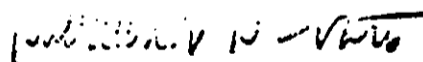
Mr. Gary Gill
Page 2
November 20, 1995

6. Erosion concerns will be addressed in the grading plan that will be submitted to the City Department of Public Works. The concrete reservoir foundation will be constructed on three feet of structural fill. We will construct the reservoir and foundation for seismic zone III.
7. The land acquisition problems mentioned in the DEA are associated with the difficulties in negotiating with the owners of a church property. Initially, the church was reluctant to lease or sell a portion of their property to the Board of Water Supply. Since condemnation would be a lengthy process, this route was not pursued. An alternative site at a private residence is currently being evaluated. We have also reopened negotiations with the church.

The inadequacies of the 578 system include the difficulty of boosting water from the highest services of the 578 system to upper Booth Road. This may create low pressure and flow problems to the highest services of the 578 system because of the quantity of water (25 to 100 gpm) that need to be boosted. Therefore, these services may need to be transferred to the upper Booth Road system if a booster station is installed.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,



RAYMOND H. SATO
Manager and Chief Engineer

Attachment

SM:js

cc: R. Sato
✓ B. Usagawa

95-3324

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU 953464
850 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

Nov 9 10 32 AM '95



JEREMY HARRIS
MAYOR

PATRICK T. ONISHI
DIRECTOR

LORETTA K.C. CHEE
DEPUTY DIRECTOR

95-07112 (ASK)

November 8, 1995

NOV 9 7 14 PM '95

MEMORANDUM

TO: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: PATRICK T. ONISHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

SUBJECT: SPECIAL MANAGEMENT AREA REVIEW - BOOTH ROAD WATER SYSTEM
IMPROVEMENTS PROJECT

Tax Map Keys : 2-2-41: 01, 03 and 2-2-39: por. 07
Type of Project: Water System Improvement Project

The proposed project on the referenced tax map keys has been reviewed. We find that it:

- Is not within the Special Management Area.
- Is within the Special Management Area, but is not defined as "development" and is therefore, exempt (Section 25-1.3 [2][], Chapter 25, Revised Ordinances of Honolulu).

Should you have any questions, please contact the Environmental Review Branch at 523-4077.

PATRICK T. ONISHI
Director of Land Utilization

PTO:am

g:9507112.ank

November 22, 1995

TO: PATRICK T. ONISHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY *Raymond H. Sato*

SUBJECT: YOUR MEMORANDUM OF NOVEMBER 8, 1995 REGARDING THE DRAFT
ENVIRONMENTAL ASSESSMENT (DEA) FOR THE PROPOSED BOOTH
ROAD WATER SYSTEM IMPROVEMENTS PROJECT, PAUOA, OAHU,
TMK: 2-2-41: 01, 03 AND 2-2-39: PORTION 07

Thank you for reviewing the DEA for the proposed Booth Road water system improvements project.

We acknowledge that the proposed project is not within the Special Management area.

If you have any questions, please contact Barry Usagawa at 527-5235.

SM:js
cc: R. Sato
B. Usagawa

95-3464

953498

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BD OF WATER SUPPLY

PLANNING DEPARTMENT

CITY AND COUNTY OF HONOLULU

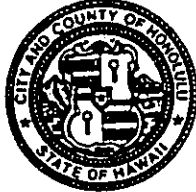
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

Mgr FZ
Depl
PE

NOV 15 1995

Nov 14 1 03 PM '95

JEREMY HARRIS
MAYOR



CHERYL D. SOON
CHIEF PLANNING OFFICER
CAROLL TAKAHASHI
DEPUTY CHIEF PLANNING OFFICER

ET 10/95-2071

November 9, 1995

MEMORANDUM

TO: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: CHERYL D. SOON, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED
BOOTH ROAD WATER SYSTEM IMPROVEMENTS PROJECT

This is in response to your memorandum dated October 5, 1995. We have reviewed the Draft Environmental Assessment for the subject project and have the following comments to offer:

- We have no objections to the proposed shallow well, 20,000 gallon steel tank, 2-1/2 and 4-inch water lines, and control house improvements to replace the water system that currently serves the upper Booth Road area. The existing system which is old and deteriorating may be the cause of the dirty water in the system.
- The proposed improvements are consistent with the following City and County of Honolulu General Plan policy:

Transportation and Utilities, Objective C, Policy 2

"Provide improvements to utilities in existing neighborhoods to reduce substandard conditions."

Thank you for the opportunity to comment. Should you have any questions, please contact Eugene Takahashi of our staff at 527-6022.

Cheryl D. Soon
CHERYL D. SOON
Chief Planning Officer

CDS:lh

cc: OEQC

J

December 4, 1995

TO: CHERYL D. SOON, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

FROM: ~~For~~ *Raymond H. Sato*
RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF NOVEMBER 9, 1995 ON THE DRAFT
ENVIRONMENTAL ASSESSMENT (DEA) FOR THE PROPOSED BOOTH
ROAD WATER SYSTEM IMPROVEMENTS PROJECT, PAUOA, OAHU,
TMK: 2-2-41: 1, 3, AND 2-2-39: POR. 7

Thank you for your review and comments on the DEA for our proposed project.

We note that you have no objections to the project and that it is consistent with the Honolulu General Plan.

If you have any questions, please contact Barry Usagawa at 527-5235.

RMA:do
cc: R. Sato
Engineering (Design A)
B. Usagawa

95-3498

9
BOARD OF WATER

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

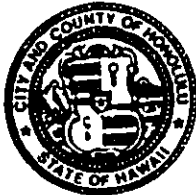
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

953194

PE

OCT 17 2 35 PM '95

JEREMY HARRIS
MAYOR



KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

DARWIN J. HAMAMOTO
DEPUTY DIRECTOR

ENV 95-284

October 16, 1995

MEMORANDUM:

TO: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: *Ken* KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER *Alex Ho*

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
BOOTH ROAD WATER SYSTEM IMPROVEMENT PROJECT
TMK: 2-2-41: 01, 03 AND 2-2-39: POR. 07

We have reviewed the subject DEA and have the following comments:


1. Page 5 - Pipeline
 - a. Please provide typical section of the pipeline.
 - b. It appears from the discussion on Page 2 and the preliminary construction plans that there is a gravel road in which the entire proposed pipeline will essentially follow. If this is the case, please provide description and indicate the limit of the existing gravel road on the preliminary construction plans.
2. Page 19 - Stream
 - a. The DEA should address approximate volume of discharge expected from test pumping.
 - b. Is it practical to include on-site retention of the discharge as part of the proposed BMPs?

Should you have any questions, please contact Mr. Alex Ho,
Environmental Engineer, at Local 4150.

Ken

October 27, 1995

TO: KENNETH E. SPRAGUE, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: For RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY 

SUBJECT: YOUR MEMORANDUM OF OCTOBER 16, 1995 REGARDING THE DRAFT
ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED BOOTH ROAD
WATER SYSTEM IMPROVEMENTS PROJECT, PAUOA, OAHU, TMK: 2-2-41: 01,
03 AND 2-2-39: PORTION 07

Thank you for reviewing the Draft EA for the proposed Booth Road water system improvements project. We have the following responses to your concerns:

1. The pipeline will be installed in accordance to Board of Water Supply standards. Enclosed is our standard detail 123 which depicts the typical cross-section of the pipeline.
2. The access road is described on 12 and 13 of the Draft EA and is indicated on Figures 1, 3, and 6. The final construction plans will indicate the limits of the access road.
3. The test pumping rates will range from 50 to 150 gpm. A discussion on the test pumping procedures will be included in the Final EA.
4. Best management practices will be implemented during the test pumping of the exploratory well to minimize potential pollution of receiving waters. Care will be taken in the disposal of the test water to preclude the possibility of flushing debris into Pauoa Stream. Flow velocities will be dissipated to reduce any scouring effects.

If you have any questions, please contact Barry Usagawa at 527-5235.

Enclosure

RMA/SM:rk

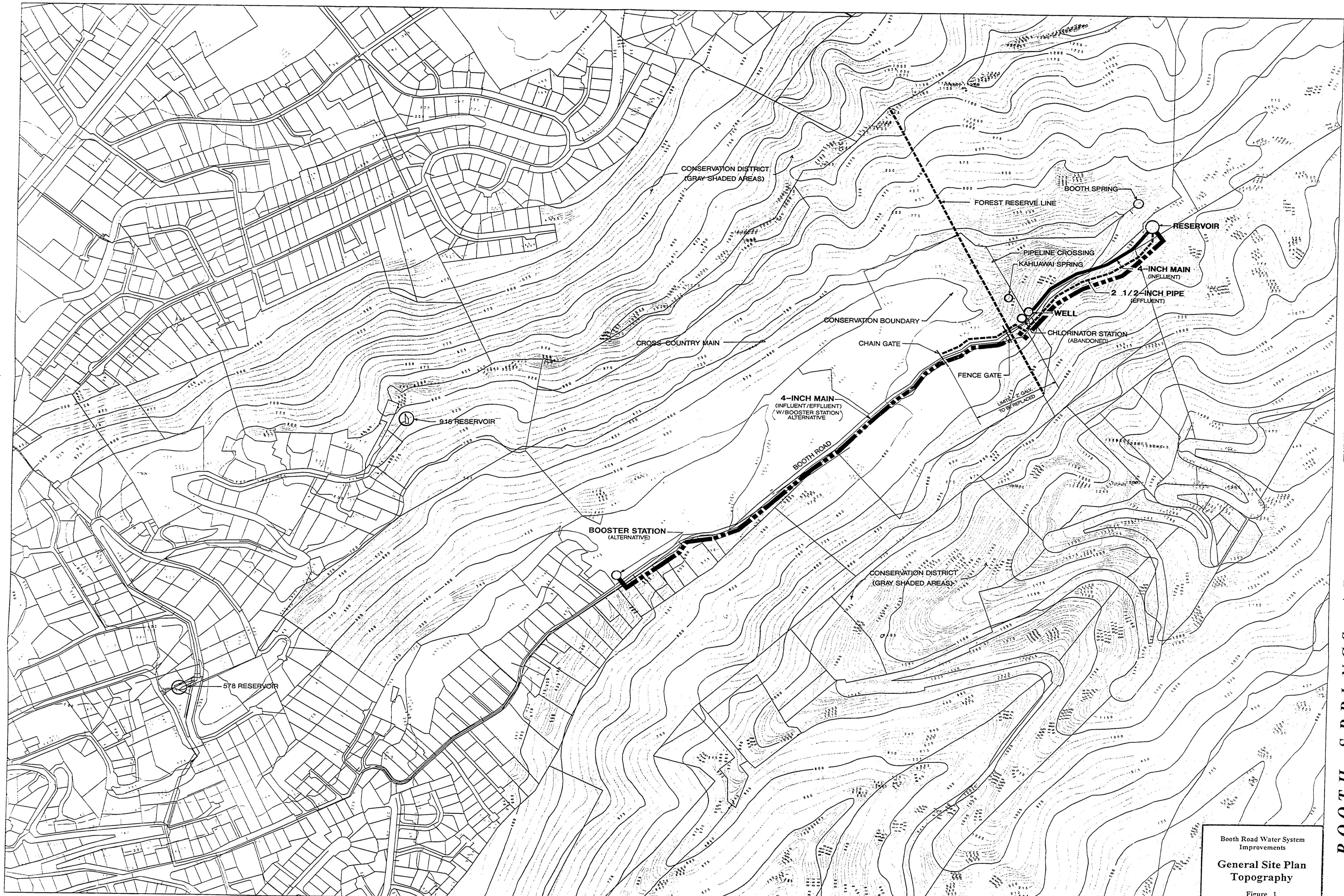
cc: R. Sato
Engineering
✓ B. Usagawa

95-3194

**OVERSIZED
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**PLEASE SEE
35MM ROLL**

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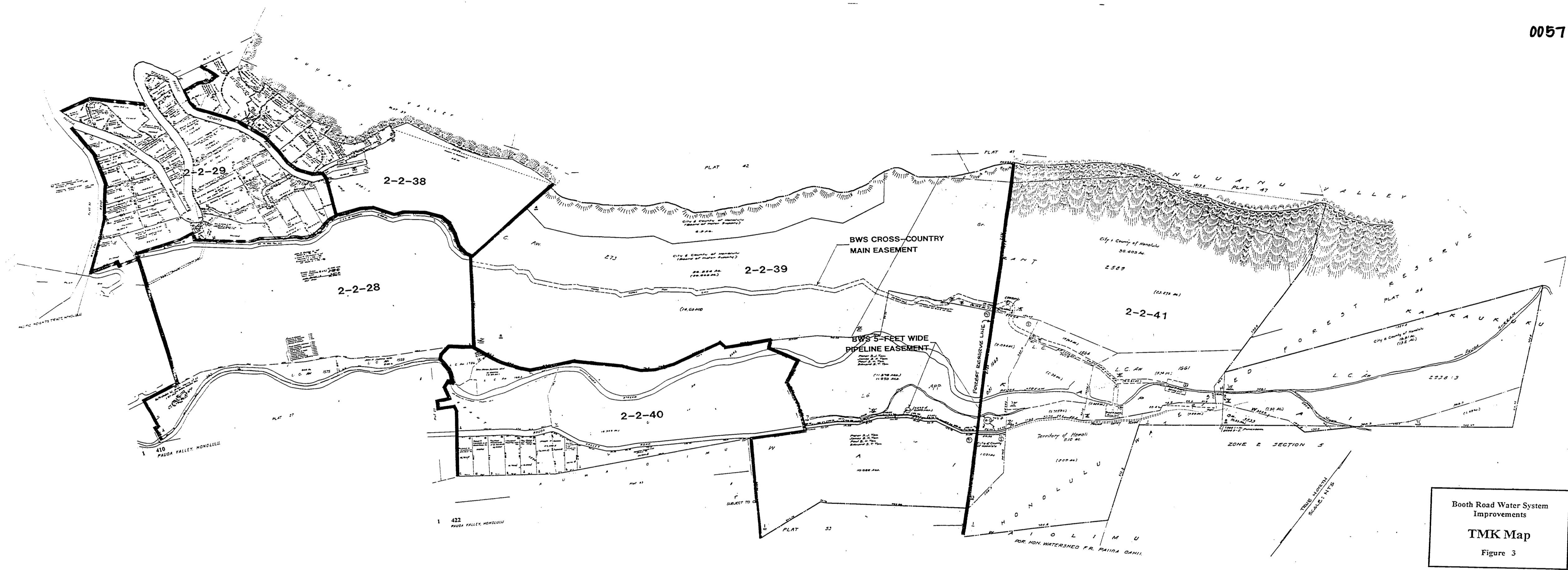
BOOTH SPRINGS AREA
 TRUE NORTH
 SCALE: 1" = 200'

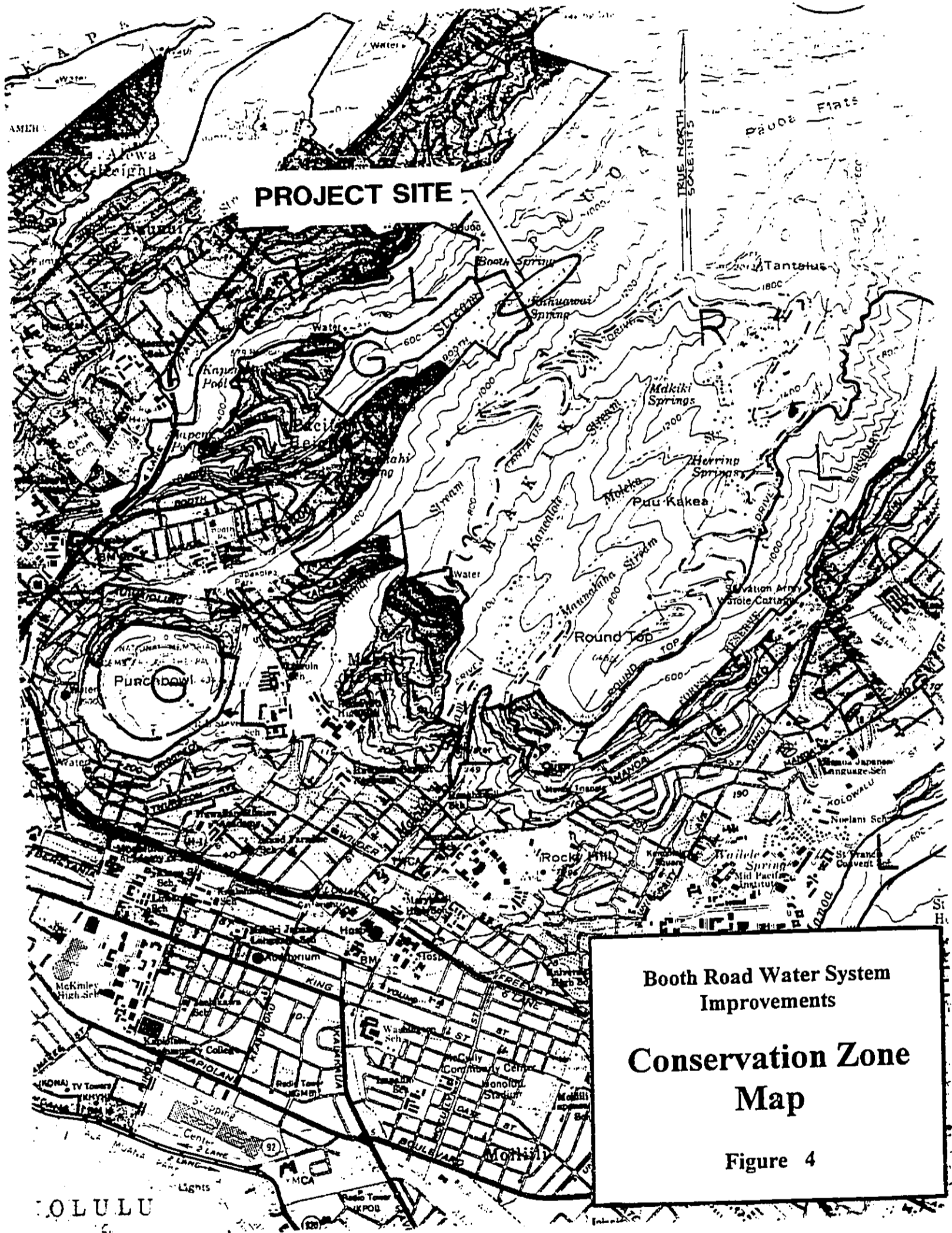
Booth Road Water System
 Improvements
**General Site Plan
 Topography**
 Figure 1

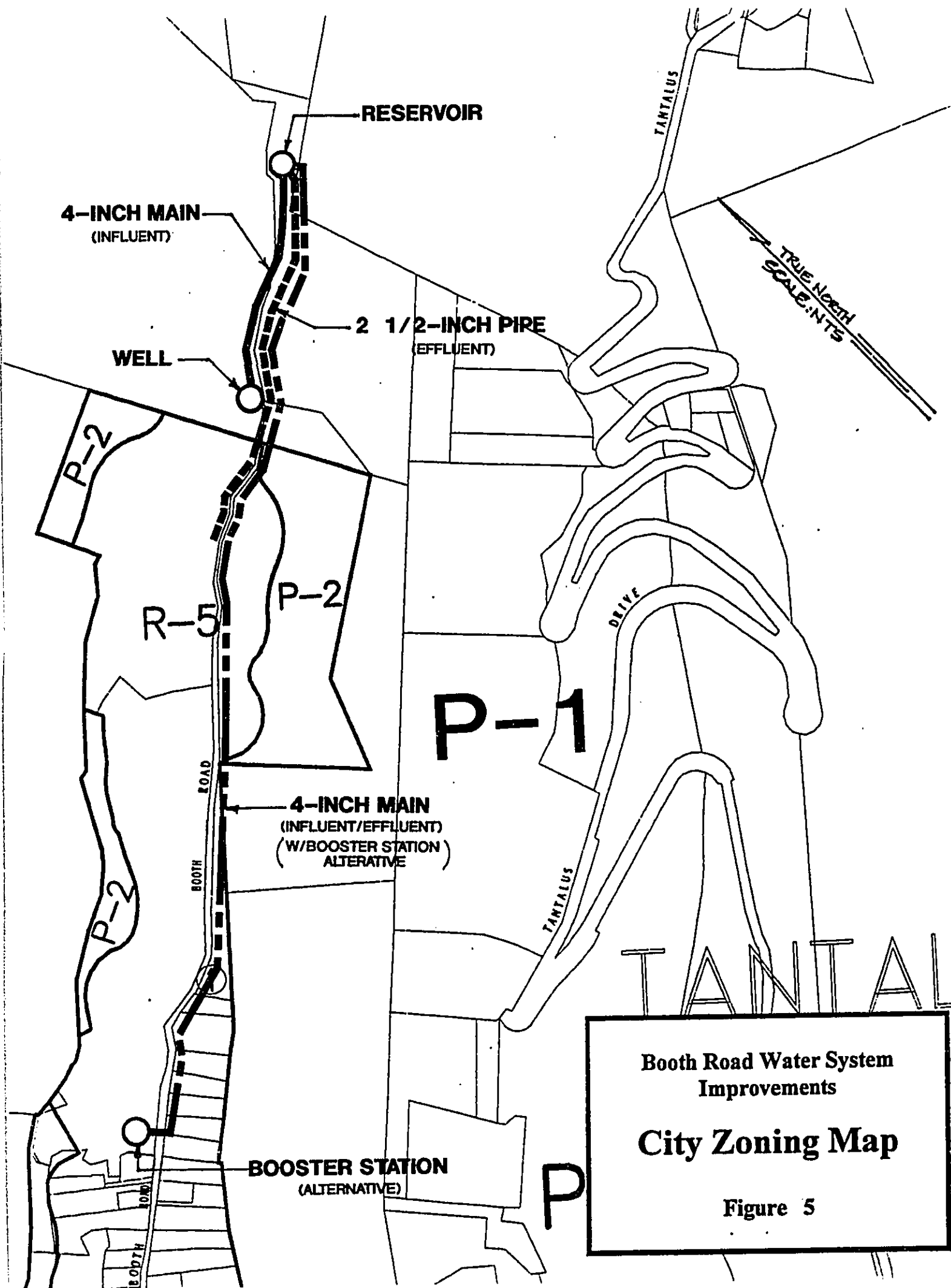
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**PLEASE SEE
35MM ROLL**

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Booth Road Water System
Improvements

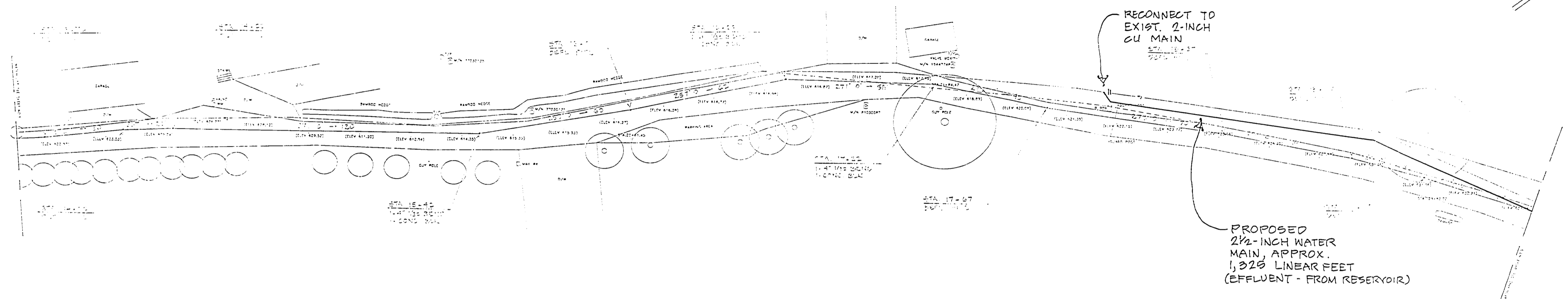
City Zoning Map

Figure 5

**OVERSIZED
DRAWING/MAP**

**PLEASE SEE
35MM ROLL**

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Booth Road Water System
Improvements
**Preliminary
Construction Plans**
Figure 6
Sheet 1 of 3

BOARD OF WATER SUPPLY

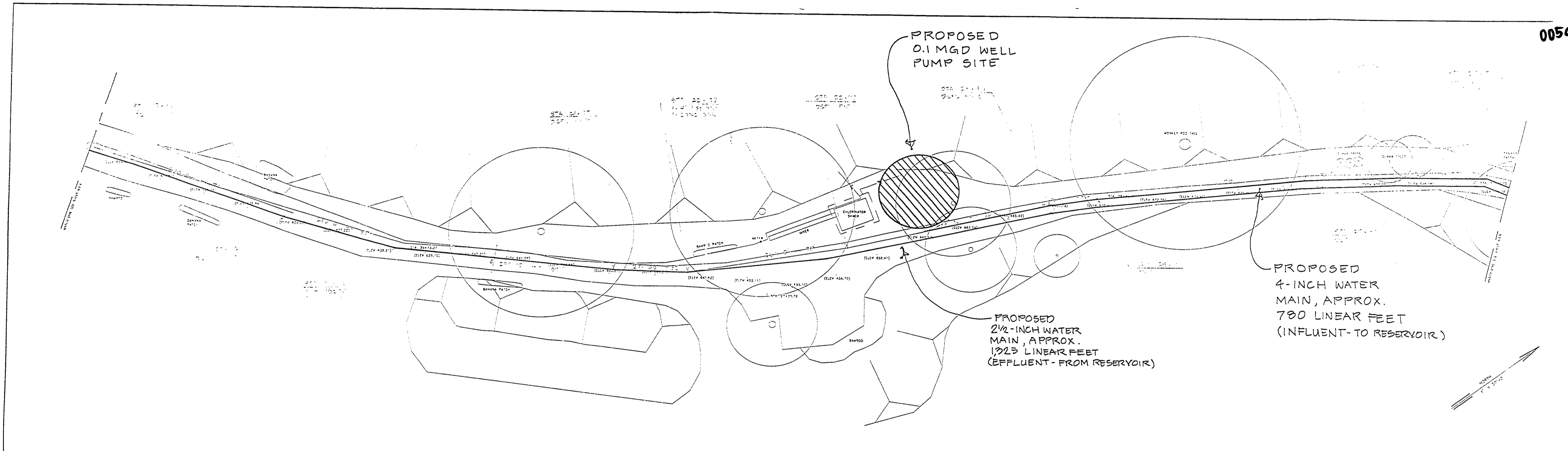
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DATE: _____

DESIGNED BY: _____
CHECKED BY: _____

**OVERSIZED
DRAWING/MAP**

**PLEASE SEE
35MM ROLL**

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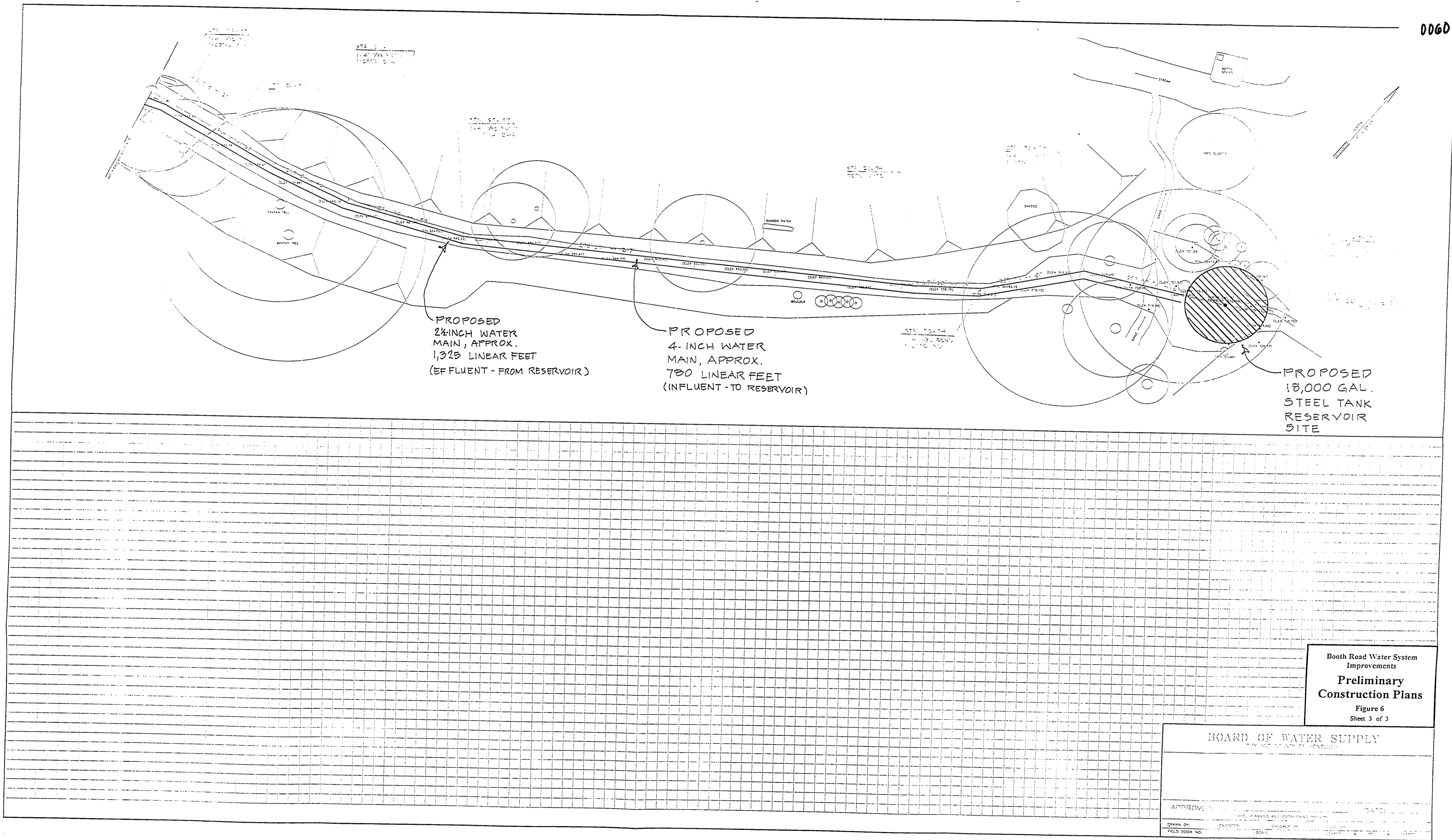


Booth Road Water System Improvements	
Preliminary Construction Plans	
Figure 6	
Sheet 2 of 3	
BOARD OF WATER SUPPLY	
CITY AND TOWN OF COVINGTON	
APPROVED: _____	DATE: _____
DESIGNED BY: _____	CHECKED BY: _____
DRAWN BY: _____	SCALE: _____
FIELD WORK BY: _____	DATE: _____

**OVERSIZED
DRAWING/MAP**

**PLEASE SEE
35MM ROLL**

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Booth Road Water System
Improvements
**Preliminary
Construction Plans**
Figure 6
Sheet 3 of 3

BOARD OF WATER SUPPLY	
APPROVED: _____	DATE: _____
Drawn by: _____	Checked by: _____
Field Book No. _____	Scale: _____