MANENGON · HILLS

ENVIRONMENTAL ASSESSMENT

MANENGON · HILLS

MUNICIPALITY OF YONA, GUAM

ENVIRONMENTAL ASSESSMENT

LSA
MAY
1990

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS

ENVIRONMENTAL ASSESSMENT
PUBLIC INTEREST REVIEW

MANENGON HILLS DAM

APPLICATION NO. _____

APPLICANT: Miyama Guam, Inc.
Union Bank, Suite 216
194 Herman Cortes Avenue
Agana, Guam 96910

_____ Date

LSA Associates, Inc.
157 Park Place
Pt. Richmond, CA 94801

Reviewed By:

_____ Date

Regulatory Branch

Approved by:

_____ Date

Regulatory Branch
Chief,

I. INTRODUCTION

This document constitutes the Environmental Assessment (EA), Statement of Findings and Compliance Determination according to the 404(b)(1) guidelines for the proposed project (applicants' preferred alternative) as described herein. The primary focus of this EA is the impact analysis of a proposed dam and reservoir facility.

II. PROPOSED PROJECT

The principal activity requiring discharge into waters of the United States (Guam) is the construction of a dam. The water that will be impounded by this facility will be used to irrigate approximately 589 acres of golf courses and other landscaped areas included in the Manengon Hills Resort Development. Approximately 1151 acre feet of water is required for the irrigation of the 589 acres.

The project site occupies approximately 40 acres within the Manengon Hills Resort Development site in the Majulosa and Manengon areas in the Municipality of Yona, Guam. As shown in Figures 1 and 2, the site is in the southern half of the island, 1.4 miles due west of Yona Village proper, and approximately 8.4 miles by road from Agana. The site is presently vacant land. The physical character of the site is varied. Much of the site consists of gradual rolling hills.

The principal activity requiring discharge into waters of the United States is the construction of a dam. The water impounded by the facility will be used to irrigate approximately 589 acres of golf courses and other landscaped areas included in the Manengon Hills Resort Development. An approximate 125-foot-high dam will be constructed at the headwaters of the Manengon River, about 0.6 miles upstream from the confluence with the Ylig River, in the southeast corner of the Manengon Hills development project site (see Figures 2 and 3).

The dam will provide storage for approximately 1,023 acre feet of water, with a reservoir surface area of approximately 33.75 acres, and will have crest length of about 570 feet. The dam will occupy a footprint of about 30,000 square yards (6.2 acres). The dam will be constructed of approximately 300,000 cubic yards of rock and soil excavated from within the Manengon Hills Resort Development site. The crest of the dam will form part of one fairway of the golf course, and the downstream shoulder will support the perimeter access road of the development. The core of the dam will be constructed of compacted on-site low permeability clay. Figures 4, 5, 6, 7, and 8 show the spillway, the horse shoo conduit, the dam site plan, cross section and geologic profile.

The Manengon River is the primary source of water supply for the proposed dam/reservoir. In addition, two other infrastructure elements of the Manengon Hills Resort Development will contribute to water resources in the reservoir. These elements include a sewage collection and treatment system, which will produce effluent discharge that will meet irrigation re-use standards set by the Guam EPA, and the collection of stormwater runoff.

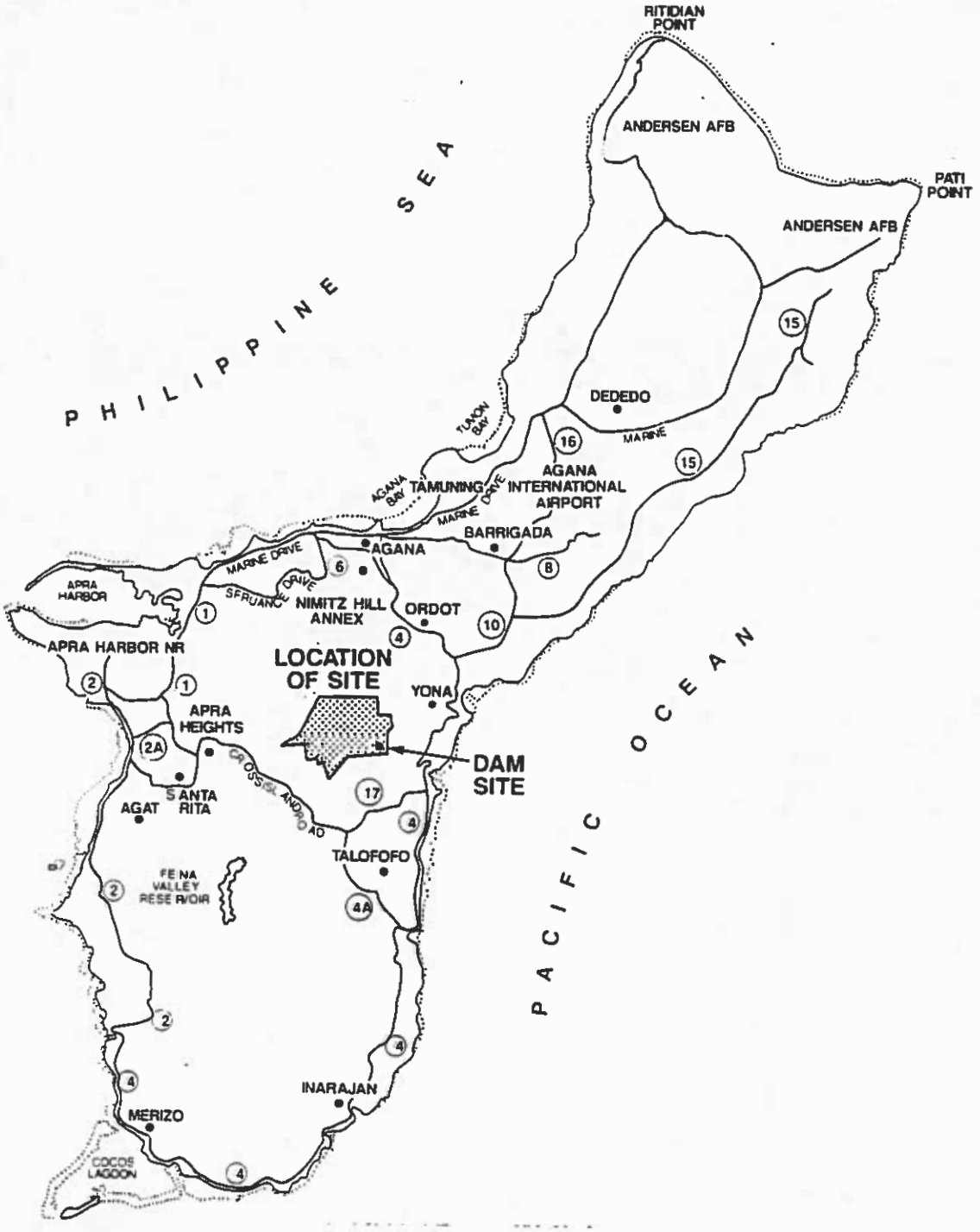


FIGURE 1

MANENGON HILLS DAM SITE

MIYAMA GUAM INC.
194 HERNAN CORTES AVENUE
SUITE 216, UNION BANK BLDG.
AGANA, GUAM 96910

VICINITY MAP

SCALE IN MILES

0 4.2

N

APPLICATION BY: MIYAMA GUAM INC.

LOCATION: PULANTAT, YONA, GUAM
IN: MANENGON RIVER HEADWATERS
AT: MUNICIPALITY OF YONA,
TERRITORY OF GUAM

05/03/90

RESERVOIR IMPOUNDMENT

FIGURE 2

DAM SITE

SCALE IN FEET

0 1000

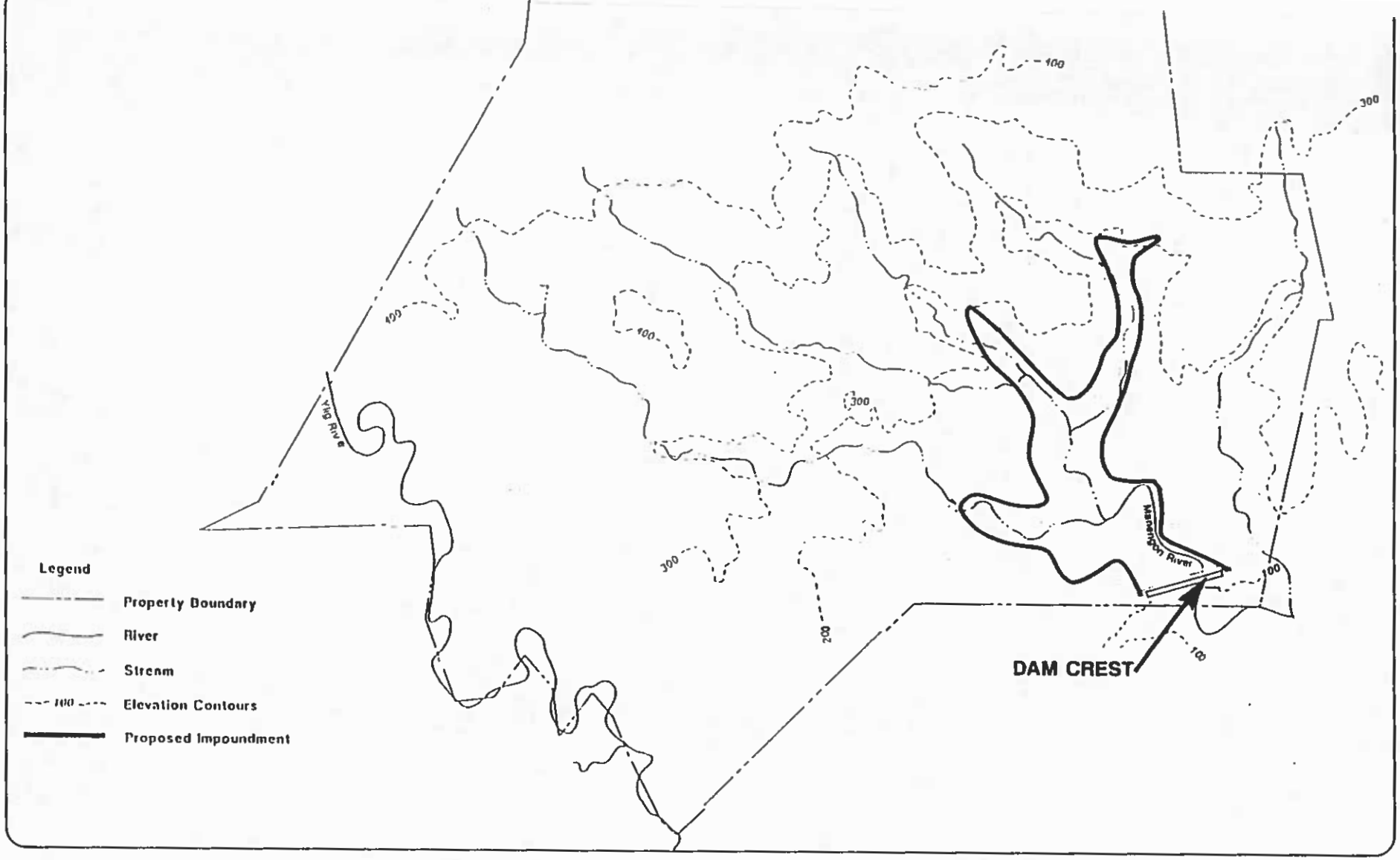
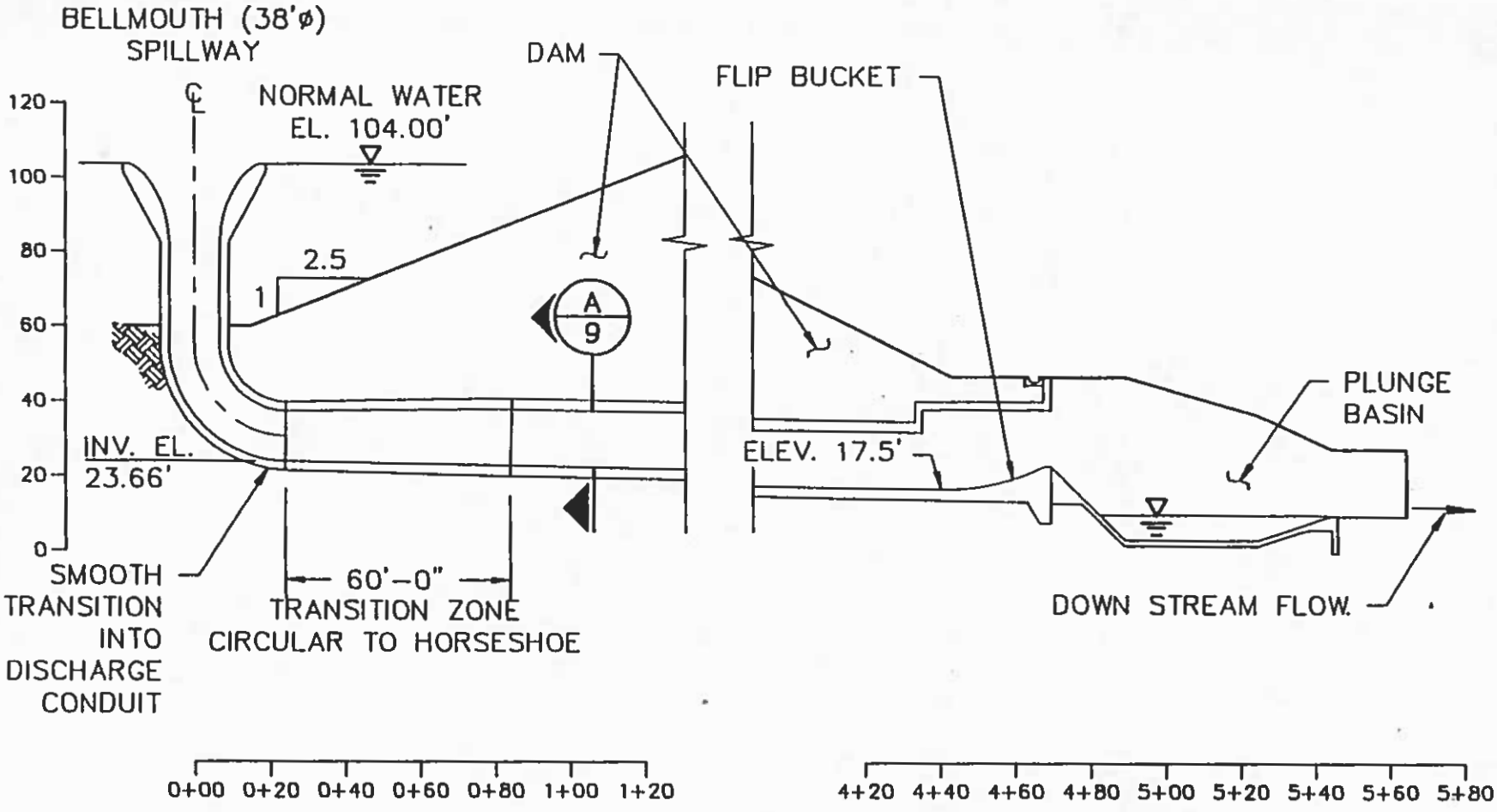


FIGURE 3

DAM LOCATION AND RESERVOIR FOOTPRINT

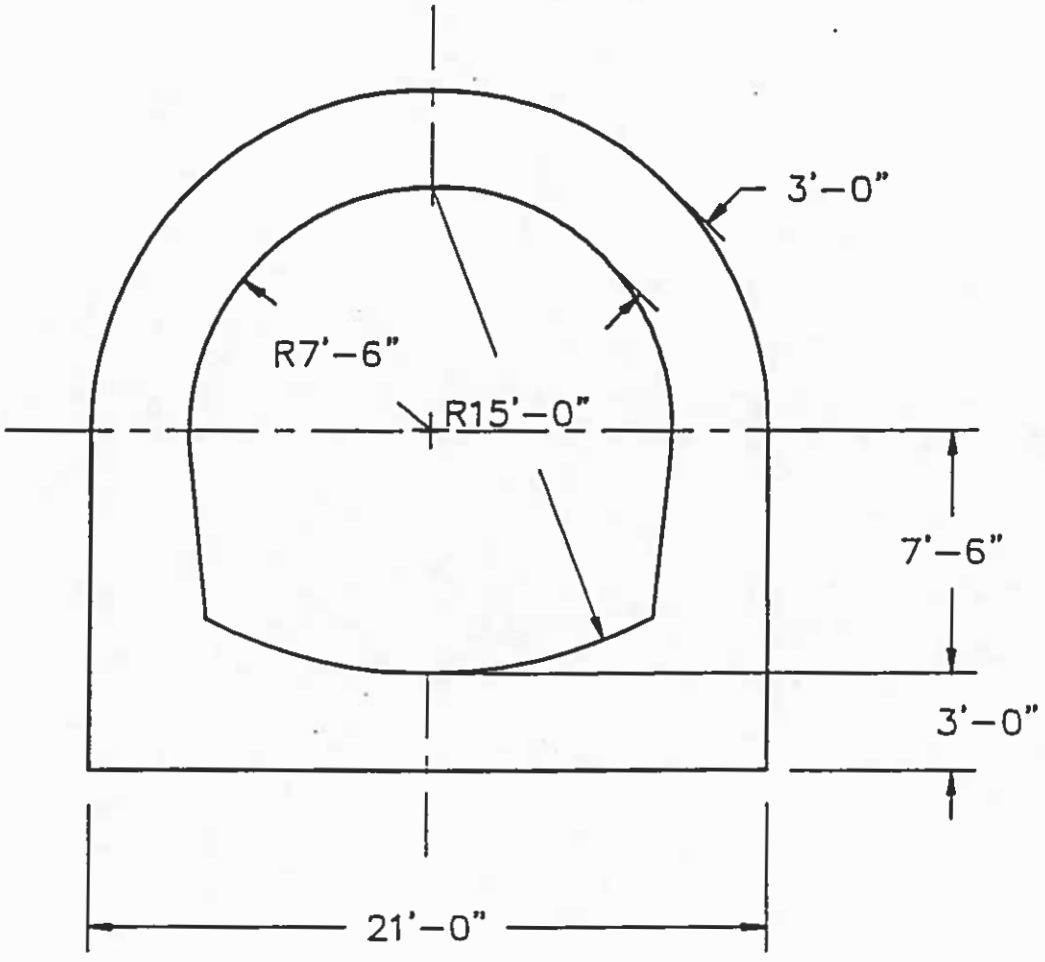


SCALE IN FEET

0 40

FIGURE 4

BELLMOUTH SPILLWAY



SECTION A/8

FIGURE 5

HORSESHOE CONDUIT

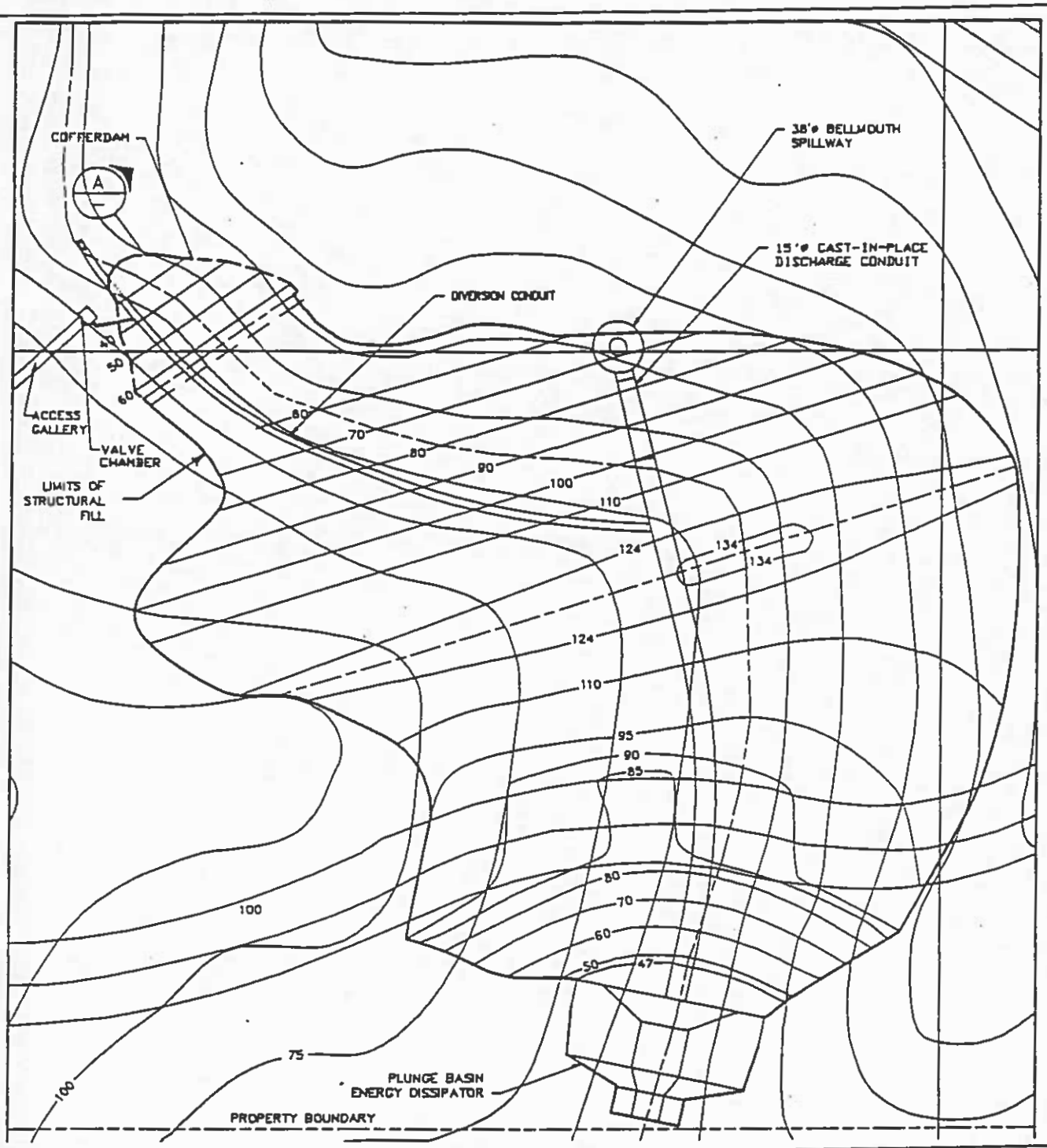


FIGURE 6

MANENGON HILLS

MIYAMA GUAM INC.
194 HERNAN CORTES AVENUE
SUITE 216, UNION BANK BLDG.
AGANA, GUAM 96910

SITE PLAN

SCALE IN FEET

0 110

N

APPLICATION BY: MIYAMA GUAM INC.

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AT: MUNICIPALITY OF YONA,
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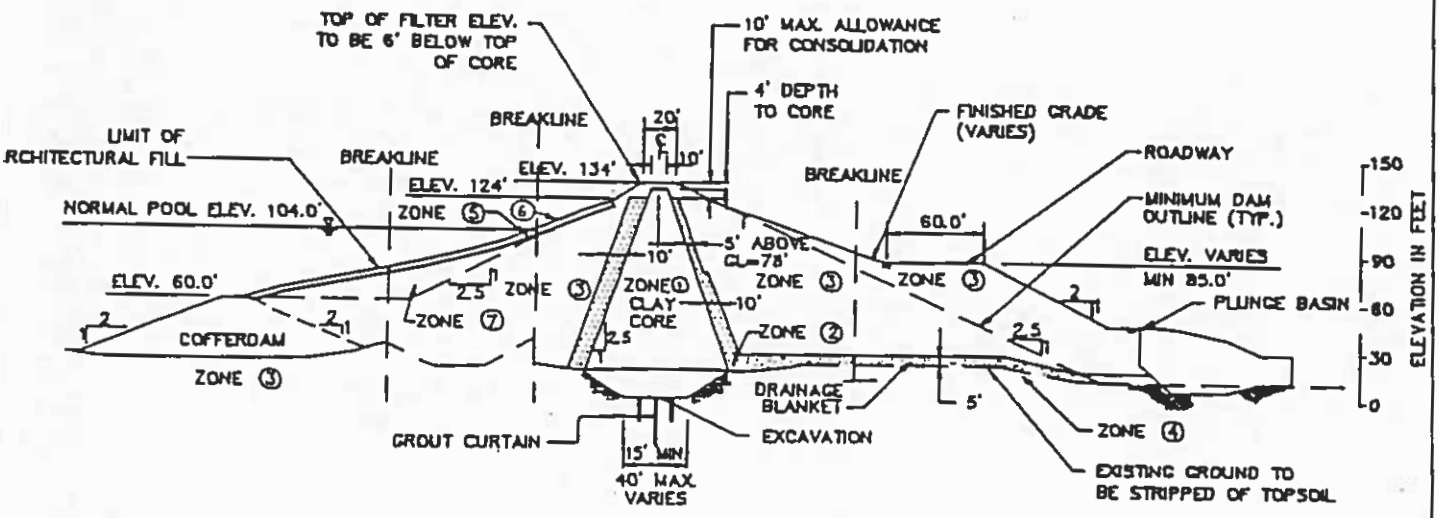
05/03/90



ZONE DESCRIPTIONS: (REFER TO SPECIFICATIONS FOR MATERIAL DESCRIPTIONS.)

ZONE 1 – CLAY CORE
ZONE 2 – FILTER
ZONE 3 – RANDOM ROCK FILL
ZONE 4 – DRAINAGE BLANKET
ZONE 5 – BEDDING MATERIAL
ZONE 6 – RIPRAP
ZONE 7 – ARCHITECTURAL FILL

FIGURE 7

MANENGON HILLS

MIYAMA GUAM INC.
194 HERNAN CORTES AVENUE
SUITE 216, UNION BANK BLDG.
AGANA, GUAM 96910

DAM CROSS SECTION

SCALE IN FEET

0 120

APPLICATION BY: MIYAMA GUAM INC.

LOCATION: PULANTAT, YONA, GUAM
IN: MANENGON RIVER HEADWATERS
AT: MUNICIPALITY OF YONA,
TERRITORY OF GUAM

05/03/90

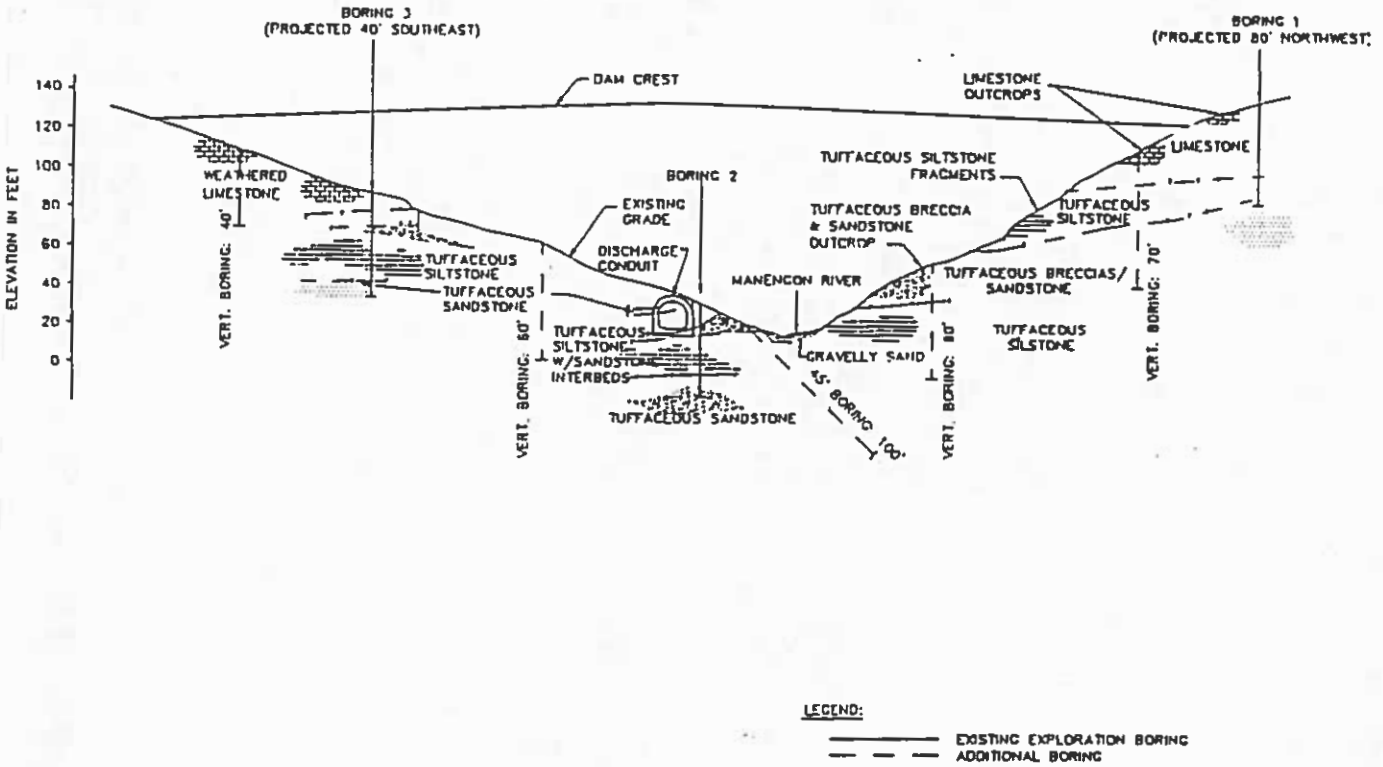


FIGURE 8

MANENGON HILLS

MIYAMA GUAM INC.
494 HERNAN CORTES AVENUE
SUITE 216, UNION BANK BLDG.
AGANA, GUAM 96910

DAM GEOLOGIC CROSS SECTION

SCALE IN FEET

0 80

APPLICATION BY: MIYAMA GUAM INC.

LOCATION: PULANTAT, YONA, GUAM
IN: MANENGON RIVER HEADWATERS
AT: MUNICIPALITY OF YONA,
TERRITORY OF GUAM

05/03/90

The Manengon Hills Resort Development occupies approximately 1300 acres and consists of 45 holes of golf, 200-room hotel, tennis, swim and equestrian facilities and 3,000 residential units. Up to nine acres of wetlands will be filled in conjunction with the development of the Manengon Hills Resort. These nine acres of wetland fill have been granted a nation-wide permit by the Corps of Engineers pursuant to a consent decree filed May 22, 1990. Although these nine acres of wetland fill technically are not the subject of this EA, for purposes of full disclosure and because of the close relationship between the proposed dam and the remainder of the resort development, the impacts associated with the nine acres of wetland fill are also summarized in this analysis.

III. ENVIRONMENTAL AND PUBLIC INTEREST FACTORS CONSIDERED

A. Purpose and Need

The purpose of the dam is to provide storage of water (approximately 1,023 acre feet per year) to irrigate the Manengon Hills Resort Development's golf courses and other landscaped areas.

B. Alternatives (33 CFR 320.4(b)(4), 40 CFR 230.10)

The applicant has considered a broad range of alternatives to the proposed project. The applicant has considered on-site alternatives as well as off-site alternative sources, as identified below. To evaluate water supply alternatives, project irrigation demands were identified and water supply alternatives were analyzed. System reliability was one of the key factors in evaluating potential alternatives. As identified by project engineers, Dames & Moore, to be viable, an acceptable water system has to provide a reliable supply of adequate quantity and quality to meet project demand on an average of 99 percent of the time.

1. On-site Alternatives:

Four on-site alternatives were evaluated in addition to the proposed project. The proposed project has been shown to have a system reliability factor of 99.5 percent (Water Availability Study for the Manengon Hills Project, Dames & Moore, May 18, 1990). A more detailed description and evaluation of these alternatives is provided in this study. In addition to the on-site alternatives discussed below, alternative resort development programs were examined in the Manengon Hills 404(B)(1) Alternatives Analysis. As noted in the 404(B)(1) Alternatives Analysis, reductions in the current proposed resort development program were rejected as impracticable due to financial feasibility considerations.

Alternative 1: Groundwater Resources

An evaluation of groundwater resources was conducted to examine the hydrogeology of the project site. Results of the evaluation indicated that there are no groundwater resources of significant capacity to meet project irrigation water supply objectives, therefore this alternative was rejected (Water Availability Study for the Manengon Hills Project, Dames & Moore, May 18, 1990).

Alternative 2: Direct Diversion from the Ylig River

Direct diversion from the Ylig would not be adequate to meet identified irrigation demands. On- or off-stream storage would be required to accommodate expected shortages. The reliability factor associated with direct diversion from the Ylig is about 60 percent, therefore this alternative was rejected because it was not capable of providing an acceptable supply of water (Water Availability Study, Dames and Moore, May 18, 1990).

Alternative 3: Ylig River Diversion with Four Small Dams Above the Headwaters of the Manengon River

This alternative would require a small diversion structure on the Ylig and four small dams above the headwaters of the Manengon. Combined storage capacity of the four reservoirs would be about 292 acre-feet. The reliability factor associated with this alternative is estimated at 86 percent and, therefore, was rejected because of its inability to provide an acceptable water supply (Water Availability Study, Dames and Moore, May 18, 1990).

Alternative 4: Ylig River Diversion with Four Small Dams Above the Headwaters of the Manengon and Reclaimed Water

This alternative is the same as Alternative 3 with the addition of wastewater produced from an on-site wastewater treatment plant. This alternative was determined to have a 93 percent reliability factor and was rejected because it was not capable of providing an acceptable supply of water (Dames and Moore, May 18, 1990).

2. Off-site Alternatives:

In addition to on-site alternative irrigation water sources, three off-site alternatives were identified.

Alternative 1. Groundwater Resources

An evaluation of groundwater resources was conducted to examine the hydrogeology of the areas in close proximity to the project site. Results of the evaluation indicated that there are no groundwater resources of significant capacity to meet project water supply objectives, therefore this alternative was rejected (Water Availability Study, Dames and Moore, May 18, 1990).

Alternative 2: Ugum River

The Ugum River is located approximately four miles south of the proposed project site. The Ugum River appears to have sufficient water of good quality to meet the water supply objectives. However Public Utilities Agency of Guam (PUAG) is presently developing this river to increase domestic water supplies for Guam. Since use of Ugum River water would have to take place

through PUAG, and because PUAG places irrigation demands last on its list of water use priorities, this alternative was rejected because it would not meet project water supply objectives.

Alternative 3: Potable Water Supplied by PUAG

The option of utilizing potable water supplied by PUAG to provide the project water supply was reviewed and rejected because PUAG policy places use of potable water for irrigation purposes last on its limited potable water resource priority list. Due to other anticipated potable water demands which have a higher priority than irrigation, it is unlikely that PUAG would ever release potable water to Manengon Hills Resort Development for irrigation purposes.

3. No Project Alternative:

The No Project Alternative is the same as the No Build Alternative. With this alternative, the development of a dam and associated water storage necessary to serve the Manengon Hills Resort Development would not occur. As such, no grading or filling of wetlands, associated with the dam would result and development of the Manengon Hills Resort would likely not occur. The No Project Alternative would also result indirectly in the loss of potential benefits to Guam that are expected in conjunction with the Manengon Hills Resort, such as increased tax revenues and increased employment opportunities.

C. Physical/Chemical Characteristics and Anticipated Changes. (Check applicable blocks)

(X) Substrate:

The substrate below the proposed dam site is composed of several materials. Gravelly sands occur in the streambed of the Manengon River while tuffaceous siltstones, sandstones and brecchias are located below the banks of the watercourse. Slopes above the river contain weathered limestone (see Figure 8).

The dam would be constructed of rock and soil excavated in the vicinity of the project site. Most of this material would be composed of volcanic rock and clay soils. The shoulders of the dam would consist of rockfill excavated near the site and the core of the dam would be composed of low permeability clay.

With the implementation of the project, substrate along the tributaries of the Manengon and part of the main stem of the river would be overcovered by the waters of the reservoir and by sediment running to the reservoir. At the dam site, fill material would overlay substrate. The dam footprint would occupy about 6.2 acres while the reservoir would cover 33.75 acres. Some impact and modification of the substrate at the dam site would occur. Weathered material at the foot of the proposed structure would need to be excvated prior to grouting and construction. In addition, loose fill placed in layers and compacted. Given the size of the

dam, the amount of substrate affected would be relatively insignificant.

The filling of up to nine acres of wetlands above the headwaters of the Manengon River would require the removal of vegetation and upper portions of the substrate which is composed primarily of clayey soils of volcanic origin. Material would be backfilled and compacted. Additional disturbance to the substrate may occur with the development of compensation wetlands. Some excavation would likely be required to establish those areas. However, the impacts to the substrate are expected to be relatively insignificant as any excavation work would only disturb shallow portions of the substrate.

(X) Range of Water Levels; Baseflows:

The Manengon River is approximately 15 feet wide and 3 to 4 feet in depth. The flow in the Manengon River is about 7 cubic feet per second (cfs.). There are seasonal fluctuations in the flow of the Manengon. Hydrologic simulation predictions indicate that flows in the Manengon River are less than 1.00 cfs for over half of the year, and during dry periods of the year, there may be no discernible flow (Dames and Moore, Aquatic Resources Preliminary Draft Report, Miyama Hills Development, Guam, May 1990).

The proposed dam on the Manengon would impound water to a normal level of 104 feet, and the reservoir would cover about 33.75 acres. Maximum flood crest for the structure would be 124 feet. During the operation of the dam, the water levels could be expected to vary substantially, depending upon the amount of rainfall and runoff into the reservoir along with reclaimed water flows. The amount of dam surface area covered with fluctuations in water levels are included in the Dames and Moore Report, Aquatic Resources, Miyama Hills Report, May 1990. In addition, the reservoir would provide approximately 0.5 cfs of flow to the Manengon River to augment the fishery below the reservoir. Levels in the reservoir could fluctuate from a maximum of 124 feet to dry or nearly dry. (Dames and Moore, Aquatic Resources, Preliminary Draft Report, Miyama Hills Development, Guam, May 1990.)

Using the Reservoir Analysis Program (HEC-3) by the U.S. Army Corps of Engineers, the reservoir was simulated for monthly years 1953 to 1985. The simulation indicated fluctuations ranging from high flow in 1976 to a low flow in 1966, a drought year. Of the options evaluated, a spillway height of 104 feet would provide the fewest years of water shortfall. With the implementation of the project, average flows would decrease somewhat over estimated natural flow (dry year 1966, average year 1968, wet year 1976) while maximum flows would remain about the same. Average flows would be about 7.8 cfs under pre-project conditions and 6.6 cfs with the project while maximum flows would be 19.5 and 19.3 cfs. A monthly comparison of these three years under estimated natural and project conditions is contained in the Dames and Moore Aquatic Resources

Report. (Dames and Moore, Aquatic Resources, Preliminary Draft Report, Miyama Hills Development, Guam, May 1990.)

To minimize fluctuations in the water level of the reservoir and to maintain the flow to protect and enhance aquatic habitat on the Manengon River, a program to manage the irrigation needs of the project would be implemented along with the previously discussed 0.5 cfs flow from the reservoir.

(X) Currents, Circulation, Drainage Patterns:

The headwaters of the Manengon River originate on the Manengon Hills site. Five tributaries of the Manengon River flow along ravines which intersect the property.

With development of the proposed project, four of the five tributaries would drain to the reservoir of the dam to be constructed on the Manengon River. The flow characteristics of the river would be altered by the dam and reservoir as described above in Section b, Range of Water Levels.

The filling of up to nine acres of wetlands comprises less than ten percent of the total on the Manengon Hills site. With the implementation of mitigation measures, including replacement of fill areas on a two-to-one basis and location of compensating wetlands in the same watershed, the impact of project fills would not significantly affect drainage patterns.

(X) Water Quality; Suspended Particulates; Turbidity:

A review of available data and reports indicates that no water quality data are available specifically for the Manengon River near the project site.

During March 1990, Dames and Moore performed some limited measurements on five tributaries of the Manengon River in the vicinity of the proposed project. The water temperature ranged from 21.5 to 29 degrees Celsius with an average of 24.6 while dissolved oxygen (DO) varied from 3.8 to 10.8 mg/l with an average of 8.7. Turbidity readings were as low as 1.0 NTZ to as high as 5.0 NTZ with an average of 2.1. Total phosphorous ranged from less than 0.002 to 0.033 mg/l while nitrates were from 0.005 to 0.008 mg/l.

To establish a baseline of water quality for the Manengon River prior to the project, it was assumed by Dames and Moore that water characteristics would be similar to the Talofofo River. As a result, total suspended solids (TSS) would be 458 mg/l, total dissolved solids 257 mg/l, temperature ranging around 27.8 degrees Celsius, dissolved oxygen of about 8.2 mg/l a nitrite-nitrate ranging from 0.001 to 0.38 mg/l with an average of 0.013, and phosphorous from 0.004 to 0.027 and average of 0.004 mg/l.

The proposed project would include the impoundment of water which would drain from about 589 acres of irrigated areas, other developed parts of the Manengon Hills Development, remaining natural lands, and treated water from the wastewater facilities. A flow of approximately 0.5 cfs would be released from the reservoir to maintain and enhance aquatic habitat.

To evaluate the impacts of the proposed impoundment on the water quality of the Manengon River, the CE-QUAL-R1 model was used. The model simulates the vertical distribution of thermal energy and chemical/biological materials in a reservoir through time. Daily reservoir operation was simulated for an average and wet year. For each of these years, it was assumed that the reservoir inflows consisted of a wastewater discharge treated to secondary standards, surface runoff from irrigation, and drainage from other parts of the site.

The results of the simulation indicated that the impacts of the proposed project on the Manengon River is likely to be insignificant with respect to the existing downstream uses. The temperature of the inflow to the reservoir would be virtually the same as the pre-project conditions while the temperature of downstream releases would range from less than 0.2 degrees to 3.4 degrees Celsius lower. TSS coming into the reservoir would average about 220 mg/l. Since much of this material would settle out in the reservoir, the downstream release would contain considerably lower levels of TSS, ranging from 23.3 to 26.94 mg/l. Total dissolved solids in the inflow would be similar to levels in the reservoir, with levels in the release range from 111.3 to 136.2 mg/l. Most of the phosphorous contained in the runoff from irrigated areas would be absorbed by the acidic soils. Expected levels in the post-project condition would range from 0.0 to 0.06 mg/l. Nitrate levels would increase to levels ranging from 0.16 to 2.01 with the reservoir. Neither of these substances would have an impact on aquatic organisms. According to information provided through the CMLS model, proposed pesticides used in the irrigated areas would be strongly absorbed by the native soils.

To reduce the impact of the project on water quality, mitigation measures would be implemented. These measures would include careful management of irrigation water and application of pesticides and fertilizers. A monitoring program would be instituted to determine the validity of the modeling stations would be located on the main stem of the Manengon River upstream of the development to measure incoming flows. A second station would be installed at the location of the wastewater discharge. A third station would be upstream of the reservoir to record the quality of water entering the reservoir while a fourth station would be located downstream of the reservoir to monitor the quality of downstream releases.

With the filling of up to nine acres of wetland fill, there would not be a significant impact on water quality. The loss of

nine acres of fill would be offset by replacement of wetlands on a two-to-one basis. The added wetlands would provide some additional natural treatment capabilities to the runoff from the Manengon Hills site.

(X) Flood Plain and Flood Control Functions:

Flood Insurance Rate Maps have not been completed for the vicinity of the project site by the Federal Emergency Management Agency. However, according to the Bureau of Planning (Guam's Natural and Manmade Constraints, August 1982), an area near the dam is in a flood hazard zone. Additional flood hazard zones are found at lower portions of the Manengon River below the dam.

To alleviate any potential impacts from flooding and in accordance with Government of Guam Storm Drainage Manual and flood protection requirements, the dam would be used to control runoff from a 20-year storm event. The capacity of the dam would be sufficient to contain this event.

The filling of up to nine acres of wetland fill would not significantly add to potential impacts from flooding. The wetland area represents less than ten percent of the total on the Manengon Hills site and are away from the identified area of flood hazard and the proposed dam. Moreover the compensatory wetlands to be created would be expected to reduce the risk of flooding since runoff would more slowly drain through these areas.

(X) Erosion and Accretion Patterns; Storm, Wave, and Erosion Buffers:

The existing topography of the site is composed of fairly rugged terrain. Elevations range from less than 100 feet above sea level in the southeast area near the Manengon River to over 500 feet to the northwest of the site. Soils on the site are composed of reddish brown inorganic clayey silts and dark brown inorganic clays/inorganic clayey silts. The areas surrounding the dam site are covered by savannah grasses and shrubs and ravine forest vegetation. Stormwater runoff from the site flows into the Manengon River which joins the Ylig River. Coral reef areas are located at the mouth of the Ylig River.

Implementation of the project would result in a minimal amount of erosion. The area of potential erosion would occur at the dam site. Weathered materials overlying the foundation sandstones and siltstones would be excavated. Loose and permeable surficial materials from the abutments of the dam would be stripped. The foundation area would be grouted, and fill would be placed in layers and compacted in the abutment areas. A coffer dam would be constructed just above the dam to divert stream flow and ameliorate any potential erosion.

The filling of up to nine acres of wetland fill would have a very minimal and insignificant impact on erosion with the implementation of control measures during construction. The creation of compensating wetlands on a two-to-one basis would likely reduce the amount of erosion from the Manengon Hills site by slowing runoff and stabilizing soils in drainage areas.

(X) **Aquifer Recharge:**

Sedimentary rock occurs in the river bed of the Manengon River while areas of the reservoir are primarily composed of clay soils underlain by volcanic rock mixed with small areas of limestone. Groundwater is very limited below the site because of the unfavorable hydrogeologic conditions. These conditions include low infiltration capacity due to the clay soils and poor to slightly moderate storage capacity of the volcanic materials under the site. For groundwater beneath the area, the development of the proposed dam project is not likely to have an impact on aquifer recharge. Similarly, the filling of up to nine acres of wetland fill is not expected to affect groudwater recharge, especially with the creation of compensatory wetland areas.

For projects involving the discharge of dredged materials:

( ) **Mixing zone, in light of the depth of water at the disposal site; current velocity, direction, and variability at the disposal site; degree of turbulence; water column stratification; discharge vessel speed and direction; rate of discharge; dredged material characteristics; number of discharges per unit of time; and any other relevant factors affecting rates and patterns of mixing:**

The proposed Project does not involve the discharge of dredged materials.

D. Biological Characteristics and Anticipated Changes (Check applicable blocks.)

(X) **Special aquatic sites (wetlands, mudflats, coral reefs, pool and riffle areas, vegetated shallows, sanctuaries and refuges, as defined in 40 CFR 230.40-45):**

The project site presently supports savanna and ravine forest. Of the plant communities found on the project site, the ravine forest supports the greatest diversity of plant species and terrestrial (i.e., non-aquatic) wildlife species. Terrestrial wildlife is scarce and composed primarily of non-native species. One endangered species, the Mariana common moorhen, is known from the larger Manengon Hills Resort Development site, although is not found at the specific dam location or found at the nine acres of previously approved wetland fills. Two perennial rivers and their tributaries, the Ylig and the Manengon, intersect the site.

Approximately 0.5 acres of the approximate 40-acre dam and reservoir footprint are wetlands. Principal wetland types are phragmites grassland and pago stands. One additional wetland type, graminoid marsh is found on the larger Manengon Hills Resort development site but will not be affected by the proposed dam project. In addition, there are transitional cover types intermediate between wetland and upland: phragmites-savanna transition and phragmites-ravine forest transition.

The most extensive wetland cover type on the site is phragmites grasslands in which phragmites (Phragmites karka) is the single dominant plant species and often occurs in nearly monotypic stands. These phragmites grasslands are found at and above the headwater of the Manengon River on relatively flat to gently sloping terrain. The phragmites grassland would be classified as palustrine, emergent, persistent, seasonally flooded (PEM1C) by the U.S. Fish and Wildlife Service's (USFWS) system for wetland habitats (Cowardin et al. 1979).

The primary value of the phragmites grassland is in maintaining aquatic habitats downstream. Located at the upper margins of the watersheds, the phragmites wetlands serve to store water and to release it slowly into the associated streams, maintaining base flows. The presence of these wetlands, together with springs and seeps in ravine forest areas, is the primary reason that perennial stream and habitat for fishes and invertebrates extends upstream into the upper most reaches of the Manengon River watershed.

The phragmites-savanna transition type is characterized by co-dominance of phragmites with a variety of other herbaceous species including other grasses such as swordgrass (Miscanthus floridus), fuzzy grass (Dimeria purpureum) along with club moss (Lycopodium cernuum) and sword fern (Nephrolepsis hirsutula). Savanna is classified as an upland type.

A few isolated pago (Hibiscus tiliaceus) stands are scattered on the project site. Typically the stands are located in small hollows or depressions that catch runoff water. These tend to be isolated from other wetlands types and are usually surrounded by upland savanna vegetation. The pago stand wetlands would be classified as palustrine, forested, broad-leafed evergreen, seasonally flooded (PFO3C).

The associated vegetation of the streams and rivers on the site is ravine forest on the steeper, relatively undisturbed areas and phragmites grassland on the flatter, more recently disturbed portions of the site. Ravine forest is characterized by a closed canopy of trees and sub-trees, including pandanus (Pandanus fragrans), palma brava (Heterospathe elata), betelnut (Areca catechu), coconut (Cocos nucifera), and bamboo (Bambusa vulgaris). Ravine forest is not classified as a wetland type.

The proposed dam will require the impoundment of the Manengon River to provide irrigation. The proposed impoundment will maintain a normal pool of 104 feet. Total wetland fill associated with the proposed dam will be limited to approximately 0.5 acres. Mitigation to offset the loss of 0.5 acres of wetlands will be implemented. This mitigation will include replacement of 2:1 acres of in-kind or higher quality habitat. The nine acres of wetland to be filled in association with the overall Manengon Hills Resort development will be mitigated by replacement at 2:1 acres of in-kind or higher quality habitat.

(X) Aquatic Organisms/Habitat:

Habitat for aquatic organisms on the site is composed of a small portion of the main stem of the Manengon River and five tributaries. The habitat on the Manengon consists of three general types which include the following: (1) Upper Habitat category is composed of wetland species and is dominated by Phragmites; (2) Middle Habitat category consists of a complex profile of canopy, understory and herbaceous plants. Short, steep runs and riffles, and pools occur in this area; and (3) Below Reservoir Habitat category where the river broadens and is composed of a mature tree canopy. The river contains many shallow and deep pools.

Aquatic fauna identified in the Middle Habitat include seven species of fish, three species of shrimp and two species of gastropods (Dames and Moore, Aquatic Resources Preliminary Draft Report, Miyama Hills Development, Guam, April 20, 1990).

The development and operation of the dam on the Manengon River could have significant impacts upon the aquatic habitat and organisms in the stream. These impacts include an effect on the volume of downstream flows and on the aquatic organisms utilizing these flows. On the site the project would have a cumulative impoundment of over 1,023 acre-feet. A total of 1,824.5 meters of stream in the Middle Habitat would be inundated by water at full capacity of the reservoir.

As part of the effort to reduce potential impacts on aquatic habitat and species from the construction and operation of the dam, several measures would be implemented. Measures include the following: (1) habitat below the dam would be maintained and enhanced through a downstream flow of approximately 0.5 cfs. This flow was determined through application of modeling, based on Instream Flow Incremental Methodology, species life histories, and concepts of weighted usable area, wetted perimeter and stream hydrology, to areas below the reservoir; (3) a fish passage would be constructed to ensure a connection for fish between the reservoir and the downstream section of the Manengon River; extensive erosion control measures, including scheduling of construction activities during periods resulting in the least amount of biological damage, would be implemented to minimize the impacts from siltation; (5) maximizing the distance of oil and fuel supplies from waterways to

minimize the potential of a spill; and (6) monitoring to ensure good construction practices and effectiveness. For the permitted fills of up to nine acres on the Manengon Hills site, some impact on aquatic species would result. However, much of this impact is expected to be offset by the development of compensatory wetlands and the eventual establishment of aquatic habitat and organisms.

( ) **Endangered and Threatened Species:**

In pristine times, phragmites grasslands were among the favored habitats of the nightingale reed-warbler (Acrophalus luscinia). The Guam subspecies (A. l. luscinia) is now extinct and for that reason is no longer considered a species of concern.

One federally-listed endangered species, the Mariana common moorhen (Gallinula chloropus guami), was found present on the Manengon Hills site. This member of the rail family is endemic to Guam and several of the Northern Mariana Islands. However, the moorhen is not found at the dam site or in the up to nine acres of wetlands which are to be filled in association with the Manengon Hills Resort development.

(X) **Biological availability of possible contaminants in dredged or fill material, considering hydrography in relation to known or anticipated sources of contaminants; results of previous testing or material from the vicinity of the project; known significant sources of persistent pesticides from land runoff or percolation; spill records for petroleum products or designated hazardous substances; other public records of significant introduction of contaminants for industries, municipalities, or other sources:**

No records are available of previous storage or spillage of hazardous materials on the project site. No petro-chemical products or other hazardous materials will be spilled on the site. Fill material will consist of off-site soils. Although larger tree trunks and other vegetation will be removed from the fill material, some organics may be incorporated in the fill.

E. Human Use Characteristics and Impacts. (Check applicable blocks.)

(X) **Existing and Potential Water Supplies; Water Conservation:**

The Ylig River and the Manengon River and its tributaries are sources of surface water on the proposed project site. Other surface waters are located away from the site. These waters include the Ylig River upstream of the confluence with the Manengon River, the Pago River north of Manengon Hills and upstream of the Ordot Landfill and the Ugum River upstream of Talofofo Falls. Groundwater sources on the site are very limited because of the hydrogeologic conditions previously described in Aquifer Recharge, above. Potential off-site sources of groundwater would primarily come from

the major aquifer on Guam which is in the northern part of the island. Connection to water from this aquifer would require the approval of the Public Utility Agency of Guam (PUAG).

The development of the proposed dam project would be required to provide sufficient water for irrigation. Given Government of Guam groundwater policies, potable water from the northern aquifer for would not be readily available for irrigation for recreational purposes. Approximately 1,000 acre-feet would be needed yearly along with a downstream flow of 0.4 to 0.7 cfs to maintain the downstream aquatic habitat. With a dam height of 124 feet, the structure would result in a reservoir surface area of 33.75 acres and storage for 1,023.12 acre-feet of water. To augment the water impounded by the dam, about one million gallons of domestic wastewater treated to tertiary levels would be routed to the reservoir. The physical, chemical and biological impacts of the dam have been discussed in previous section of this report.

To minimize the amount of water needed for irrigation uses, conservation measures would be implemented. Water for irrigation needs would be reduced through management of impounded water which would include determination of optimum application rates and reduction of evaporation. No impacts to existing and potential water supplies would result from the permitted filling of up to nine acres of wetlands on the site.

( ) Recreation or Commercial Fisheries:

At present, the site is in private ownership. No recreation or commercial fisheries occur on the property.

( ) Other Water-Related Recreation:

There are no other water-related recreational activities that presently occur on the site.

(X) Aesthetics of the Aquatic Ecosystem:

The visual character of a portion of the site will change from its present open space and undeveloped state to a dam structure and reservoir.

( ) Parks, national and historic monuments, national seashores, wild and scenic rivers, wilderness areas, research sites, etc:

There are no parks or national and historic monuments located adjacent to the project site. A Territorial Reserve is located approximately one quarter mile south of the project site.

( ) Traffic/Transportation Patterns:

Traffic would be limited to the year of construction for the project. Since construction would be restricted to the dam site and

fill materials from the Manengon Hills Resort development, no impact on traffic/transportation patterns would occur.

( ) **Energy Consumption or Generation:**

Energy consumption demands of the project will be within the available supplies.

( ) **Navigation:**

There are no navigable waters on the project site.

(X) **Safety:**

The project will confirm to and meet all existing safety standards and requirements.

( ) **Air Quality:**

Guam is in attainment of federal air quality standards for carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide and particulates (PM10). The construction of the proposed project would generage some additional air pollutants, notably particulates. However, the amounts would be relatively insignificant and would not be a significant impact.

( ) **Noise:**

There are no sensitive noise receptor sites adjacent to or in the vicinity of the project site.

( ) **Historic Properties, Cultural Resources:**

There are no historic properties or cultural resources on the proposed dam and reservoir site.

(X) **Land Use Classification:**

On September 6, 1988, the applicant submitted to the Territorial Planning Commission of Guam an application for a zone change from agriculture to Planned Development in order to allow the project to develop The zone change was granted on October 27, 1988. Primarily in response to environmental concerns, the applicant prepared a revised development plan dated April 1990 which is the current proposal for the site. This current proposal constitutes an amendment to the approved PUD. In that the majority of the area surrounding the site is vacant or has only scattered residences to the east, development of the project site will not result in a conflict with adjacent land uses.

(X) **Economics:**

The project would provide benefits to the economy of Guam by providing jobs both during and after construction (short and long-term benefits) and by enhancing Guam's tax base (short and long-term benefits).

( ) **Prime and Unique Farmland; (7 CFR Part 658) Food and Fiber Production:**

The project site does not contain any prime or unique farmland, nor is the site used for the production of food or fiber products.

( ) **Mineral Needs:**

There are no known mineral resources on the project site. The project has no mineral requirements associated with its implementation.

(X) **Consideration of Private Property:**

The Project is privately financed and constructed on private property. The applicant believes the Project to be a reasonable use of private property.

F. Summary of indirect, secondary, and cumulative effects; other similar activities in the vicinity

Impacts from the development of a project, by itself, may be relatively minor and mitigable. In combination with other similar projects, however, cumulative impacts and indirect and secondary impacts could be significant, affecting other resources in the vicinity in addition to water for irrigation. The Government of Guam would have authority over much of the resources and jurisdiction over issues such as traffic, groundwater supplies, land use, and archaeological sites.

For the subject dam and reservoir project, the cumulative, secondary and indirect impacts would be insignificant. No other irrigation or dam projects exist or are projected on the Manengon River or the Ylig River watersheds.

IV. FINDINGS

A. Other Authorizations

1. Guam wetlands permit;
2. NPDES permit for wastwater treatment facility;
3. Guam flood hazard permit;
4. Section 401 water quality certification;
5. Section 7 Endangered Species Act consultation;
6. Natural Historical Preservation Act approval; and
7. Coastal Zone Management Consistency.

B. A complete application was received on _____, 1990. A public notice describing the project was issued on _____, 1990 and sent to all interested parties including appropriate local (Guam) and federal agencies. All comments received on this action have been reviewed and are summarized below.

1. Summary of Comments Received:

a. Federal Agencies
(To be provided upon receipt of Comments)

b. Local Agencies
(To be provided upon receipt of Comments)

c. Organizations
(To be provided upon receipt of Comments)

d. Individuals
(To be provided upon receipt of Comments)

2. Evaluation and Consideration of Comments:
(To be provided upon receipt of comments)

C. Evaluation of Compliance with 404(b)(1) guidelines (Restrictions on Discharge, 40 CFR 230.10)

1. Alternatives Test:

___ YES X NO a. Based on the discussion in II B, are there available, practicable alternatives having less adverse impact on the aquatic ecosystem and without other significant adverse environmental consequences that do not involve discharges into "waters of the United States" or at other locations within these waters?

X YES ___ NO b. Based on II B, if the project is in a special aquatic site and is not water-dependent, has the Applicant clearly demonstrated that there are not practicable alternative sites available?

2. Special Restrictions. Will the Discharge:

___ YES X NO a. Violate state water quality standards?

___ YES X NO b. Violate toxic effluent standards (under Section 307 of the Act)?

___ YES X NO c. Jeopardize endangered or threatened species or their critical habitat?

___ YES X NO d. Violate standards set by the Department of Commerce to protect the marine sanctuaries?

___ YES X NO e. Evaluation of the information in II C and D above indicates that the proposed discharge material meets testing exclusion criteria for the following reason(s) (with mitigation):

(X) Based on the above information, the material is not a carrier of contaminants.

( ) The levels of contaminants are substantially similar at the extraction and disposal sites, and the discharge is not likely to result in degradation of the disposal site, and pollutants will not be transported to less contaminated areas.

( ) Acceptable constraints are available and will be implemented to reduce contamination to acceptable levels with the disposal site and prevent contaminants from being transported beyond the boundaries of the disposal site.

3. <u>Other Restrictions. Will the Discharge Contribute to Significant Degradation of "Waters of the U.S." through Adverse Impacts to</u>:

___ YES X NO a. Human health or welfare, through pollution of municipal water supplies, fish, shellfish, wildlife, and special aquatic sites?

___ YES X NO b. Life states of aquatic life and other wildlife?

___ YES X NO c. Diversity, productivity, and stability of the aquatic ecosystem, such as loss of fish or wildlife habitat or loss of the capacity of wetland to assimilate nutrients, purify water, or reduce wave energy?

___ YES X NO d. Recreational, aesthetic, and economic values?

4. <u>Actions to Minimize Potential Adverse Impacts (Mitigation) Will all Appropriate and Practicable Steps (40 CFR 230.70-77) be Taken to Minimize the Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem</u>?

X YES ___ NO

The Applicant shall obtain any and all additionally necessary permits from relevant permitting agencies and

shall abide by any conditions attached to these permits.

Implementation of the applicant's mitigation plan shall begin concurrently with the initiation of on-site project work in wetlands.

Included in the mitigation plan will be a monitoring program to ensure that conditions have been complied with and that performance standards are met as conditions of the permit. The monitoring program will be of sufficient duration to determine that mitigation objectives have been reasonably achieved, and will provide overview of the mitigation plan implementation.

C. General Evaluation (33 CFR 320.4(a)

1. The Relative Extent of the Public and Private Need for the Proposed Work:

The dam will provide necessary irrigation water to a development project that provides housing and recreational opportunities for tourists and visitors to Guam. Designed as a complete destination resort, the Manengon Hills Resort Development will help to improve Guam's place in the competitive destination market with other islands in the Western Pacific Region. As such, the Manengon Hills Resort Development aids in solidifying Guam's emerging tourist industry.

2. The Practicability of Using Reasonable Alternative Locations and Methods to Accomplish the Object of the Proposed Structure or Work:

As detailed in the 404(b)(1) alternative analysis (Manengon Hills 404(b)(1) Alternatives Analysis, May 1990), no other off-site or on-site alternatives are practicable.

3. The Extent and Permanence of the Beneficial and/or Detrimental Effects that the Proposed Structures or Work May Have on the Public and Private Uses to Which the Area is Suited:

The U.S. Army Corps of Engineers has determined that 0.5 acres of wetlands will be permanently lost, which is not a significant biological impact when mitigated by the creation, enhancement and permanent dedication of ___ acres of wetland on-site. The project will provide beneficial housing and recreation facilities and will also provide economic benefits to Guam.

IV. Determinations

A. Finding of No Significant Impact (FONSI) (33 CFR Part 325)

Upon review of the information provided by the Applicant, all interested parties and the assessment of environmental impacts contained in Part II B of this document, it is determined that this permit action will not have a significant impact on the quality of the human environment. Therefore, an Environmental Impact Statement is not required.

B. 404(b)(1) Compliance/Non-Compliance Review (40 CFR 230.12)

( ) The discharge complies with the guidelines.

(x) The discharge complies with the guidelines, with the inclusion of the appropriate and practicable conditions listed above to minimize pollution or adverse effects to the affected ecosystem.

( ) The discharge fails to comply with the requirements of these guidelines because:

( ) There is a practicable alternative to the proposed discharge that would have less adverse effect on the aquatic ecosystem and that alternative does not have other significant adverse environmental consequences.

( ) The proposed discharge will result in significant degradation of the aquatic ecosystem under 40 CFR 230.10(b) or (c).

( ) The discharge does not include all appropriate and practicable measure to minimize potential harm to the aquatic ecosystem.

( ) There is not sufficient information to make a reasonable judgement as to whether the proposed discharge will comply with the guidelines.

C. Public Interest Determination

The issuance of a Department of the Army permit, as prescribed by regulations published in 33 CFR Parts 320 and 330 and 40 CFR Part 230, is not contrary to the public interest.