CENTRAL AND SOUTHERN FLORIDA PROJECT

APPENDICES to the FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT

ENVIRONMENTAL RESTORATION KISSIMMEE RIVER, FLORIDA

DECEMBER 1991

US Army Corps of Engineers
Jacksonville District
South Atlantic Division

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HYDROLOGIC AND HYDRAULIC ANALYSES

FORWARD

This analysis reviews hydrologic models, operating criteria, and engineering requirements of the hydrologic analyses presented in the Corps of Engineers' (Corps) 1985 Report on the Kissimmee River basin. It also reviews a hydraulic routing model developed by the South Florida Water Management District (SFWMD) to analyze a plan to reduce the conveyance capacity of Canal 38 and restore portions of the Kissimmee River to pre-project conditions.

SFWMD prepared a Kissimmee River Restoration report in June 1991 which used the hydrologic analyses produced by the Corps' 1985 Survey Report on the Kissimmee River. The major hydrologic differences in the two studies are the starting water surface elevation of Lake Kissimmee, the early discharge restrictions at S-65 and the hydraulic models used to route floods down the Kissimmee River. SFWMD used the Corps' runoff hydrograph model (HEC-1) and routing model (CHANOP) for the upper basin down to the outlet of Lake Kissimmee. Below the outlet, SFWMD used a dynamic wave routing model (DWOPER) which is able to simulate the restoration plan for the Kissimmee River. The CHANOP model is better suited for simulating the closely regulated existing Kissimmee River project. However, neither model is well suited for analyzing both conditions.

In this analysis of the recommended restoration plan, the starting water surface elevation of Lake Kissimmee is raised to 52.5 feet, National Geodetic Vertical Datum of 1929 (NGVD)[1], rather than the 51.0 feet used in the 1985 report. This is an integral part of a new plan to re-regulate lakes in the upper basin and to extend the hydroperiod of the Kissimmee River. To offset the increase in flood stages on Lake Kissimmee, the plan also calls for an increase in the maximum early regulatory release from Lake Kissimmee from 3,000 cubic-feet-per-second (cfs) to 6,000 cfs. This analysis also uses the DWOPER model to analyze the hydraulic performance of a restoration plan known as the Level II Backfilling Plan.

A directive of this study was to maximize the use of previous analyses and to minimize additional work. To the extent possible, this was followed. However, additional hydrologic studies were required in the Lake Istokpoga

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[1] All elevations in this appendix are referenced to NGVD.

basin and on numerous small tributaries to the Kissimmee River that will be impacted by the restoration plan. In addition, many hydraulic analyses were required because of the large number of features needed to implement the restoration plan. Storm frequency in this appendix is shown as return period. Actual statistical analyses and flood risks are defined by exceedence probabilities of 0.2, 0.1, 0.02, and 0.01 represented by return periods of 5-, 10-, 50-, and 100-year. The Standard Project Storm (SPS) and resultant Standard Project Flood (SPF) is defined as the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area.

HYDROLOGIC HISTORY

First Survey

Historical information on the Kissimmee River basin dates back to the Seminole Indian Wars which ended in 1858. Forts Kissimmee and Bassinger were constructed along the Kissimmee River, Fort Gardner between Lake Kissimmee and Lake Hatchineha, and Fort Davenport near the Polk-Osceola County line where it crosses Reedy Creek. The first Survey of the Kissimmee River was made by Lt. H. Benson of the Second Artillery, by direction of Col. H. Brown, commander of troops on the Caloosahatchee River; it was dated June 7, 1885. The survey gave the depths at different points along the river as well as tree growth. Lt. Benson wrote, "in my opinion a boat more than 60 to 70 feet in length drawing more than three feet of water could not go up the river, on account of the short bends, strong current and narrow channel".

Hamilton Disston

The area began to populate after the Civil War when settlers began moving into the Kissimmee basin. On July 20, 1881, Hamilton Disston and associates incorporated as the Atlantic and Gulf Coast Canal and Okeechobee Land Company. Four dredges were built by the company. One worked entirely on connecting Lake Okeechobee to the Gulf of Mexico through the Caloosahatchee River. The others worked from Lake Tohopekaliga to Lake Okeechobee. By August 1884, Disston's company had established a navigable waterway linking Lake Tohopekaliga with the Gulf of Mexico. East Lake Tohopekaliga was connected to Lake Tohopekaliga in 1884. However, the channel was little more than a ditch; navigable only by small boats. That year, the report of the State Engineer, H.S. Duval, stated that over two million acres had been permanently drained. Lake Tohopekaliga is reported to have dropped three feet in the first 30 days after Southport Canal was completed to Lake Kissimmee.

Navigation Study

Navigation began to flourish and dredging continued to tap into new headwater lakes. In 1888, dredging began from Lake Tohopekaliga up the east chain of lakes. Although the Kissimmee River had been dredged, the discharge capacity was still very small. The additional runoff from the new drainage area is likely to have held the river abnormally high for many years. Drainage works ceased in the early 1890's and the water table in the upper lakes basin began to stabilize at a lower level. The groundwater levels in the upper basin also stabilized and runoff to the Kissimmee River slowed. As discharge in the river slowed during the dry season, stages in the river began to fall to pre-dredging depths, and navigation was impacted. The navigation problem was probably not so much a lack of depth; but a lack of additional runoff created by upland drainage. These low water problems provided the impetus for the federal navigation survey study of the Kissimmee River in March 1901. This Survey provides us with the earliest record of water level elevation in the Kissimmee basin. Water stages during the normally dry season in 1901 are compared to 1947 flood levels and the current September 1 regulation schedule in Table A-1.

Higher Water Levels

The 1901 Survey shows the Kissimmee River and its headwater lakes at a much higher stage than exists today. However, the depths and sizes of the lakes found during the 1901 Survey were only slightly greater when compared to those found today.

BASIN DESCRIPTION

Location

The area under consideration is located in central Florida; it includes most of Osceola and Okeechobee Counties and parts of Orange, Polk, and Highlands Counties. It is bounded on the north by the lakes of the Orlando area, on the west by the Peace River watershed, on the south by Lake Okeechobee and the Indian Prairie-Harney Pond Canals area, and on the east by the upper St. Johns River Basin. The Kissimmee River is crossed from east to west by United States Highway 98, CSX Transportation Railroad (CSXT), State Road 70, and by State Road 60 near the outlet of Lake Kissimmee. Location of the area under consideration and its relation to the overall project area are shown on Figure 1 in the main report.

Kissimmee Basin

The entire Kissimmee River Basin comprises 3,013 square miles. The Lake Istokpoga area (622 sq. miles), lower Kissimmee River Basin (758 sq. miles), and the Upper Kissimmee Basin (1633 sq. miles) make up the principle divisions in the watershed. For description, the Upper Basin is subdivided into the East and West chains of lakes (732 sq. miles) and the Middle Lakes Basin (901 sq. miles). Lake Kissimmee was originally the principal source of Kissimmee River but channel and drainage development work connecting to the headwater lakes in the upper basin now place the source just south of Orlando. The watershed is about 105 miles long and has a maximum width of 35 miles. Elevations range from about 100 feet in the headwaters, and in excess of 200 feet in the high sandy ridge along the westerly boundary, to about 15 feet near Lake Okeechobee. Characteristics of the major subdivisions of the watershed are discussed in the following paragraphs.

East and West Chains of Lakes

The major lakes in the east and west chains are Gentry, Alligator, Preston, Mary Jane, Hart, East Tohopekaliga, and Tohopekaliga. Together with several minor lakes, they have a total surface area at normal stages of 70 square miles, or about 10 percent of the drainage area of the east and west chains. The flow divides generally in Alligator Lake. Northward flow is to Lake Mary Jane, thence south through Lakes Hart, East Tohopekaliga, and Tohopekaliga, thence to Cypress Lake; southward flow is through Lake Gentry and thence to Cypress Lake by way of Canoe Creek (C-34). A low, flat divide just east of Lake Mary Jane separates the Kissimmee River and upper St. Johns River watersheds. Overflow from the Kissimmee River Basin to the upper St. Johns River watershed once occurred during extreme high water. Boggy Creek, draining an area of about 77 square miles, discharges into East Lake Tohopekaliga. Shingle Creek, with a drainage area of 199 square miles, discharges directly into Lake Tohopekaliga.

Middle Lakes Basin

The principal lakes of the Middle Lakes Basin are Cypress, Hatchineha, Kissimmee, Tiger, Rosalie, Weohyakapka, and Marian. The combined surface area of those lakes plus that of several minor lakes is about 132 square miles, or about 15 percent of the total middle Kissimmee River drainage area. Lake Kissimmee is the most important and largest of the lakes in the Kissimmee River Basin, with a surface area of 55.5 square miles at the normal stage of about 51 feet. It is the southernmost storage area of the upper Kissimmee River watershed, collecting the inflow from 1,633 square miles of area before discharging into Kissimmee River. Cypress Lake, the collector lake for inflow from the east and west chains of lakes, discharges to Lake Kissimmee by way of Cypress-Hatchineha Canal (C-36), Lake Hatchineha, and Hatchineha-Kissimmee Canal (C-37). The average daily discharge from Lake Kissimmee for the period of gage record prior to the C-38 project was 1,180 cfs. The maximum daily outflow during the period of known record was 8,820 cubic feet a second, which occurred during the 1948 flood. Elevations in the Middle Lakes Basin range from as high as 200 feet on the sandy ridge west of Lake Pierce (near the city of Lake Wales) to about 58 feet around Lake Kissimmee. Several important lakes in the Middle Lakes Basin are not in the main chain of lakes, but are tributary to it.

Lakes Marion and Pierce are both tributary to Lake Hatchineha from the west. Lake Marion has an outlet on its north side by way of Lake Marion Creek, which flows southeasterly about 8 miles to the northwest corner of Lake Hatchineha. Flow from Lake Pierce enters the southwest side of Lake Hatchineha by way of Catfish Creek, which flows about seven miles east and northeast from Lake Pierce. In the area west of Lake Kissimmee, Lakes Weohyakapka, Rosalie, and Tiger form a secondary chain of lakes which discharge generally north and east to Lake Kissimmee. Lake Marian (not to be confused with the Lake Marion that is tributary to Lake Hatchineha, mentioned above) and Lake Jackson discharge into the east side of Lake Kissimmee through Jackson Canal. Reedy Creek, which discharges into both Lakes Cypress and Hatchineha, is the largest tributary, with a drainage area of 207 square miles.

Lower Kissimmee River Basin

Excluding the Lake Istokpoga area, the Kissimmee River between the outlet of Lake Kissimmee and Lake Okeechobee has a drainage area of 758 square miles. The easterly divide separating that basin from the upper St. Johns River Basin is low and poorly defined, with elevations up to 75 feet. For the most part, the westerly divide is a well-defined ridge with elevations ranging up to 130 feet. The old river channel meandered extremely. The straight-line distance between Lakes Kissimmee and Okeechobee is 52 miles but the old river channel distance was about 100 miles, with a total fall of about 36 feet. The maximum observed discharge at the mouth of Kissimmee River occurred in 1948 when the discharge reached a peak of 17,400 cfs. About 2,000 cfs of that total came from the Lake Istokpoga area. The flood of August 1928 (prior to gage records), which resulted from a hurricane, caused the river to discharge an estimated 20,000 cfs and rise to elevation 29.0 feet at State Road 70 bridge near Okeechobee.

HISTORICAL FLOODING

General

Rainfall records, dating back to 1871 for the Kissimmee River basin and the adjoining St. Johns River Basin, document the repeated incidents of major storms and the extended periods of inundation associated with these storms. Since construction of C-38 began in the mid-1960's, only the 1969 storm has produced flooding. Table A-2 shows the record of significantly wet years prior to and after C-38 construction. A discussion of the more severe floods follows:

Flood of 1945

Flooding of lengthy durations resulted from a hurricane that struck South Florida on September 15, 1945. The Kissimmee River Basin withstood average rainfalls of eight inches when the hurricane traveled northward through the center of the State. Because the area was already saturated from prior rains, areas of the Kissimmee basin experienced flooding for as long as eight months. The Reedy Creek tributary area was inundated for about three months, as well as tracts of fringe lands adjacent to the basin. The lower Kissimmee River Basin was flooded for most of the year. The peak outflow from Lake Kissimmee was 6,130 cfs and the peak stage of the lake reached 56.0 feet.

Flood of 1947

Flooding that occurred during 1947 was the most damaging of all recorded floods within the Kissimmee River Basin. About 250,000 acres were subjected to flooding of lengthy durations. An unusually wet summer followed by two hurricanes occurring on September 17, 1947 and October 12, 1947, caused the areas of the upper chains of lakes to flood three months. The central valley, between Lakes Cypress and Kissimmee, was inundated for about eight months. The peak outlet discharge from Lake Kissimmee reached 6,870 cfs at a peak stage in the lake of 56.9 feet.

Flood of 1953

Rainfall that was recorded during this time was on of the heaviest of any flood on record. An average rainfall of 46.8 inches occurred from June to October 1953. On October 9, 1953, a tropical disturbance traveled through the basin, bringing three to five inches of rainfall. The peak outflow from Lake Kissimmee was 7,170 cfs and the peak stage of the lake reached 56.8 feet.

EXISTING FLOOD CONTROL PROJECT

Kissimmee River Project (Canal 38)

Canal 38 (C-38) was authorized for flood control in 1954; designed between 1954 and 1960 and constructed between 1962 and 1971. The total length of C-38 is about 56 miles. There are six water control structures, S-65, S-65A, S-65B, S-65C, S-65D and S-65E, each with tieback levees, that divide the river into five pools. S-65 is the outlet structure from Lake Kissimmee and uses the SR 60 road embankment as a tieback levee. Pool A is between S-65 and S-65A; Pool B is between S-65A and S-65B; Pool C is between S-65B and S-65C; Pool D is between S-65C and S-65D and Pool E is between S-65D and S-65E. Structure 65E is located eight miles north of Lake Okeechobee. Details of these structures are available in the Design Memorandums; however, some pertinent information is given in Table A-3.

Design

The Kissimmee structures are designed to step down the 36 foot fall of the river in six foot increments. The canal is designed to pass the outflow from Lake Kissimmee plus local inflow for a storm equal to 30 percent of the SPF. The 30 percent SPF discharge capacity at Lake Kissimmee represents a 25 percent increase over historical capacity, thus, providing flood protection to the upper chain of lakes. In the lower C-38 basin, the design channel is capable of passing the twin-peaked hydrograph produced by the local inflow and the delayed peak from the upper basin. Even with higher inflow discharges, the C-38 project significantly reduced flood stages in the lower valley because of the reduction in surface friction and hydraulic conveyance provided by the canal.

Lake Kissimmee Regulation

Lakes Kissimmee, Hatchineha, and Cypress are regulated by a single structure, S-65 located at the outlet of Lake Kissimmee, at the head of C-38. The lakes are regulated between elevations 48.5 and 52.5 feet, according to a seasonally varying schedule. The present regulation schedule for flood protection of the Kissimmee River valley uses the storage capacity in Lakes Kissimmee, Hatchineha, and Cypress above elevation 51.0 feet to temporarily store floodwaters from the upper lakes. The design discharge of 11,000 cfs from Lake Kissimmee is restricted to a firm capacity of 3,000 cfs until flooding recedes along the lower river; usually less than two weeks. When the river recedes to a point where the Kissimmee River structures can discharge their design flow at design stages, the discharge from Lake Kissimmee is increased to 11,000 cfs. For floods less than about 10-year recurrence frequency, the inflow hydrograph into Lakes Kissimmee, Hatchineha, and Cypress has already passed the peak and has dropped to below 11,000 cfs before S-65 is opened up to the 11,000 cfs maximum discharge. Therefore, the peak stage in Lake Kissimmee would occur at the time discharge at S-65 is increased to 11,000 cfs. Before C-38 was built, the outlet capacity of Lake Kissimmee was impacted by backwater effects from the reach of Kissimmee River immediately downstream of the Lake. The maximum discharge recorded from Lake Kissimmee prior to the project was 8,800 cfs and occurred during the 1948 flood at a peak stage of about 57.0 feet. Today, the 11,000 cfs outlet capacity is available any time there is a three foot head differential across S-65. During floods, the full capacity usually becomes available on a rising stage in Lake Kissimmee at about 51 feet.

Regulation of Lake Kissimmee, Hatchineha and Cypress with the Level II Backfilling Plan

The conceptual regulation schedule proposed by the SFWMD in their June 1990 report is shown in Figure F-2 of the main report. Primarily, this schedule raises the maximum stage of Lakes Kissimmee, Hatchineha and Cypress from 52.5 feet to 54.0 feet; however, there are other differences. The new schedule proposes, that during March, the level of these lakes should not be allowed to rise or fall at a rate greater than 0.1 feet per week. This is based on a recommendation by the Florida Game and Fresh Water Fish Commission to facilitate fish spawning. There is also a minimum discharge requirement of 250 cfs that is in force at all times, except during March or when the Lakes are below 48.5 feet.

The new schedule shows a maximum 1 September stage of Lakes Kissimmee, Hatchineha and Cypress of 52.5 feet. These are the date and starting water surface elevation used in the SFWMD hydrologic analyses. This is the same initial condition used in this study. Accordingly, some discussion on the relationship of the regulation schedule to flood stages on the lakes is warranted. Theoretically, floods can occur almost any time. Therefore, the probability of a specific flood stage in Lake Kissimmee is a joint probability of antecedent lake stage and rainfall. Specifically, the total probability is the integral summation of the product of all the possible combinations that would produce that stage. The more traditional approach has been to start the storm at an average lake level which is usually represented by the 1 September stage on the regulation schedule. This is the approach followed in this study and all prior studies of the Kissimmee River Basin. The new regulation schedule was a design consideration in sizing the S-65 bypass weir to pass the median discharge at a stage of 52.5 feet.

HYDROLOGY

Rainfall

General

The rainfall frequency analysis performed for this study included a review of previous rainfall analyses utilized for the design of C&SF Project works. The additional period of rainfall records available since earlier studies in 1951 and 1953, in addition to current automatic data processing capabilities, led to development of a procedure for estimating the probability of basin wide rainfall events occurring.

Previous C&SF Rainfall Studies

Partial Definite Project Report, Central and Southern Florida Project, Par I (July 10, 1951)

This report presented analysis of mean annual, seasonal, and maximum rainfall for various durations. The rainfall study included an area outlined by the drainage areas of the Everglades, Lake Okeechobee, and the Kissimmee River. Coastal areas were not included. Maximum depth-area relationships presented for rainfall durations ranged from six hours to 12 months. Rainfall depths for a return period of 100 years and for durations from one to 12 months were also presented. The Standard Project Storm was computed by the Office of the Chief of Engineers as being 125 percent of the 100-year rainfall. Daily distributions of rainfall were generally obtained by prorating monthly values based on the rainfall pattern during the 1947 flood period. However, the maximum one-month rainfall was distributed with the maximum one-day rainfall assigned to the first day, the next highest rainfall was assigned to the second day, etc.

Part VI, Supplement b, Design Memorandum, Rainfall Frequency Estimates (September 4, 1953)

Rainfall frequency values utilized in the design of project works in the Kissimmee Basin were based on this report. Isohyetal maps of south Florida for various return periods of the maximum one-day rainfall are presented. A log-Pearson Type III frequency distribution with a 0.6 skew factor was utilized for the maximum one-day rainfall values. Values were provided that enabled computation of rainfall values for durations up to 60 days based on the one-day rainfall for each return period.

Studies were made of the depth-area relationships for the one-day duration and it became obvious that considerable variation can be expected between rainfall at a specific point and rainfall over a delineated area. The report concluded that the probability of future rainfall events over various durations could be confidently predicted up to about 50 years. Since the majority of frequency curves utilized were based on short records, extrapolation beyond about 50 years would not be advisable. Appendix A of the design memorandum report includes a rainfall frequency analysis for durations from one month to one calendar year. Monthly increments of maximum rainfall were based on calendar months. A normal distribution of monthly rainfall log values was utilized in this frequency analysis. Depth-area reduction factors were computed for various durations and frequencies.

Adopted Rainfall Procedure

Previous rainfall studies of the selected critical durations (30 days) exhibited two characteristics which indicated the need for an updated analysis. First, the previous analyses were dependent upon relative short periods of records at most rainfall gages. But more than 30 years of additional data are now available. Second, previous studies were made on the basis of a maximum calendar month of rainfall rather than a maximum 30-day period of rainfall. Basin wide rainfall frequencies were computed for this study utilizing the current available period of record for the duration of 30 days. Table A-4 gives the average basin rainfall depths used in this study.

Basin Wide Rainfall

Average daily rainfall amount over both the upper and lower basins was computed for the period of record. All available gage data of acceptable quality were utilized for this method. An average rainfall value over the entire basin was then calculated by area weighing the rainfall at each gage, utilizing the Thiessen Polygon Method. The basin wide maximum rainfall value for a duration of 30 days is identified for each year.

Point Rainfall

Maximum rainfall values for durations of 1, 2, 5, 10, 20, and 30 days were identified for each year at all rain gages. Point rainfall frequencies for the upper and lower basins were computed by area weighing the point rainfall values at each gage utilizing the Thiessen Polygon Method.

Frequency Distribution

A log-Pearson Type III distribution analysis was utilized for both point and basin wide rainfall analyses. Skew factors were obtained from the results of a regional analysis of south Florida. The skew factors varied with duration and location. For the 30-day duration, a skew factor of zero was used. Point rainfall data was checked and adjusted for high outliers according to procedures prescribed in the *Guidelines for Determining Flood Flow Frequencies*, U.S. Water Resources Council. Figure A-1 shows a comparison of basin wide and point rainfall frequency.

Project and Post-Project Runoff

Data representing runoff conditions was gathered during the pre-project and post-project years from 1930 to 1962 and from 1966 to 1982, respectively. Comparing the basin average rainfalls for the pre-project and post-project periods for the Kissimmee basin, as well as the neighboring runoff areas in South Florida (see Table A-5), the pre-project years possessed a larger amount of rainfall than for the period since the project was completed. (See Table A-6 for a comparison of pre-project and post-project runoff values).

Evapotranspiration Losses

That portion of rainfall not classified as runoff is called losses. Most losses result from infiltration, evaporation, and transpiration. The U.S. Soil Conservation Service (SCS) has devised a method of estimating these losses based upon hydrologic soil classification, land use, and antecedent moisture conditions. Each type of soil has been analyzed and assigned a rainfall runoff classification of either (A), (B), (C), or (D) with classification (A) having the most losses (least runoff) and classification (D) having the least losses (most runoff). From previous SCS studies, each runoff soil group has been assigned a runoff curve value (0 to 100) representing roughly the percentage of water that will runoff from a given storm rainfall. The majority of soil types found in the upper and lower basins are classified under the Smyrna-Myakka-Basinger soil association. Other predominate classifications are the Myakka-Basinger category and the Myakka-Immokalee-Basinger category. Most of these soils have a variable runoff classification that depends on the antecedent moisture condition of the basin.

The SCS curve number (CN) methodology was originally developed for the short duration storm event, normally 24 hours or less. To account for the evapotranspiration (ET) experienced during a 30-day storm, an average ET value of four inches for the month of September was reduced to a daily amount and subtracted from the total rainfall amounts for each day. The actual loss was 3.8 inches since the peak two days of rainfall were judged sufficiently wet to preclude significant ET losses. The expected probability correction was not applied to the rainfall frequency analysis.

Unit Hydrographs

Six-hour unit hydrographs were used to model the rainfall runoff process in the Kissimmee River basin. However the standard unit hydrograph shape, developed by the SCS based on the ratio between the rising and falling limbs of a triangular unit graph, were inappropriate for the area. The shape of the unit hydrographs were patterned after those presented in the Kissimmee River GDM, Part II, Supplement 5 (1956). The standard peak rate factor was changed from 484 to 312. This produced unit hydrographs with lower peaks and longer recession limbs.

Pilot Storm

Based on a total of 519 years of rainfall records at 13 gaging sites, a 30-day pilot storm was selected. The storm occurred in September and October of 1953 and included the passage of two hurricanes. The rainfall distribution provided by this storm is typical of the storm patterns for the study area and is of the same distribution that was used in the original GDM.

HYDROLOGIC MODELS

HEC 1 Flood Hydrograph Model

The Corps' flood hydrograph model (HEC-1) was used to compute flood discharges for the 5-year, 10-year, 50-year, 100-year, and SPF storm frequencies. The Kissimmee Basin was divided into 13 sub-basins, eight areas draining into the upper lakes region and five areas that drain into the five pools along C-38. The model simulates the rainfall runoff response to the watershed by representing the basin as a system of hydraulically connected sub-basins. Each sub-basin is simulated by a group of hydrologic and hydraulic parameters which describe aspects of the rainfall runoff process within each sub-basin. Principal parameters used in the hydrologic simulation are average basin rainfall, infiltration, losses, land slope, soils, stream length, soil cover, and land use. Another parameter used was the SCS's formula of small watershed lag. This is a mathematical composite of several hydrologic parameters.

Principal hydraulic parameters used in the HEC-1 model are channel conveyance, channel roughness, and channel storage. These parameters are primarily used to route storm runoff through storage within each sub-basin and channel route outflow hydrographs to downstream junctions. However, the existing Kissimmee River (C-38) is highly regulated and outflows are predominately tailwater driven. Therefore, a new routing model had to be developed. HEC-1 was used to develop the inflow hydrograph for input into the routing model. Table A-7 list some of the hydrologic parameters of each sub-basin.

HYDPAR

A grid cell data bank was constructed to organize all hydrologic parameters. This consisted of subdividing the Kissimmee River basin into grid cells. Each grid cell was represented by 50 detailed soil classifications (provided by the SCS soil classifications maps), 29 land use types, ground elevations, and nine hydrologic soil groups.

In order to access information stored in the data bank, HYDPAR, a Hydrologic Engineering Center utility program, was used. HYDPAR has the capability to compute SCS curve numbers (CN) and sub-basin lag times based on the SCS dimension-less unit hydrograph procedure. After the program assigns a CN for each grid cell, an average value of CN is then computed for each sub-basin within the study area.

HYDPAR's data hierarchy was modified to accept up to nine hydrologic soil types and 29 land use types. Normally, the land slopes are determined from HYDPAR for each grid cell. A slope for each sub-basin is computed by taking an arithmetic average of the grid cells' land slopes within the sub-basin. However, for the Kissimmee River drainage basin, the upland areas required a manual computation of the sub-basin slopes by scaling off the distance between the elevation contours on USGS quadrangle maps. HYDPAR was then modified to allow manual input for each of the sub-basin land slopes.

A soil data matrix was developed to coordinate the CN, the land use type, and the hydrologic soil classifications for each sub-basin. The antecedent soil moisture condition II (AMC II) for average conditions was used in this study.

Hydrologic conditions were analyzed for the years 1985, 2000, and 2035. Lag times and CN's were calculated by HYDPAR for each of these three years. After reviewing the resulting values, it was determined that the CN's and lag times did not differ significantly beyond 1985 conditions. Therefore, the hydrology described in this appendix is suitable for both existing and future runoff conditions in the basin.

CHANOP

The existing Kissimmee River Project is a complex and closely regulated system. No existing generalized mathematical model was found to be adequate in modeling the entire basin. The primary difficulties were tailwater effects at the structures, varied regulation of structures based on downstream conditions, and the need to develop structure discharges based on changing downstream conditions. The Channel Structures Operation Program (CHANOP) for the Kissimmee River routing and channel operation model was developed by the Jacksonville District and written at the Hydrologic Engineering Center in Davis, California. CHANOP uses a sloping pool, modified Puls routing and various methods of computing structure discharges. These methods include digitized gate opening and discharge rating curves, table look-up of pre-computed headwater, tailwater, and discharge data, and hydraulic equations to compute various types of discharge. However, the most important feature of CHANOP is that all calculations for each reach are computed, routed and balanced, prior to going to the next time interval step. With this method, tailwaters are available for discharge calculations and downstream operational constraints can be evaluated before the structures are operated.

HEC-2

Most of the routing information required to be compiled into the CHANOP program, such as rating curves and elevation storage curves for sloping pools, were developed by the Corps' water surface profile package, HEC- 2.

DWOPER

The Dynamic Wave Operational Model (DWOPER) was only used to route flood flows through the Lower Kissimmee River for the Level II backfilling restoration plan. DWOPER is a dynamic wave routing model based on an implicit finite difference solution of the complete one-dimensional St. Venant equation. Input into the DWOPER model consisted primarily of an inflow hydrograph at the upstream boundary of the model. This boundary condition was the flood outflow hydrograph from Lake Kissimmee computed by the CHANOP model. The input also included the same HEC-1 generated inflow hydrographs from the tributaries along the Kissimmee River that were used in the existing condition CHANOP model, and 85 field surveyed cross sections describing the refilled channel geometry and floodplain topography for the Level II backfilling plan. The downstream boundary was a stage hydrograph of Lake Okeechobee. The model simulated weirs and other structures as internal boundaries; however, it could not model the structure operating criteria of the existing C-38 project.

DWOPER Topographic Input Data

The detailed topographic information needed to define the floodplain geometry in the DWOPER model was developed from cross sections obtained by a Corps field survey in 1979. The survey drawings are located in D.O. FILE NO. 77-33-244 in the Corps' Jacksonville District Office. This is the basic topographic data used in the previous 1985 and 1990 studies. The field survey obtained 90 cross sections along a base-line that followed the C-38 alignment between Lake Okeechobee and Lake Kissimmee. Station 0+00 is the centerline of State Road 78 at Lake Okeechobee and the cross section numbers increase to the north. The same stationing and cross section numbers were used in this report. However, not all of the surveyed cross sections were used. Additional cross sections were obtained by interpolation, and some were moved in some way to define some special topographic feature in the model. To distinguish between cross sections at new locations with those taken directly from the field surveys, a letter has been added to the cross section number of the extra or moved cross sections. Only those cross sections used in the DWOPER model are shown in this report.

Manning's "n" Value

The hydraulic resistance of the future marsh filled floodplain is perhaps the most important parameter in the DWOPER analysis. Manning's Roughness Coefficient is a major determinant of flow velocity and conveyance and it directly affects water stages during floods. Sensitivity analyses on a range of "n" values from 0.15 to 0.5 showed that even small variations in the value can have a significant impact on flood stages. The value of 0.3 was selected for this study and is based on analyses summarized in Table VII-1. of the 1990 report by SFWMD. In that study, a one dimensional model of the Kissimmee River was run for four separate discharge conditions and for three "n" values (0.3, 0.5, and 1.0). The discharges were obtained from pre-project gage records at the outlet of Lake Kissimmee and the Kissimmee River at Lake Okeechobee. The computed stages from the numerical model for the three "n" values are compared to the actual observed stages in Table A-8.

MODEL CALIBRATION

CHANOP Model

To calibrate the CHANOP model for existing conditions, the 1969 storm event was modeled for the lower basin of the Kissimmee River. With ongoing construction, limited data was available for discharge, headwater stage, rainfall and estimated tailwater stages at the six S-65 structures. Calibration between actual and simulated storm volumes within each sub-basin was very good. However, peak discharges and stages at each structure indicated that during the actual 1969 event, the gate openings were restricted. It was found that the model follows the gate opening curves exactly, resulting in the gates opening and closing at each time step. However, in actual operation the gates were used to balance the pools and the operation was less radical. The average discharge over a long period of time in the model matched closely with the recorded discharges.

DWOPER Model

The CHANOP model was used for existing conditions and the DWOPER model was used for the Level II backfilling plan. In order to compare performance, it would require revising one of the models to the hydrologic conditions of the other. To revise the DWOPER model for existing conditions would have required a complex reprogramming of the DWOPER model. To revise the CHANOP model for the Level II Backfill Plan would have required revising all the HEC-2 generated routing information input internally into the model. This is because there is a substantial difference in the Manning's roughness coefficient between the vegetation in the existing floodplain and that which will become established with the restoration plan.

A third alternative was available as a result of work done with the CHANOP model in the 1985 study. There, a plan called "Partial Backfill" was analyzed which was almost identical to the Level II backfill plan. The only major difference is that the 1985 study used a Manning's "n" value of 0.15 for the floodplain. As previously discussed, a Manning's "n" value of 0.3 is more appropriate for the marshy vegetation that will become established with the restoration plan. To compare the results of the two models, the "n" value for the restoration plan in the DWOPER model was reduced to 0.15 and the results were in reasonable agreement with those published for the Partial Backfill Plan in the 1985 report.

ANALYSES OF KISSIMMEE RIVER TRIBUTARIES

Lake Istokpoga Canal

Historically, the only outlet of Lake Istokpoga was east through Istokpoga Canal to the Kissimmee River. Today, the capacity of that canal is limited and the primary flood outlet of the lake is through canal 41A and associated canals south of the lake. Canal 41A discharges into the Kissimmee River below S-65E and offers a firm outlet capacity from Lake Istokpoga of 3,000 cfs and a maximum capacity of 5,900 cfs. The Level II Backfilling Plan will sufficiently increase flood stages at Cross Section No. 46 in the Kissimmee River to where backwater will impact the outlet capacity of Istokpoga Canal. The effect of this loss in outlet capacity on flood stages in Lake Istokpoga was analyzed and found to be small because of the large overflow capacity at the southern end of the lake once the stage reaches the top the local levee. Under the worst possible conditions of full restriction of 800 cfs for the entire storm, the Level II Backfill Plan will cause a 0.12 foot rise in the 10-year flood level of Lake Istokpoga and less than a 0.10 foot increase during the 100-year flood level. A 1982 flood insurance study gives the flood stages on Lake Istokpoga as follows: 10-year = 40.9 feet; 50-year=41.4 feet; 100-year= 41.7 feet; and, the 500-year = 43.0 feet. Outlet flood stages in the Kissimmee River for the Level II Backfilling Plan are given in Table A-15 at Cross Section No. 46.

Kissimmee River Tributaries

The tributaries along the Kissimmee River were grouped into 5 sub-basins according to which of the five pools they drained into. These sub-basins were analyzed using HEC-1 and the resulting inflow hydrographs were uniformly distributed into the river along the length of the corresponding pool. This is the way the tributary inflow was input into the CHANOP model for the existing condition analyses. It was also the way the inflow was input into the DWOPER model for the Level II backfill project conditions. In addition to an analysis of the combined tributaries of each pool, some of the larger tributaries were studied on a individual basis. The purpose of the analysis was to determine any backwater effects the high river stages cause by the Level II Backfill Plan project would have on the flood stages of the individual tributaries. The same hydrologic techniques, as previously discussed, were used to develop runoff hydrographs from the tributaries along Kissimmee River for 5-year, 10-year, 50-year 100-year and SPF floods. Table A-9 lists hydrologic parameters and peak discharges for some of the major Kissimmee River tributaries studied.

OTHER STUDY ITEMS

Proposed By-pass Weir at Lake Kissimmee Outlet

The Level II Backfilling Plan includes a weir to be constructed below State Road 60 to assist S-65 in the regulation of Lake Kissimmee. The design criteria for the weir was to have the crest set at elevation 51.0 feet, the median discharge of about 800 cfs from Lake Kissimmee to occur at a stage of 52.5, and the discharge performance of the weir to blend into the natural capacity of the historical outlet. The weir was not considered in the DWOPER modeling because for the design storms analyzed, S-65 was able to meet the discharge requirements. However, it is pertinent that the structure was just barely able to meet the requirements because of the higher tailwater caused by the Level II Backfill Plan. On the recession side of some of the Lake Kissimmee flood hydrographs, S-65 was unable to discharge the 11,000 cfs design flow; but this was not considered a deficiency because it did not affect the peak stages. Considering that some head loss occurs between S-65 and the south end of Lake Kissimmee, especially at lower stages, and that strong winds may affect Lake Kissimmee levels during floods, it is likely that the weir will be required at times to meet the 11,000 cfs outlet capacity. Other reasons for the weir include the facts that the weir would reduce the cost of operating S-65 and would better mimic the historical discharges from Lake Kissimmee. Figure A-2 shows the historical rating curve for the outlet of Lake Kissimmee prior to the C-38 project. Also shown is the performance rating of the proposed weir.

PRESENTATION OF RESULTS

Historical Data

Table A-10 gives the historical flood elevations in the Kissimmee basin for the 1947 and 1953 floods along with the optimum and design stages shown in Detailed Design memorandum for the Kissimmee Project. These stages are shown as historical data because they no longer represent existing condition. Since the project was completed in 1971, several of the Kissimmee River structures have been modified, structure operation have been revised and regulation schedules have changed. The stage data is furnished so that they may be compared with existing conditions and those stages that will occur with the Level II Backfilling project.

Existing Conditions

A summary of results of the CHANOP model for both the upper basin lakes region and the lower Kissimmee River are given in Table A-11. The CHANOP model was run on conditions that exist today. The water surface elevation of the Kissimmee Chain-of-Lakes at the beginning of the design storm was in accordance with the 1 September stage of the current regulation schedules. The starting water surface elevation on Lake Kissimmee was 51.0 feet. Discharge out of Lake Kissimmee was in accordance with the current operating criteria which limits the discharge at S-65 to 3,000 cfs when downstream stages exceed specified levels. The area flooded along the Kissimmee River for the 5-year and 100-year floods for existing conditions is shown on Plates A-1 through A-5.

Level II Backfilling Conditions

A summary of results of the CHANOP model for the upper basin lakes region and results of the DWOPER model for the Kissimmee River for the Level II Backfilling Plan are given in Table A-12. The CHANOP portion of the analysis is the same as for existing conditions except that the 1 September starting water surface elevation of Lake Kissimmee was raised to 52.5 and the outflow criteria from S-65 was changed. The Level II Backfilling Plan eliminates the need for the present operating criteria at S-65. The only flow restriction at S-65 was that the discharge could not exceed 6,000 cfs until Lake Kissimmee reached a stage of 53.8 feet.

For comparison purposes, the locations shown in Table 12 are the same as those shown for existing conditions in Table 11. Table A-13 displays the algebraic difference between Tables A-11 and A-12.

Comparison of Stage Hydrographs

Figures A-3 through A-7 compares the stage hydrographs for existing conditions with those of the Level II backfilling conditions at the Kissimmee River structure locations, for the 5-year, 10-year, 50-year, 100-year and SPF.

Discharges and Velocities

Table A-14 gives discharges and velocities at key locations along the Kissimmee River for the Level II Backfilling plan.

Flood Stages

Table A-15 gives the flood-stage-frequency results for the Level II Backfilling Plan at all 85 cross sections used in the DWOPER model.

Flooded Area

The area flooded along the Kissimmee River for the 5-year and 100-year floods for the Level II Backfilling condition is shown on Plates A-6 through A-10.

HYDRAULIC ANALYSIS

Hydraulic Design Criteria

The Kissimmee River was channelized and provided with water control structures as part of the flood control system designed to serve the upper Kissimmee valley chain of lakes and the river itself. The major project feature of the flood control project for the Kissimmee River consists of a canal (C-38) and 6 water control structures (S-65, S-65A, S-65B, S-65C, S-65D, and S-65E). That canal was constructed in the historic flood plain between Lake Kissimmee and Lake Okeechobee. The canal and structures provide in-bank conveyance for the 30 percent of SPF discharge from Lake Kissimmee and local runoff through the floodway to Lake Okeechobee. The existing canal bottom width varies from 90 feet to 300 feet wide with depths of about 30 feet. The canal was designed by slope control. Design discharge produces low velocities less than 2 feet per second. Side slopes were cut to 1 vertical on 2 horizontal.

The objective of the proposed dechannelization is to restore the natural hydroperiod of the reaches of the Kissimmee River floodway which are to be backfilled. The pre-C-38 flow-way consisted of a floodway up to 2 miles in width with a smaller sinuous channel with a capacity of about 800 to 1,000 cfs. The size of C-38 is many times the size of the sinuous historic channel. Construction of C-38 segmented the original channel into oxbow segments. Many reaches were cut or destroyed by excavation of the project channel or were buried under the spoil mounds generated by excavation of the channel.

The existing conditions for this study are assumed to be the existing C-38 channel and structures. The post-project condition is assumed to be the Level II Backfilling Plan.

WATER SURFACE ELEVATIONS

The existing water surface profile for discharges through C-38 (Kissimmee River) form a "stair-step" configuration as flood discharges would be conveyed from Lake Kissimmee through the C-38 channel and the six gated water control structures. The proposed de-channelization would result in a natural continuous profile which would be higher than the project design profile. Figure A-8 shows the existing water surface profile for the 1 in 5-year, and 1 in 100-year events. As stated previously, C-38 and the structures provide in-bank conveyance for the 30 percent of SPF discharge from Lake Kissimmee and local runoff through the floodway to Lake Okeechobee. Higher discharge floods would cause ponding upstream of the structures which would be contained by tieback levees. Post-project flooding was analyzed by using a computer program entitled DWOPER.

Analyses of the tributaries was performed by the HEC-2 computer models. The tributaries are characterized by relatively constricted central channels with pasture lands usually extending up to the channel. Each channel is filled with vegetation.

The tributaries were analyzed to determine if induced flooding results from the proposed project for the 100-year and SPF storm frequencies. The drainage area adjacent to the river was broken into 50 sub-basins. Each sub-basin consisted of a tributary inflow point to the river. Post backfilled stages from the Kissimmee floodway completely inundate identifiable topographic relief for 20 of the sub-basins. This rendered hydraulic analysis unnecessary. About 30 tributaries were identified and modeled using HEC-2.

Each tributary was analyzed with three starting water surface conditions and three flow conditions.

The first condition analyzed was the existing conditions. This condition used the starting water surface elevation from the Kissimmee River and used the peak discharge of the tributary.

The second condition analyzed was one of two proposed conditions (with Level II Backfill in place). This analysis used the starting water surface elevation from the Kissimmee River that corresponded to the time when the peak discharge would occur within the tributary. Backwater profiles for the tributary were compiled for the peak runoff condition.

The third condition was the second proposed condition with Level II backfilling in place. This analysis used the peak stage in the Kissimmee River as the starting water surface elevation and the discharge corresponding to that time in the tributary.

The backwater profiles were compared and the worst condition was considered. Induced flooding was considered to occur when the stages in the tributaries increased. The limits of the induced flooding extended from the old C-38 channel, up the tributary to the point where normal depth occurred. When the Kissimmee River's 100-year stage was higher than the normal depth elevations, no induced flooding was considered other than flood plain flooding. Analyses determined that the tributaries were not being impacted because of the flow from the tributaries but rather from the peak stages in the Kissimmee River. All conditions showed that differences in backwater stages are negligible. The Table A-27 shows increased stages for tributaries whose backwater profiles would be affected by the SPF stages.

CANAL CHARACTERISTICS

The Level II Backfilling Plan calls for backfilling the existing C-38 channel between stations 544+35 and 2075+00. The original design alignment of C-38 was chosen to minimize the amount of channel excavation and consequently, cut across the old river channel at numerous locations. Backfilling the C-38 channel will require that those sections be reconnected with the new channel. Since the objective of the project is to construct features which would re-establish the low flow regime, the size of the new channel was determined by averaging the conveyance of remnant channel sections upstream and downstream of the sections of C-38 which are to be backfilled.

The post-project condition assumes that the existing C-38 channel would be backfilled to elevations which correspond to the pre-project bank elevations in the immediate vicinity of the channel section. Before each section of C-38 is backfilled, the new channel would be constructed adjacent to the existing C-38 channel. Those channels would provide bypass conveyance around the backfill section and would remain as a permanent features.

New canal sections to be designed are sections of channel to reconnect the historic oxbows. Channel sections would be designed to provide the same conveyance as the natural sections upstream and downstream of the filled sections. Geometry of the design channel segments would match the geometry of existing channels.

Maximum Permissible Velocities

Sections of the existing channel were analyzed to determine the maximum velocities which could be expected in the original channel. The existing channel segments are very sinuous with many oxbows and heavy bank vegetation. Analyses showed that the maximum velocities for the restored channel would be between 1.8 to 2.0 feet per second for a bankfull stage. Discharges which exceed bankfull would begin to discharge overland passing through the floodplain as sheet flow. Computer modeling of the floodplain under post-backfilling conditions showed average velocities would be on the order 0.2 to 0.4 feet per second.

Side Slopes

New channel segments required to connect existing oxbows would be located as close to the historic channel alignment as possible. Historic alignments which pass through areas now covered by spoil mounds would be reconstructed. All other alignments would be designed to pass through areas that have not been disturbed by previous channels or man-made excavation. Side slopes measured from existing oxbow channel sections range from 1 vertical to 2.8 to 3.6 horizontal. Minimum side slopes for oxbow channel replacement canal segments would be designed for stability after soil sampling and analyses of existing conditions on those alignments. Inside and outside radii of curves or bends in the oxbows would be provided with side slopes conducive to environmental enhancement stability.

Floodplain Cross Sections

Numerical computer models were formulated from field cross sections taken in 1979. The location and spacing was chosen after field reconnaissance and review of available USGS quadrangle maps. The cross section data was coded into the input format for HEC-2, DWOPER and CHANOP numerical computer models. Plates A-1 through A-5 show the location of the cross-sections. No major storm events have occurred since those surveys were taken and there is no evidence that appreciable changes have taken place in the basin since construction of the project. The survey data is considered adequate for this report.

Tributary Cross Sections

Tributary cross sections were compiled from USGS quadrangle maps and limited topography provided by SFWMD. Spacing of sections were set at about 2,000 feet except where geometric changes occurred, then spacing was more frequent to simulate the hydraulic conditions. The cross sections were taken perpendicular to the direction of flow.

Transitions

Transitions from project channels to natural channels would be gradual and would be furnished with grade control measures to insure against erosion due to high velocities. Various configurations for transitioning discharges from backfilled sections to the existing C-38 channel were studied by Dr. Shen's design team at the University of California, Berkeley. Physical model studies at the University of California, Berkeley, produced a preliminary plug design for that purpose. That design is proposed for the downstream end of backfill sections which would act as temporary and permanent grade control measures.

Roughness Coefficients

Pre-project flood events were reviewed for stages and discharges to determine the average manning's roughness coefficient for each individual event. Table A-8 shows the computed roughness values for recorded events. Roughness coefficients were shown to increase inversely with depth. A roughness coefficient of 0.3 was chosen for analyses of the post-backfilling flood stages in the Kissimmee floodway..

Roughness values for the tributaries were based on density of vegetation in the area as could best be determined from the site investigations, pictures and flow-way limits outlined on USGS Quadrangle maps. The values chosen are consistent with criteria used in other similar projects in Florida. The tributaries are characterized by heavy vegetation and minimal or negligible base flow. Vegetation, and not soil condition, is the controlling factor in roughness determination. Roughness coefficients for existing and proposed conditions range from 0.08 to 0.15 in channel sections to 0.15 to 0.2 in overbank areas. Sensitivity analyses showed that increasing roughness values induced normal depth to occur in tributaries at locations closer to the Kissimmee River floodway. The resulting effect on backwater profiles was to decrease the distance that normal depth would be reached in the tributary for a given discharge. Consequently, areas flooded due to increased stages in the main floodway would be small under large roughness values.

Freeboard

No freeboard was considered in channel design.

Water Control Structures

Water Control Structures S-65, S-65A, S-65B, S-65C, S-65D and S-65E are ogee weir spillways with slide gate controls. Table A-3 shows the hydraulic design data for each structure. Each structure provides up to 6 feet of head loss. S-65, S-65A and S-65E with upstream and downstream approach channels would not be removed. S-65B, S-65C and S-65D would be decommissioned and subsequently demolished and the tieback levees removed to natural grade.

The structures at S-65B, S-65C and S-65D have been modified by installation of gate extension plates on the top of the gates. Those modifications were completed to allow regulation of higher stages upstream of the structures in a past experiment to increase wetlands without backfilling. The gate extensions would remain to allow higher stages to cause inundation backfill above the structures. Before backfill would begin between any of the existing structures, the historic oxbow sections would be reconnected by excavating new channel segments to the post-backfill channel dimensions. This would provide continuity for discharges in the 800 cfs to 1,200 cfs range. Reconnected channel segments would also provide bypass for discharges around the backfill activities. Design of transition areas between floodplain and channels would be finalized by the proposed two-dimensional modeling. The hydraulic functions for the proposed construction sequence are described in the following paragraphs.

Degrade S-65A tieback levee and construction of overflow structures in the tieback levee. Installation of gate extensions would allow raising the upstream pool elevation to 48.0 feet. However, discharges would pass through the tieback levee and into the wetland areas west and east of S-65A when stages exceed 48.0 feet.

Backfill of C-38 in "Pool C" (upstream of S-65C) would begin after construction of the Istokpoga levee is complete and an "armored" plug constructed upstream of S-65C. Backfilling of C-38 would begin upstream of the plug. S-65C would be operated to prevent headwater stages from falling below 34.0 feet. Water surface elevations would be controlled to produce headwater stages at S-65C up to elevation 35.5 feet. Stages would be manipulated to insure that the area around the plug would be submerged to as great a depth as possible to prevent excessive velocities during discharge events. Under the original flood analyses, an SPF event could produce headwater stages at S-65C up to elevation 37.6 feet.

After completion of all proposed backfill segments in Pool C, the tieback levee of S-65B would be degraded to natural ground. The historic channel segments upstream and downstream of the tieback levee would be reconnected. S-65B and the boat lock at S-65B would then be rendered inoperable.

Backfill of C-38 in "Pool D" (upstream of S-65D) would begin after construction of Yates Marsh and Chandler Slough levees and the additional bridge openings in the US 98 and CSXT railroad causeways. An armored plug would be constructed upstream of S-65D to anchor backfill material. S-65D would be operated to prevent headwater stages from falling below 26.8 feet. Water surface elevations would be controlled to produce headwater stages at S-65D up to elevation 28.8 feet. Stages would be manipulated to insure that the area around the plug would be submerged to as great a depth as possible to prevent excessive velocities during discharge events. Under the original flood analyses, an SPF could produce headwater stages at S-65D up to elevation 32.4 feet.

After completion of all proposed backfill segments in Pool D, the tieback levee of S-65C would be degraded to natural ground. The historic channel segments upstream and downstream of the tieback levee would be reconnected. S-65C and the boat lock at S-65C would then be rendered inoperable.

Backfill of C-38 in "Pool E" (upstream of S-65E) would begin after construction of the weir structure upstream of S-65E and construction of an additional lock gate which would be added upstream of the existing boat lock. Backfill would also be preceded by construction of new levee segments which would connect the existing spoil mound and the existing east bank tieback levee. That would be required to protect the area behind the east bank spoil mound. An armored plug would then be constructed upstream of the SR 70 bridge. Backfilling of C-38 would begin upstream of that plug. Water surface elevations would be established by operation of S-65E in conjunction with the weir. S-65E would be operated to prevent headwater stages from falling below elevation 21.0 feet. Water surface elevations would be controlled to produce headwater stages upstream of the weir at S-65E up to elevation 27.0 feet. Stages would be manipulated to insure that the area around the plug would be submerged to as great a depth as possible to prevent excessive velocities during discharge events. Under the original flood analyses, an SPF event could produce headwater stages at S-65E up to elevation 24.2 feet.

After completion of all proposed backfill segments in Pool E, the tieback levee of S-65D would be degraded to natural ground. The historic channel segments upstream and downstream of the tieback levee would be reconnected. S-65D and the boat lock at S-65D would then be rendered inoperable.

After completion of all phases of backfilling in Pools C, D, and E, backfilling operations would begin upstream of the former site of S-65B. Experimental discharges and monitoring of resulting stages are planned to determine the effects of backfilling between S-65B and S-65E on stages at S-65A. The data collected during those discharges and the results of the proposed two-dimensional modeling would be evaluated to determine the final termination of backfill of C-38.

Backfill of the C-38 channel would terminate 2.25 miles upstream of S-65E. Discharges from the backfilled reached of C-38 would transition from shallow floodplain flow to the existing C-38 channel. A fixed crested weir would be constructed upstream of S-65E to cause an increase in stages at the beginning of the backfill section upstream of SR 70. The increased stages will result in decreased velocities on the downstream face of the armored plug. The weir was designed to pass an SPF discharge of 19,000 cfs at a stage of 27.0 feet, NGVD. This represents a reduction from the C-38 SPF discharge of 24,000 cfs. That reduction is due to additional flood storage in the backfilled segments of the floodway due to higher stages. Tailwater elevations at the weir would be controlled by the operation of gates at S-65E.

An additional fixed crest weir would be constructed to augment discharges from S-65. The weir would provide a two fold service. Uncontrolled discharges over the weir would provide a more natural hydroperiod during non-flood times and would allow reduced discharges through S-65. Additional capacity would also be available to augment S-65 discharges in the event that higher than expected tailwater conditions occur in Pool A. The weir was designed to pass a discharge of 800 cfs at a lake stage of 52.5 feet. The crest would be set at elevation 51.0 feet. That design corresponds to a discharge which has 50% chance of exceedence. Design stages are based on preliminary water supply estimates and routings for the upper basin and will be reviewed upon completion of those routings.

Inlet structures would be provided to maintain flow through levees which block natural flow patterns.

An inlet culvert structure would be required to provide discharge of flow from the Lake Istokpoga floodway to the restored Kissimmee River floodway. The Istokpoga Levee would be constructed to prevent flow from the Kissimmee River to Lake Istokpoga due to the higher expected stages in Kissimmee River under flood discharges. The structure would be controlled by flapgates to prevent backflow from Kissimmee River. The design head loss is 0.5 feet.

Culverts would be required to provide continuous discharge to the Kissimmee River through the Yates Marsh Levee. The design would allow discharges to flow through natural swails to the Kissimmee River floodway.

LEVEES

Three levee sections would be required to contain the higher stages within the floodway. The levees would reduce the land purchase requirements while not infringing into the "wetland" areas to be recreated. The alignments would also minimize encroachment into floodway and would terminate at natural ground elevations greater than the expected water surface elevations. Because of the relatively small difference between the 1 in 10-year and 1 in 100-year stages for the design backfill condition, the level of protection for project levees is 1 in 100-year.

A study of discharge and stage from past recorded events revealed that roughness associated with shallow flow regime was significantly higher than the somewhat deeper flow associated higher discharge events. This is attributable to the nature of vegetation within the flow-way which when overtopped has less impact on resistance and stages.

Minimum freeboard was designed after a review of the stages expected for all floods after the backfill was completed. Levee crest were designed by modeling the flow-way under the conditions that assumed that all proposed backfill was in place and the roughness of the floodway was increased from 0.3 to 0.5. This would amount to a 60% increase in roughness value for the basin. That roughness coefficient has been determined to be attributable to low shallow flow conditions and would represent a dense vegetation resistance factor. Levee crest are considered to provide safety against the possibility that the roughness value of the floodway could increase seasonally.

BRIDGES

The original project channel was bridged at four locations. State Roads 60, 78 and 98 (SR 60, SR 78 and SR 98) and one CSXT (formerly Seaboard Coastline) railroad bridge. SR 60 and SR 78 are outside the backfilling project limits and no modifications are planned to those bridges or the approach causeways. Hydraulic modeling of discharges through varying levels of backfilling showed flood stages would not reach the low chord of any bridge. However, the approach roadway to US 98 would be raised. The existing C-38 channel section under SR 98 and the CSXT railroad bridge would be backfilled to reduce the depth under each bridge and assure higher stages and low recession rates in the adjacent marsh. Additional bridges would be provided through the existing approach causeways to allow increased backfilling under the existing bridges and to provide a more even distribution of flow in the floodway upstream and downstream of the bridges.

Bridges were analyzed and backfill set to simulate not less than 4 feet of debris buildup around bridge piers. Maximum allowable backfill was also limited to elevations which would allow conveyance of all flood flow frequencies with velocities less than 2.5 fps. Low velocities in the floodway should minimize debris and sediment transport.

BACKFILL MATERIAL

Backfill material would be obtained from areas on which material excavated to construct C-38 was stockpiled. Those areas are located within the floodway immediately adjacent to the C-38 channel. Removal of those stockpile mounds and the existing ring dikes would result in increased area available for wetland growth and flood flow conveyance. The hydraulic analyses assumed that those areas would be available conveyance of flood flows.

BERMS

Temporary berms would be required for construction of plugs. A low (one foot high) berm would be constructed around the upstream approach channel to the central CSXT railroad bridge. The function of the berm would be to prevent local runoff from entering the un-backfilled section of C-38, upstream of the bridge and thus lower recession rates for the immediate area. However, the berm would be highly(?) submerged by high discharges and would not affect design storm water surface elevations. Yearly maintenance would be required.

SEDIMENTATION POTENTIAL

General

The objective of the backfill project would be to largely re-establish pre-channelization conditions to the reaches between S-65A and S-65E. Sedimentation potential of several alternatives proposed for modification to the C-38 channel were addressed in Appendix I, *"Kissimmee River Modeling,"* of the 1990 *Restoration Report* by SFWMD. An extensive study effort was conducted by Dr. Hsieh Wen Shen, Guillermo Tabios III and James A. Harder at the University of California at Berkeley.

Computer modeling and physical modeling were performed to determine the discharges conditions within the restored oxbow channel and the floodway. Information pertaining to the Level II Backfill Plan from that report are summarized in the following paragraphs.

Velocities

Computer and physical modeling showed that high discharge events, 11,000 cfs at S-65A and 24,000 cfs at S-65E, some oxbow flow velocities could range from 3 to 4 fps. During normal flow conditions, velocities within 40% to 50% of the lengths of the oxbows would range between 0.8 to 1.8 fps. Flow velocities in all oxbows are not expected to reach 2.5 fps. Velocities over the floodplain in large discharge events were determined to be less than 0.5 fps. Given those velocity limitations only a small amount of maintenance dredging in oxbows would be necessary to maintain navigation.

Sediment Movement During Initial Construction Phases

The phasing of backfilling is an important consideration in reducing the potential for erosion of backfill material and oxbow channels. Construction backfill would be initiated under dry season conditions to insure low discharges. Initial backfilling would begin upstream of an existing water control structure

(S-65C, S-65D and S-65E, respectively) to insure that adequate tailwater stages can be maintained to minimize formation of erosive velocities at the junction of C-38 and the oxbow channel. In addition, the downstream face of the backfill material would be provided with an armored plug to protect against loss of material during transition to high discharges. Armored plugs would be installed upstream of S-65C, S-65D and S-65E. The armored plug at S-65E would be permanent while plugs at S-65C and S-65D would eventually be buried after the structures are decommissioned and the tieback levees removed.

An added benefit of initiating backfill upstream of a structure would be that the C-38 channel reach between the backfill location and the structure would act as a sediment catchment basin. Sand size material would be provided ample time and velocity conditions to settle before reaching the structure.

During construction, it is expected that turbidity in the downstream channel would increase significantly. Turbidity would be due to the construction practices and increased discharge velocities in oxbow channels. Field discharge test during high turbidity conditions were conducted by the local sponsor. Measurements taken from two discharge tests near the entrance of Kissimmee River and Lake Okeechobee showed that even with high turbidity, the movement of fine sand particles was limited.

Sediment Movement After Project Completion

The establishment of vegetation on backfilled sections of the floodway should occur over time. The most critical areas would be those areas immediately upstream of the armored plug in Pool E. That plug would be located in the reach of the floodway which would transition flow from the restored floodway to the existing C-38 Channel which serves as the approach to S-65E. Sediment movement from the oxbow channel and sheet flow from high discharges would be trapped in that channel section. Stages created by S-65E and the proposed weir upstream of S-65E would create stages high enough to limit velocities to non-erosive values. Cross section ranges and sediment sampling stations would be established to monitor sediment build-up in this reach to determine possible dredging requirements.

Erosion and Deposition in Restored Oxbows

A review of data for the years between 1910 and 1958 indicate that the Kissimmee River was relatively stable prior to channelization. Only a small number of alignment changes were noted. River bends with sharp curvatures were reduced by natural processes, such as high overbank flow and bank cutting between close channels of an oxbow. The low average discharges did not result in impacts to river morphology. As stated previously, mathematical modeling of basin dominant discharge basin flows predicted velocities less than 2.5 fps.

Sediment Monitoring

Sediment monitoring would be required at key locations during and upon completion of backfilling. Continuous reading suspended sediment sampling stations should be set up in the following locations:

Pool C. One sampling station should be set at project station 1369+87 to record suspended sediment being transported in the oxbow channel. One additional station should be set upstream of S-65C. Those stations would remain active during the duration of backfill activities until S-65C is decommissioned. Recording should begin before backfill activities commence. Prior to and following backfilling, cross sections should be taken immediately downstream of the plug site at station 1359+69, station 1329+10 and upstream of S-65C at station 1293+00. The data would allow determination of sediment rates being produced by the backfill activities upstream and the effectiveness of the remaining channel section to trap suspended sediments and reduce turbidity. The distance between the beginning of backfill and S-65C is 8,500 feet. This would result in an effective stilling basin volume of about 1,380 acre-feet.

Pool D. One sampling station should be set at project station 1043+50 to record suspended sediment being transported in the oxbow channel. One additional station should be set-up at station 900+80 at the CSXT railroad bridge. Those stations would remain active during the duration of backfill activities. Recording should begin before backfill activities commence. Prior to and following backfilling, cross sections should be taken immediately downstream of the plug site at station 1035+00 at the SR 98 bridge, station 900+80 at the CSXT railroad bridge and upstream of S-65D at station 827+97. The data would allow determination of sediment rates being produced by the backfill activities upstream would be used to calibrate the 2-Dimensional numerical model proposed to study this area. The distance between the beginning of backfill and S-65D is 5,500 feet. This results in an effective stilling basin volume of about 1,064 acre-feet.

Pool E. One sampling station should be set at project station 526+00 to record suspended sediment being transported in the oxbow channel. One additional station should be set-up upstream of S-65E. Those stations would remain active during the duration of backfill activities and until it has been determined that the backfill project has stabilized. Recording should begin before backfill activities commence in this pool. Prior to and following backfilling, cross sections should be taken immediately downstream of the plug site at station 536+00, station 506+00 at the SR 70 bridge and upstream of S-65E at station 478+35. The data would allow determination of sediment rates being produced by the backfill activities upstream and the effectiveness of the remaining channel section to trap suspended sediments and reduce turbidity. Sediment rates would be used to predict the frequency of dredging required to keep the approach to S-65E open. The distance between the beginning of backfill and S-65E is 12,000 feet. This would result in an effective stilling basin volume of about 2,400 acre-feet excluding overbank areas. Backwater analysis showed that over 10 feet of sediment could be deposited in that reach without causing unacceptable stages at SPF discharges.

Conclusions

The complexity of flow and the potential for long term sediment problems around bridges and plugs has prompted SFWMD to extend the hydraulic modeling effort to include development of two-dimensional numerical models of transitional areas.

Discharge from Pool A would be a combination of flow through S-65A and overflow through hardened and unhardened sections of the degraded S-65A tieback levee. The upstream limit of backfilling would be set based on maximum allowable tailwater stages for structure S-65 at Lake Kissimmee. Expansion and contraction losses for flow transitioning from the C-38 channel to overland flow across the degraded tieback levee, the floodway, and back to the channel would be studied to accurately determine the limit of backfill.

The downstream face of the backfilled section of C-38 must be a permanent feature and be able to resist erosive forces due to the full range of discharges. Transition of flow from the floodplain to the unbackfilled reach of C-38 upstream of S-65E would be studied to insure that the final design of the downstream face of the backfill is stable. The presence of the SR 70 bridge in the channel would also be studied to determine if the bridge would be a factor in the location or configuration of that plug.

The CSXT railroad bridge and the US 98 bridge located upstream of S-65D would also be studied to determine the level of backfill and the armoring requirements to form a stable transition of flow from the floodplain upstream of the bridge to channelized flow under the bridges and back to floodplain flow downstream of the bridges.

The possibility exists that adequate supplies of backfill material may not be available from adjacent spoil mounds adjacent to some sections C-38. A possible solution would be to limit backfill depths within certain lengths of the canal.

This would essentially create small "lakes" in those areas. Modeling would determine parameters for design which would minimize the impact of unbackfilled sections on recession rates and erosion producing turbulence.

HYDRAULIC DESIGNS

Canals

A weir would be constructed adjacent to S-65 to augment discharge capabilities of S-65. Upstream and downstream approach channels would be constructed to convey discharges from Lake Kissimmee to the C-38 channel downstream of S-65. The weir would be located to the west of the existing S-65 structure. The channels would be designed to convey design discharges passed over the weir under free discharge conditions. Table A-16 shows the hydraulic design data for the channels.

New channel sections would be constructed to reconnect existing oxbow sections in alignments after soil sampling has determined the side slope design for stability. The length of channel required to reconnect the existing oxbows was measured from USGS quadrangle maps. Those maps show the historic alignment of pre-project channel. Table A-17 shows the length and cross sectional area required to reconnect existing oxbow segment. The result of reconnecting the oxbows would be to form a continuous channel about 56 miles long between backfilled sections.

Spillway Structures

S-65 would be would operated according to existing maximum gate opening curves. Frequency of operational adjustment of S-65 gates is expected to decrease due to the S-65 bypass weir which would allow discharge when stages in Lake Kissimmee rise above elevation 51.0 feet. A combined discharge of 11,000 cfs would be made for the frequencies of about 1- in 5-year up to the SPF storm. Table A-3 shows the hydraulic design data for S-65.

The S-65 bypass weir was designed to pass the 50% exceedence discharge of 800 cfs with a headwater elevation of 52.5 feet. The C-38 canal would pass 800 cfs with little increase in stages. Therefore, the design tailwater elevation was set at the lowest expected regulated stage of 46.3 feet. The weir would be constructed with a permanent fixed crest. However, the local sponsor is desirous of retaining the capability of regulating stages above elevation 51.0 feet. Consequently, an adjustable weir crest would be provided on the top of the permanent crest which would allow insertion of flash boards to elevation 53.5 feet. A bridge structure would also be constructed on the downstream side of the weir to provide access to the flash boards. The bridge deck low chord should have an elevation not lower than 59.0 feet. A CIT type stilling basin would be constructed downstream to dissipate the energy from freefall discharges. Table A-18 shows the hydraulic design data for S-65A.

The length was solved using the following standard weir equation:

$$Q = C\ L\ He^{1.5}$$

C = 3.0 is the weir coefficient. This coefficient was reduced for submergence by use of the US Deep curve reduction factors.

L = 163 feet. This is the length of the Weir.

He = 1.5 feet. This the height of the water level over the crest of the weir.

S-65A would be operated according to existing maximum gate opening curves. The S-65A tieback levee would be degraded to elevation 49.0 feet. A total of six trapezoidal shaped structures would be constructed at regular intervals in the degraded levee. Each structure would have a crest length of 200 feet at an elevation of 48.0 feet. These structures would allow discharge to the floodplain downstream of S-65A when stages exceeded 48.0 and would augment the discharge capacity of S-65A. The crest of the trapezoidal sections would be paved with concrete to prevent erosion. Table A-19 shows the hydraulic design data for those structures.

Decommissioning of S-65B, S-65C and S-65D would be accomplished after backfilling is completed in the pool downstream of each structure. Maximum gate opening curves would be followed until backfill is complete. Continued operation would allow attenuation of discharges from Lake Kissimmee by holding water above the structure.

S-65E would be operated according to existing maximum gate opening curves. Modifications to the gate machinery would be made to allow higher headwater stages to be held. A firm discharge of 19,000 cfs would be made for the SPF frequency storm.

This plan calls for construction of an SAF type drop structure in the existing channel of C-38 upstream of S-65E. The weir crest and stilling basin would be segmented into three separate chambers. Each chamber will be separated by a vertical wall which would extend from the crest to the end of the apron. This wall is necessary to insure laminar flow conditions at all discharges. The elevation of the top of each wall would be set at elevation 27.0 feet. The weir crest was designed using the same procedure as outlined for the S-65 by-pass weir. The Waterways Experiment Station was consulted concerning the design of this weir. After reviewing preliminary designs they recommended construction of the SAF type stilling basin to dissipate the energy from discharges. Table A-20 shows hydraulic design data for the weir.

A flood gate structure would be constructed upstream of the existing boat lock at S-65E. Operation of the gate would be determined by stages upstream of the S-65E weir. The gates would remain open until upstream stages reach elevation 23.0 feet. Once the gate is closed, boat traffic would be terminated. Subsequent to a return to normal stages upstream of the weir, the gate would be reopened and normal traffic resumed. The weir would discharge up to 6,000 cfs at a headwater stage of 23.0 feet. That discharge is expected to be reached about 5% of the time.

The flood gate would be capable of holding headwater elevations up to 27.0 feet, with a corresponding tailwater elevation of 18.6 feet. The opening between the gates should be no less than the 30 foot wide. The upstream approach channel to the flood gate would be extended and a spur dike would be constructed to form closure with the existing S-65E east tieback levee.

INLET STRUCTURES

Structures are required to convey local runoff to the main floodway through Yates Marsh and Lake Istokpoga levees. Drainage culverts would also be required to convey runoff away from the area blocked by construction of the flood gate structure at S-65E.

The outlet structure for Lake Istokpoga would consist of corrugated metal pipes with flap gate controls. The culverts would allow discharge from Lake Istokpoga to the Kissimmee River under normal conditions but eliminate backflow. The design would allow 800 cfs discharge with a head loss of 0.5 feet. Table A-21 shows the hydraulic design data for that culvert structure.

Two areas were identified in flow-ways which would be cutoff by the Yates Marsh Levee. Table A-22 shows the hydraulic design data for those culverts.

Construction of the flood gate would isolate the drainage basin located to the northeast of C-38 spoil mound. This area currently drains to the upstream pool of S-65E through an existing channel. A new drainage system which involves conveying runoff from that area to the approach channel downstream of the S-65E lock would be constructed. Table A-23 shows the culvert sizes required to pass the all discharges up to the SPF flood. Short channel segments will be required to connect culverts CS-1, CS-2 and CS-3. Each channel would require a bottom width of 5 feet at an elevation of 16.0 feet. Side slopes would be 1 vertical on 3 horizontal.

LEVEES

Levees are proposed to prevent floodwaters in the Kissimmee River from spilling over into adjacent basins, and to limit the land which would be flooded due to backfilling of the C-38 channel. Levees were designed for Chandler Slough, Yates Marsh and Lake Istokpoga flow-way. Levee crest elevation designs were based on stages expected for the 100-year flood event on the Recommended Plan. Levee side slopes would be 1 vertical on 3 horizontal.

A levee would be provided on the northeast side of the C-38 channel at Chandler Slough and Yates Marsh. The lands protected by these levees normally drain to the south. Local runoff is conveyed by sheetflow to shallow sloughs which empty into the floodway south of the CSXT railroad. Conveyance through the railroad causeway is provided by short trestle bridges. The levees would prevent high stages expected in Chandler Slough under post-backfilling from spilling over onto the lands between the railroad and US 98.

The Chandler slough levee segment would be 5.34 miles long. It would begin at high ground on the northeast at US 98 and would intercept the CSXT railroad at a right angle. The Yates Marsh Levee segment would begin at the intersection of the CSXT railroad causeway and the Chandler Slough levee and parallel the existing floodway for a distance of 2.8 miles. Closure between the levee segments would be formed at the CSXT railroad causeway. The Yates marsh levee segment would be terminated as far south as possible to reduce flooding induced from stages in the floodway. The topography of the land downstream of the levee shows a slough shaped floodway about 3,000 wide between high ground points of elevation 34.0 feet. The lowest point of the slough would be at elevation of 30.0 feet.

Post-backfill stages for the area protected by the levees would be reduced from 38.3 feet to 33.4 feet. Flood stages for that area would then be limited to runoff from rainfall on the area behind the levees and stages from the Kissimmee River at station 703+05. Table A-24 shows hydraulic design of this levee. Plates 4 and 5 in the main report show the alignment of the levee.

A levee would be provided on the west side of the C-38 channel at the Istokpoga floodway. The Istokpoga floodway is well defined with a small locally constructed canal and culvert structure to provide drainage from Lake Istokpoga directly to Kissimmee River. Flood control lake regulation for Lake

Istokpoga is provided by C-41 and C-41A which convey water south directly to Lake Okeechobee. The original Central and Southern Florida flood control plan called for constructing a canal and flood control structure from Lake Istokpoga to C-38 with the capacity to convey 800 cfs. Studies performed subsequent to construction to C-38 found that flood stages were only minimally reduced by this feature and the canal and structure were not constructed.

The levee would prevent high stages expected in Kissimmee River under post-backfilling from entering Lake Istokpoga and causing increased lake stages. The levee would be 3.3 miles long and would be constructed on the alignment shown on Plate 4. The levee profile is shown on Figure A-9. The alignment would be located across the Istokpoga floodway and would be parallel to the CSXT railroad line. The 1 in 100-year stage under post-backfill conditions would be 41.8 feet. The SPF stage would be 42.46 feet. The SPF stage under existing conditions would be 37.6 feet. Table A-25 shows hydraulic design of this levee.

BRIDGES

The backfill elevations under existing bridges were designed to insure that stages in the restored floodway would not reach the low chord or threaten the structural integrity of the existing bridges under all flood flow frequencies. The backfill elevations under the existing bridges were determined by including conveyance which would be provided by the additional bridges constructed in the existing causeways. The beginning of the backfill section upstream of each bridge would be armored to prevent erosion from discharges which would be in transition from sheet flow to the channel reach under the bridge. Table A-26 shows the hydraulic design data for new bridges.

The existing CSXT causeway bridges would be backfilled to elevation 20.0 feet. Natural grade in the area is between elevation 27.0 and 28.0 feet. The backfilled channel bottom would be maintained for a distance of 4,300 feet upstream and 1,500 feet downstream. Those distances should assure adequate collection and distribution of flow through the bridge. Velocities under the bridge would be between 1.8 and 2.3 fps at 100-year discharges. Two new bridges would be constructed on the east and west sides of the existing bridge at the CSXT causeway. The west bridge would be constructed to the provide clearance for a channel which would be constructed to the historic channel dimensions. The east bridge would provide an opening to allow flow to pass flow to the east floodway area. The bottom elevation would be set at natural grade.

The Backfill Plan proposed for the US 98 bridge and causeway requires backfilling C-38 under the existing US 98 bridge to elevation 20.0 feet. Natural grade in the area is between elevation 28.0 and 30.0 feet. The backfilled channel bottom would be maintained for a distance of 4,000 feet upstream and 1,500 feet downstream. Those distances should assure adequate collection and distribution of flow through the bridge. Velocities under the bridge would be between 2.0 and 2.3 fps for 100-year discharges. One new bridge would be constructed on the east side of the existing causeway. This bridge would provide an opening to allow flow to pass to the east floodway area. The bottom elevation would be set at natural grade with a bottom width of 400 feet.

ARMORED PLUGS

The downstream face of backfilled sections would be armored to resist flows which would transition from the overland flow to canal flow. The armored face is considered to be necessary because the backfill material would not be compacted and could be more easily eroded until vegetation is established and consolidation occurs. The design was recommended by Dr. Shen of the University of California, Berkeley, after the basic configuration was determined from flume tests. The basic design was analyzed as an alterative plan which would have removed the S-65 structures and placed armored earth plugs at intervals of 0.5 miles on center. That armored plug design is shown on Figure B-8.

The downstream face of backfill material would be armored at stations 1368+87, 1086+49, 940+00, 874+97 and 544+35. The plug located at station 544+35 would be permanent. Plugs at station 940+00 and 1086+49 would be partially buried by backfill of bridge openings.

PERFORMANCE

Water Surface Profiles

The objective of the restoration project is to restore the ecology of the Kissimmee River basin. The Level II Backfilling plan would force high discharges to be conveyed as sheetflow within the whole floodplain. Reconnection of the existing oxbows would also force low discharges to be conveyed through the natural channel. Lower discharges would be able to flood larger areas of wetlands with a greater frequency. Recession rates would also decrease as lateral drainage after major storm events would require longer periods of time. Overall performance and hydrologic effects on stages and recession rates for the main Kissimmee River floodway are graphically displayed on Figures A-3 through A-7. Figure A-9 shows the water surface profile after de-channelization. Plates 6 through 10 show the flooded area mapping of the post-project conditions.

Outlet Discharge from Lake Kissimmee

Construction of the S-65 weir would not only be required to augment discharges from S-65 but would also allow a more natural discharge regime from Lake Kissimmee to the Kissimmee River. Figure A-2 shows the close approximation to the pre-project discharge regime.

Project Levees

Project levees for the Chandler Slough, Yates Marsh area and the Lake Istokpoga flow-way would provide 1- in 100-year protection. Those levees are provided to reduce land purchases. The levee grades were designed by modeling the basin with higher roughness values within the floodway. Overtopping analyses was performed to determine frequency of overtopping as a measure of the factor of safety offered by the levees.

Chandler Slough and Yates Marsh

Overtopping analyses showed that the levee would be overtopped at a discharge of 35,000 cfs. The reason for this excessive figure is the large floodway which borders the levee in the Chandler Slough area produces very flat water surface profiles. The southernmost and downstream termination of the levee would be open to average ground. That would allow normal sheetflow drainage to the Kissimmee River.

The area served by the levee is sparsely populated at this time. The depths of water outside of wetland areas would be less than 2 feet deep. Velocities would be restricted due to the shallow depths and the resistance to flow by the vegetation and wetland areas. Consequently, the risk of potential loss of life is very low.

Istokpoga Levee

Flood stages for Lake Istokpoga, as determined by Flood Insurance Studies, are equal to stages determined at the Istokpoga outlet canal for the Level II backfilling plan. Therefore, without a levee to block flow from the Kissimmee River, the probability of flooding on Lake Istokpoga would increase due to separate and independent floods on the Kissimmee River.

Overtopping analyses showed that the levee would be overtopped at a discharge of 25,000 cfs. That discharge corresponds to a frequency in excess of the SPF. The levee grade would be set to provide over topping at the southern most and downstream termination of the levee. Flood stages on lake Istokpoga are regulated by the existing C-41 and C-41A canal system. That system would continue to operate in that capacity. Natural drainage to the Kissimmee River would be provided by a flapgate controlled structure. The drainage structure proposed would provide discharge capability beyond the capability of the existing canal.

Routing shows the flood stages on Lake Istokpoga for the SPF event would be less than 42.5 feet. Most structures around the lake are located on natural grades about or above elevation 40.0 feet. The current regulation schedule for Lake Istokpoga ranges from 38.25 to 39.5 feet. Flooding would result from slowly rising stages in Lake Istokpoga. Maximum flood depths in areas immediately adjacent to the lake would not exceed 2.5 feet and would have negligible flow velocities. Ample time should be available for evacuation. Consequently, the risk of potential loss of life is low.

TABLES

TABLE A-1
HISTORICAL STAGES

LOCATION	STAGES DURING SURVEY IN MARCH 1901 FT.	RECORDED PEAK STAGES 1947 FLOOD FT.	REGULATION SCHEDULE SEPT 1991 FT.
Lake Tohopekaliga	63.82	58.5	53.5
Lake Cypress	62.01	57.4	51.0
Lake Hatchineha	60.86	56.9	51.0
Lake Kissimmee	58.84	56.9	51.0
Fort Kissimmee	50.19	50.0	40.0
Istokpoga Canal	39.77	39.1	34.0

Elevations shown in Table A-1 are referenced to NGVD. Elevations published in the 1901 Survey are referenced to the old Lake Okeechobee Datum which was 1.44 feet below NGVD.

TABLE A-2

ANNUAL PEAK 30-DAY RAINFALL(INCHES)

	YEAR	PEAK 30-DAY RAINFALL (INCHES)	STATISTICS FOR PEAKS GREATER THAN MEAN (11.07 INCHES)		
			RANK	ESTIMATED RETURN PERIOD	
	1934	15.22	8	12.5	
	1935	11.11	18	2.0	
	1936	11.61	15	2.3	
	1937	8.72	--	--	
	1938	10.27	--	--	
	1939	15.17	3	14.9	
	1940	9.79	--	--	
	1941	15.71	4	14.3	
	1942	10.01	--	--	
	1943	10.30	--	--	
	1944	11.19	17	2.0	
Pre-Project	1945	15.41	6	12.8	
	1946	8.27	--	--	
	1947	12.53	13	3.2	
	1948	14.27	10	7.1	
	1949	13.83	11	5.6	
	1950	10.92	--	--	
	1951	11.24	16	2.0	
	1952	8.77	--	--	
	1953	15.34	7	12.7	
	1954	12.56	12	3.3	
	1955	8.82	--	--	
	1956	15.97	2	16.7	
	1957	9.40	--	--	
	1958	8.24	--	--	
	1959	12.40	14	3.0	
	1960	14.93	9	10.0	
	1961	7.41	--	--	
	1962	9.11	--	--	
	1963	8.25	--	--	
	1964	11.06	--	--	
	1965	8.95	--	--	
	1966	10.50	--	--	
Post-Project	1967	10.25	--	--	Construction Period
	1968	16.31	1	21.3	
	1969	10.31	--	--	
	1970	8.80	--	--	
	1971	8.13	--	--	
	1972	10.32	--	--	
	1973	9.70	--	--	
	1974	15.65	5	13.5	
	1975	9.83	--	--	

NOTE: -- indicates greater than 18 for rank column and less than 1 year for estimated return period column

TABLE A-3

KISSIMMEE RIVER STRUCTURES

	S-65	S65-A	S65-B	S65-C	S65-D	S65-E
Control Gates	Vert-Lift	Vert-Lift	Vert-Lift	Vert-Lift	Vert-Lift	Vert-Lift
No. of Gates	3	3	3	4	4	6
Net Width of a Gate	27'x13.7'	27'x13.7'	27'x13.7'	27'x13.7'	27'x13.7'	27'x13.7'
Crest Elev. (msl.)	39.3'	34.5'	26.3'	20.8'	13.1'	9.7'
Apron Elev. (msl.)	34.0'	28.6'	19.4'	13.4'	5.3'	-1.6'
Discharge (cfs)	11,000	11,000	14,000	18,000	21,300	24,000
HWE (msl.)	51.5'	46.3'	40.0'	34.0'	28.0'	22.0'
TWE (msl.)	49.0'	42.9'	35.7'	30.1'	23.4'	19.3'

TABLE A-4

BASIN RAINFALL (INCHES)

	DURATION (DAYS)					
EXCEEDENCE PROBABILITY	1	2	5	10	20	30
0.2	5.78	7.16	8.30	9.67	11.85	13.42
0.1	6.40	7.92	9.18	10.69	13.11	14.84
0.02	7.64	9.46	10.96	12.76	15.64	17.71
0.01	8.14	10.08	11.68	13.60	16.67	18.88
SPF	9.28	11.48	13.31	15.50	19.00	21.51

TABLE A-5

COMPARISON OF PRE-PROJECT AND POST-PROJECT ANNUAL RAINFALL OVER SOUTHERN FLORIDA

RAINALL STATION	Average Annual Rainfall (inches) Preproject (pre-1964)	Postproject (post-1964)
Kissimmee Basin (weighted average)	50.39	46.52
Punta Gorda	51.44	47.35
Homestead Exp. Sta.	62.49	61.43
Melbourne	50.25	44.90

TABLE A-6

HISTORICAL RAINFALL - RUNOFF AT S-65E

	Preproject (1930–1962)	Postproject (1966–1982)
Drainage Area (sq. mi.)	2886	2305 *
Mean Annual Flow (cfs)	2202	1325 *
Mean Annual Runoff (inches)	10.36	7.8
Mean Annual Rainfall (inches)	50.39	47.11
Total Losses From Rainfall (inches)	40.03	39.31

NOTE: * Corrected for effect of Lake Istokpoga Basin Diversion.

TABLE A-7

SUB-BASIN HYDROLOGIC INFORMATION

WATERSHED	STRUCTURE	DRAINAGE AREA IN SQ. MI. LAND (WATER)	SCS CN LAND AREA	LAG HRS	SLOPE (%)
Lakes Myrtle & Joel	S-57	50.9 (4.8)	73	8	0.30
Lakes Hart & Mary Jane	S-62	56.9 (5.6)	73	8	0.42
Boggy Creek & East Lake Tohopekaliga	S-59	89.6/36.9 (16.2) [1]	65/71	20/4	0.40
Shingle Creek & Lake Tohopekaliga	S-61	112.4/105.6 (25.6) [2]	68/72	20/8	0.53
Lakes Alligator, Coon, & Trout	S-60	40.7 (8.1)	66	20	0.32
Lake Gentry	S-63	47.9 (3.5)	71	20	0.13
Canoe Creek	S-63A	35.7	73	16	0.16
Lakes Cypress & Hatchineha	(S-64) [3]	517.3 (17.9)	63	16	0.13
Lake Kissimmee	S-65	398.6 (41.8)	73	16	0.13
Pool A	S-65A	161.3	71	20	0.24
Pool B	S-65B	202.4	72	24	0.14
Pool C	S-65C	78.3	74	16	0.14
Pool D	S-65D	184.6	74	32	0.13
Pool E	S-65E	62.5	73	16	0.18

1. Boggy Creek/E. Lake Tohopekaliga
2. Shingle Creek/Lake Tohopekaliga
3. Authorized but never constructed

TABLE A-8

COMPARISON BETWEEN HISTORICAL STAGES AND MODEL SIMULATED STAGES FOR VARIOUS n VALUES

	HISTORIC DATA IN FEET	STAGES FROM FLOW MODEL		
		n=0.3	n=0.5	n=1.0
1260–1290 cfs*				
(March 29, 1952)				
STAGE AT FORT BASINGER (FT)	29.41	29.25	29.75	30.41
STAGE AT FORT KISSIMMEE (FT)	44.38	43.49	44.07	44.89
2030–2070 cfs				
(June 16, 1934)				
STAGE AT FORT BASINGER (FT)	31.17	30.71	31.43	32.40
STAGE AT FORT KISSIMMEE (FT)	———	44.81	45.57	46.66
3640–3640 cfs				
(March 20, 1960)				
STAGE AT FORT BASINGER (FT)	———	32.52	33.50	34.86
STAGE AT FORT KISSIMMEE (FT)	47.48	46.66	47.72	49.23
6270–6920 cfs				
(November 5, 1947)				
STAGE AT FORT BASSINGER (FT)	33.44	34.74	36.05	37.91
STAGE AT FORT KISSIMMEE (FT)	48.53	48.73	50.14	52.21

*Corresponding discharges at S65 (Lake Kissimmee outlet) and S65E (Kissimmee River at Okeechobee)

TABLE A-9

KISSIMMEE RIVER TRIBUTARIES

TRIBUTARY	AREA	CN	TLAG	5-YR	10-YR	50-YR	100-YR	SPF
NAME	SQ MI		HRS	PEAK DISCHARGE (CFS)				
WILDCAT HAMMOCK	27.4	71	21.2	1198	1441	1912	2097	2505
BUTTERMILK SLOUGH	1.5	71	2.4	100	119	156	171	203
LONG HAMMOCK	3.1	71	4.3	203	242	316	346	411
BLANKET SLOUGH	27.4	71	45.1	768	923	1232	1354	1624
ICE CREAM HAMMOCK	13.9	71	23.8	561	668	874	956	1137
RATTLESNAKE SLOUGH	3.2	71	12.2	201	239	313	342	407
HARD LUCK	8.3	71	26.9	318	380	499	546	650
TICK ISLAND	36.8	71	66.7	763	918	1227	1350	1625
MCGUIRE HAMMOCK	1.9	71	10.3	131	155	202	221	262
ARMSTRONG	17.5	71	40.7	535	643	855	939	1125
WOODS HAMMOCK	0.8	72	11.5	51	61	79	86	102
MOSQUITO HAMMOCK	12.0	72	10.1	812	964	1256	1371	1624
OAK CREEK	31.8	74	52.7	869	1021	1337	1461	1738
TURKEY HAMMOCK	0.9	74	5.7	60	70	91	99	117
NEAR DINNER BAY	1.1	74	4.6	76	90	116	127	149
UNDERHILL SAWGRASS	5.1	74	18.3	261	310	403	440	521
CHANDLER SLOUGH	90.7	74	64.3	2092	2495	3288	3601	4298
YATES MARSH	27.9	73	66.5	605	725	960	1054	1261
MAPLE RIVER	12.0	72	10.1	812	964	1256	1371	1624
SADDLE HAMMOCK	1.9	72	7.4	129	153	199	218	258
DUCK SLOUGH	14.6	72	64.1	324	388	516	567	680
PINE ISLAND AND SEVEN MILE SLOUGHS	77.5	72	62.5	1750	2099	2787	3061	3668

TABLE A-10

SUMMARY OF PERTINENT HISTORICAL DATA

X–SECTION NUMBER	LOCATION	HISTORIC STAGES		DETAILED DESIGN MEMO		
		1947	1953	OPTIMUM	30% SPF	SPF
	MYRTLE–JOEL	66.0		61.0	62.9	67.4
	MARY JANE–HART	64.6	64.0	60.0	61.3	66.7
	EAST L. TOHOPEKALIGA	61.5	62.0	56.5	58.6	64.1
	LAKE TOHOPEKALIGA	58.5	58.6	53.5	54.7	60.1
	ALLIGATOR, COON TROUT AND LISSIE	66.0	66.3	63.2	64.9	67.4
	LAKE GENTRY			62.0	62.5	66.2
	CANOE CREEK			57.0	57.0	61.0
	CYPRESS	57.4	57.2	51.0	51.5	58.0
	HATCHINEHA	56.9	56.8	51.0	51.5	58.0
	KISSIMMEE	56.9	56.8	51.0	51.5	58.0
	S–65 HEADWATER	56.9	56.8		51.5	58.0
86A	S–65 TAILWATER	56.9	56.8		49.0	53.1
85	OLD KISS GAGE LOC	56.0	56.5			
74A	S–65A	50.8	52.0	46.3	46.3	52.0
73A					42.9	47.1
71	FT KISSIMMEE GAGE	50.0	50.9			
55D	S–65B	44.5	45.8	40.0	40.0	44.5
55C					37.5	39.0
44A	S–65C	38.6	39.8	34.0	34.0	37.6
43					30.1	33.7
37	US HWY # 98	35.0	36.2			
26A	S–65D	31.7	32.4	26.8	28.0	32.4
25					23.4	26.4
14A	STATE ROAD 70	27.1	27.0			
12A	S65–E	25.7	25.5	21.0	22.0	24.2
	STATE ROAD 78	18.5	17.2		19.3	20.0

TABLE A-11

EXISTING CONDITIONS

LOCATION	STRUCTURE	PEAK WATER SURFACE ELEVATIONS FEET NGVD FOR				
		5-YR	10-YR	50-YR	100-YR	SPF
MYRTLE-JOEL	S-57	64.33	65.23	67.64	68.09	68.35
MARY JANE-HART	S-62	61.95	62.37	63.29	63.66	64.48
EAST LAKE TOHOPEKALIGA	S-59	58.72	59.31	60.38	60.81	61.78
LAKE TOHOPEKALIGA	S-61	55.39	56.10	57.46	57.96	58.99
ALLIGATOR, COON, TROUT	S-60	63.41	63.65	64.22	64.46	65.02
LAKE GENTRY	S-63	62.26	62.73	63.64	64.01	64.66
CANOE CREEK	S-63A	57.17	58.62	58.92	58.89	59.54
LAKE KISSIMMEE CYPRESS AND HATCHINEHA	S-65	52.81	53.46	54.93	55.49	56.56
POOL A	S-65 TW	49.75	49.76	49.77	49.78	49.79
	S-65A HW	47.61	47.69	47.86	47.79	48.90
POOL B	S-65A TW	43.28	44.06	44.99	45.50	46.84
	S-65B HW	41.41	42.29	43.90	44.68	46.21
POOL C	S-65B TW	36.46	36.73	37.05	37.24	38.06
	S-65C HW	34.00	34.49	35.03	35.35	36.65
POOL D	S-65C TW	30.09	30.66	31.22	32.03	33.16
	S-65D HW	28.01	28.83	29.26	30.64	32.05
POOL E	S-65D TW	23.66	23.92	24.02	26.40	27.58
	S-65E HW	22.04	22.05	22.05	25.40	26.52

NOTE :

1: INITIAL WATER LEVEL AT LAKE KISSIMMEE 51.0 FEET

2: DISCHARGE AT S-65 RESTRICTED TO A MAXIMUM OF 3000 CFS IF S-65A STAGE EXCEEDS 46.6 FT., OTHERWISE MAXIMUM OF 11000 CFS

TABLE A-12

SUMMARY OF RESULTS FOR LEVEL II BACKFILLING PLAN

LOCATION	STRUCTURE	PEAK WATER SURFACE ELEVATIONS FEET NGVD FOR				
		5-YR	10-YR	50-YR	100-YR	SPF
MYRTLE-JOEL	S-57	64.39	65.31	67.73	68.09	68.36
MARY JANE-HART	S-62	62.04	62.54	63.49	63.86	64.65
EAST LAKE TOHOPEKALIGA	S-59	58.63	59.21	60.31	60.74	61.75
LAKE TOHOPEKALIGA	S-61	55.88	56.41	57.54	58.03	59.06
ALLIGATOR, COON, TROUT	S-60	63.58	63.79	64.34	64.58	65.09
LAKE GENTRY	S-63	62.36	62.83	63.77	64.12	64.75
CANOE CREEK	S-63A	57.22	58.69	58.86	58.95	59.58
LAKE KISSIMMEE CYPRESS AND HATCHINEHA	S-65	53.81	54.05	54.81	55.15	56.10
POOL A	S-65 TW	50.98	51.51	52.83	53.01	53.30
	S-65A HW	49.70	50.56	51.12	51.25	51.76
POOL B	S-65A TW	49.70	50.56	51.12	51.25	51.76
	S-65B HW	44.43	45.40	45.81	45.99	46.54
POOL C	S-65B TW	44.43	45.40	45.81	45.99	46.54
	S-65C HW	38.99	40.36	40.98	41.23	41.95
POOL D	S-65C TW	38.99	40.36	40.98	41.23	41.95
	S-65D HW	32.92	34.16	34.81	35.08	35.88
POOL E	S-65D TW	32.92	34.16	34.81	35.08	35.88
	S-65E HW	25.30	25.80	26.10	26.20	26.90

NOTE:
1. INITIAL WATER LEVEL AT LAKE KISSIMMEE 52.50 FEET
2. DISCHARGE AT S-65 RESTRICTED TO A MAXIMUM OF 6000 CFS UNTIL LAKE KISSIMMEE REACHES 53.8 FEET, THEN 11000 CFS.
3. STRUCTURES S-65B, S-65C, S-65D REMOVED.

TABLE A-13

SUMMARY OF WATER LEVEL INCREASES DUE TO LEVEL II BACKFILLING PLAN

LOCATION	STRUCTURE	INCREASE OF WATER LEVELS DUE TO LEVEL II BACKFILL PLAN FOR				
		5-YR	10-YR	50-YR	100-YR	SPF
MYRTLE-JOEL	S-57	0.06	0.08	0.09	0.00	0.01
MARY JANE-HART	S-62	0.09	0.17	0.20	0.20	0.17
EAST LAKE TOHOPEKALIGA	S-59	-0.09	-0.10	-0.07	-0.07	-0.03
LAKE TOHOPEKALIGA	S-61	0.49	0.31	0.08	0.07	0.07
ALLIGATOR, COON, TROUT	S-60	0.17	0.14	0.12	0.12	0.07
LAKE GENTRY	S-63	0.10	0.10	0.13	0.11	0.09
CANOE CREEK	S-63A	0.05	0.07	-0.06	0.06	0.04
LAKE KISSIMMEE CYPRESS AND HATCHINEHA	S-65	1.00	0.59	-0.12	-0.34	-0.46
POOL A	S-65 TW	1.23	1.75	3.06	3.23	3.51
	S-65A HW	2.09	2.87	3.26	3.46	2.86
POOL B	S-65A TW	6.42	6.50	6.13	5.75	4.92
	S-65B HW	3.02	3.11	1.91	1.31	0.33
POOL C	S-65B TW	7.97	8.67	8.76	8.75	8.48
	S-65C HW	4.99	5.87	5.95	5.88	5.30
POOL D	S-65C TW	8.90	9.70	9.76	9.20	8.79
	S-65D HW	4.91	5.33	5.55	4.44	3.83
POOL E	S-65D TW	9.26	10.24	10.79	8.68	8.30
	S-65E HW	3.26	3.75	4.05	0.80	0.38

TABLE A-14

PEAK DISCHARGES AND VELOCITIES FOR LEVEL II BACKFILLING PLAN

LOCATION	DISCHARGE IN 1000 CFS FOR					VELOCITIES FEET/SEC FOR				
	5-YR	10-YR	50-YR	100-YR	SPF	5-YR	10-YR	50-YR	100-YR	SPF
S-65 TAILWATER	11.00	10.31	11.00	11.00	10.31	0.26	0.22	0.20	0.20	0.18
S-65A	9.80	10.93	11.86	11.92	12.50	0.44	0.40	0.38	0.38	0.36
S-65B *	9.61	11.95	13.02	13.78	15.17	0.21	0.22	0.23	0.24	0.24
S-65C *	9.73	12.85	14.22	14.78	16.29	0.14	0.16	0.16	0.16	0.16
US HWY 98	10.15	13.30	14.94	15.63	17.78	0.11	0.13	0.13	0.14	0.14
CSX RAILROAD	10.33	13.52	15.31	16.06	18.46	0.19	0.21	0.21	0.22	0.23
S-65D *	10.33	13.51	15.30	16.06	18.48	0.28	0.31	0.32	0.32	0.34
STATE ROAD 70	8.56	13.58	15.35	16.30	18.86	0.94	1.05	1.14	1.16	1.35
S-65E	8.58	13.63	14.63	14.73	19.09	1.07	1.20	1.30	1.32	1.54

NOTE : * STRUCTURES S-65B, S-65C AND S-65D REMOVED

TABLE A-15

SUMMARY OF DWOPER RESULTS FOR LEVEL II BACKFILLING PLAN

REPORT STATION (FT)	RIVER MILE	REPORT X-SECT NUMBER	LOCATION	WATER SURFACE ELEVATION FEET NGVD FOR				
				5-YR	10-YR	50-YR	100-YR	SPF
			S-65 HEADWATER	53.81	54.05	54.81	55.15	56.10
294903	55.85	86A	S-65 TAILWATER	50.98	51.51	52.83	53.01	53.30
289267	54.79	86		50.96	51.50	52.80	52.99	53.28
282853	53.57	85	OLD KISS GAGE LOC.	50.90	51.45	52.73	52.91	53.22
279770	52.99	84		50.73	51.35	52.57	52.75	53.09
277045	52.47	83		50.58	51.25	52.42	52.60	52.95
274118	51.92	82		50.47	51.18	52.30	52.48	52.85
270795	51.29	81		50.34	51.08	52.14	52.31	52.70
268600	50.87	80		50.29	51.04	52.06	52.23	52.63
263604	49.93	79		50.12	50.90	51.81	51.97	52.39
257729	48.81	77		49.93	50.74	51.51	51.65	52.11
253418	48.00	76		49.88	50.70	51.42	51.57	52.03
246979	46.78	75		49.83	50.66	51.33	51.47	51.93
242095	45.85	74		49.77	50.61	51.22	51.36	51.84
238595	45.19	74A	S-65A	49.70	50.56	51.12	51.25	51.76
238395	45.15	73A		49.70	50.56	51.11	51.25	51.76
232282	43.99	72		49.66	50.53	51.04	51.18	51.70
229129	43.40	71	FT. KISSIMMEE GAGE	49.65	50.51	51.01	51.16	51.68
223308	42.29	70	PINE ISLAND SLOUGH	49.63	50.49	50.97	51.13	51.64
218371	41.36	68		49.60	50.47	50.92	51.09	51.60
213501	40.44	66		49.57	50.45	50.86	51.05	51.55
210290	39.83	65		49.56	50.43	50.81	51.02	51.51
208455	39.48	64	C-38 INTACT	49.55	50.42	50.79	51.01	51.48
206659	39.14	63D	C-38 FILLED AT STATION 2075+00	49.31	50.19	50.56	50.78	51.27
204862	38.80	63C		49.15	50.02	50.40	50.63	51.12
203066	38.46	63		48.97	49.85	50.23	50.47	50.96
202477	38.35	63B		48.91	49.79	50.17	50.41	50.91
201882	38.24	63A		48.84	49.72	50.10	50.34	50.84
201291	38.12	62D		48.76	49.65	50.03	50.27	50.77
200697	38.01	62C		48.69	49.57	49.95	50.20	50.70
200107	37.90	62B		48.60	49.49	49.87	50.11	50.62
199516	37.79	62A		48.51	49.40	49.78	50.03	50.54
190283	36.04	61		47.27	48.19	48.57	48.81	49.31
188493	35.70	59A		47.08	47.99	48.37	48.61	49.10
186703	35.36	59		46.81	47.72	48.10	48.33	48.82
181523	34.38	58		45.77	46.72	47.13	47.35	47.87
179264	33.95	57A		45.44	46.40	46.80	47.01	47.54
177023	33.53	57		45.13	46.09	46.49	46.69	47.22
174719	33.09	56		44.64	45.61	46.01	46.20	46.75
173789	32.91	55D	S-65B (REMOVED)	44.43	45.40	45.81	45.99	46.54
173600	32.88	55C		44.39	45.37	45.77	45.95	46.51
171045	32.39	55		43.90	44.87	45.28	45.44	46.00
170626	32.32	55B		43.81	44.78	45.19	45.36	45.91
168419	31.90	55A		43.09	44.11	44.54	44.72	45.28
166969	31.62	53B		42.82	43.87	44.31	44.50	45.06
165313	31.31	53A		42.65	43.71	44.16	44.35	44.92

* SEPT 1 STAGE OF LAKES CYPRESS,HATCHINEHA AND KISSIMMEE INCREASED TO 52.5 FT. FOR THIS STUDY

TABLE A-15 (con't)

SUMMARY OF DWOPER RESULTS FOR LEVEL II BACKFILLING PLAN

REPORT STATION (FT)	RIVER MILE	REPORT X-SECT NUMBER	LOCATION	WATER SURFACE ELEVATION FEET NGVD FOR 5-YR	10-YR	50-YR	100-YR	SPF
164986	31.25	53		42.62	43.68	44.14	44.33	44.90
161929	30.67	52		42.20	43.30	43.78	43.97	44.56
154616	29.28	51	OAK CREEK	41.16	42.34	42.86	43.07	43.68
151906	28.77	49		40.85	42.06	42.60	42.82	43.43
146739	27.79	48		40.35	41.61	42.17	42.40	43.04
141988	26.89	47		40.04	41.32	41.90	42.13	42.79
141838	26.86	47A		40.03	41.31	41.89	42.13	42.79
136987	25.94	46A		39.63	40.95	41.54	41.79	42.47
136887	25.93	46	ISTOKPOGA CANAL	39.62	40.93	41.53	41.77	42.46
135969	25.75	45		39.51	40.84	41.45	41.69	42.38
133644	25.31	44C		39.36	40.70	41.31	41.55	42.25
133269	25.24	44B		39.33	40.68	41.28	41.53	42.23
132910	25.17	44		39.31	40.66	41.27	41.52	42.21
128310	24.30	44A	S-65C (REMOVED)	38.99	40.36	40.98	41.23	41.95
126405	23.94	43		38.88	40.25	40.88	41.13	41.86
120172	22.76	42		38.56	39.90	40.53	40.79	41.52
117837	22.32	41		38.35	39.68	40.31	40.56	41.31
114131	21.62	40		37.77	39.08	39.71	39.97	40.73
111658	21.15	39		37.41	38.69	39.33	39.59	40.37
108619	20.57	38		37.14	38.40	39.03	39.29	40.07
105358	19.95	37	US HWY # 98	36.70	37.95	38.58	38.85	39.64
98830	18.72	35	CHANDLER SLOUGH	36.10	37.36	38.01	38.28	39.09
96982	18.37	34		36.01	37.27	37.92	38.19	39.00
94582	17.91	33A		35.74	36.98	37.62	37.89	38.69
92640	17.55	33		34.93	36.17	36.81	37.08	37.88
89790	17.01	28A	CSX RAILROAD	34.36	35.59	36.23	36.50	37.29
82797	15.68	26		33.30	34.53	35.17	35.43	36.23
81297	15.40	26A	S-65D (REMOVED)	32.92	34.16	34.81	35.08	35.88
79841	15.12	25		32.71	33.97	34.62	34.89	35.69
76520	14.49	24	YATES MARSH	32.28	33.52	34.16	34.43	35.22
74540	14.12	21		32.04	33.26	33.89	34.16	34.94
70305	13.32	20		31.32	32.51	33.12	33.39	34.16
66371	12.57	19		30.59	31.76	32.36	32.63	33.39
59886	11.34	17		29.6	30.7	31.3	31.5	32.3
55436	10.50	16	END FILL AT 544+35	27.6	28.4	28.9	29.1	29.7
50600	9.58	14A	STATE ROAD 70	25.3	25.8	26.1	26.2	26.9
47835	9.06	13		25.3	25.8	26.1	26.2	26.9
44565	8.44	12		25.3	25.8	26.1	26.2	26.9
42665	8.08	12B		25.3	25.8	26.1	26.2	26.9
42565	8.06	12A	S65E	25.3	25.8	26.1	26.2	26.9
	0.00		STATE ROAD 78 AT LAKE OKEECHOBEE					

* SEPT 1 STAGE OF LAKES CYPRESS,HATCHINEHA AND KISSIMMEE INCREASED TO 52.5 FT. FOR THIS STUDY

SHEET 2 OF 2

TABLE A-16

HYDRAULIC DESIGN DATA
S-65 BYPASS WEIR CANAL

				Channel Dimensions			
				Bottom			
Station	Location	Natural Grade Elev	Design WSEl ft, NGVD	Width feet	Elev ft, NGVD	Side Slope 1 on	Vel fps
0+00	Upstream of S-65	60.00	54.55	80.00	44.00	3.00	2.47
3+50	Beg. Trans	48.00	54.50	80.00	44.00	3.00	2.48
6+50	End Trans	48.00	54.50	165.00	44.00	3.00	1.41
7+00	Bypass Weir Site	48.00	54.50	165.00	44.00	3.00	1.41
7+25	End of Riprap	48.00	52.15	165.00	42.00	3.00	1.47
10+00		47.00	52.14	165.00	42.00	3.00	1.47
13+50		47.40	52.15	165.00	42.00	3.00	1.47
17+00	Downstream S-65	52.00	52.10	165.00	42.00	3.00	1.47

TABLE A-17

NEW CHANNELS TO CONNECT OXBOWS

STATION (FT)	STATION (FT)	Remarks	LENGTH (FT)	TYPICAL AREA (SQ FT)
2065+55	2020+66	(2)	5,170	1,300
2009+00	2004+00	(1)	392	1,300
1970+50	1899+00	(2)	11,253	1,100
1792+00	1781+00	(2)	1,316	1,100
1774+00	1769+00	(2)	621	510
1659+00	1655+00	(1)	713	2,700
1650+00	1647+00	(1)	345	2,700
1626+00	1586+00	(2)	4,496	710
1559+00	1557+00	(1)	380	710
1547+00	1543+00	(1)	602	710
1417+00	1399+00	(2)	2,551	630
1164+50	1163+50	(1)	586	830
1080+00	1045+00	(2)	3,676	1,150
1043+00	985+50	(2)	6,666	1,430
953+00	935+00	(2)	4,004	1,430
869+50	847+50	(2)	2,574	1,480
746+00	740+00	(1)	1,047	2,080
629+00	555+00	(2)	14,738	1,350
544+35				
	TOTAL		61,130	
	Average Area (sq. ft.)			1,290
	Length (miles)=		11.60	

(1) Natural Ground
(2) Spoil Area

TABLE A-18

S-65 DROP STRUCTURE
SUMMARY OF HYDRAULIC DESIGN

Design Conditions	
Discharge (CFS)	800
Headwater Elevation	52.5
Tailwater Elevation	46.3
Optimum Conditions	
Headwater Elevation	48.5/52.5
Tailwater Elevation	46.3/48.0
SPF Conditions	
Discharge (CFS)	5,600
Headwater Elevation	55.5
Tailwater Elevation	53.1
Maximum Head Difference	
Headwater Elevation	52.5
Tailwater Elevation	46.3
Weir Data	
Crest Length (feet)	163
Crest Elevation	51.00
Maximum Head on Crest (feet)	4.5
Shape	Vertical Wall
Stilling Basin	
Apron Elevation	44.0
Length (feet)	15.0
End Sill Elevation	45.0
Baffle Block Elevation	N\A
Rows of Baffle Blocks	None
Velocity Over the End Sill (fps)	3.78
Canal Section	
Side Slopes (Vert. on Hor.)	1 on 3
Upstream Bottom Width	165
Upstream Bottom Elevation	44.00
Downstream Bottom Width	165
Downstream Bottom Elevation	42.00
Riprap Requirements	
Upstream Length (feet)	N/A
Upstream Protection Elevation	N/A
Downstream Length (feet)	20.0
Downstream Protection Elevation	54.0
Protection Elevation	58.00

Note: All elevations given in feet, NGVD

TABLE A-19

S-65A OVERFLOW WEIRS
SUMMARY OF HYDRAULIC DESIGN

Design Conditions	
Discharge (CFS)	400
Headwater Elevation	48.7
Tailwater Elevation	48.0
Optimum Conditions	
Headwater Elevation	48.0
Tailwater Elevation	46.0
SPF Conditions	
Discharge (CFS)	(1)
Headwater Elevation	51.8
Tailwater Elevation	51.8
Maximum Head Difference	
Headwater Elevation	49.0
Tailwater Elevation	46.5
Weir Data	
Crest Length (feet)	200
Crest Elevation	48.00
Side Slopes (Vert. on Hor.)	1 on 10
Maximum Head on Crest (feet)	2.0
Slopes Downstream of Crest (Vert. on Hor.)	1 on 15
Crest Shape	Trapazoidal
Stilling Basin	
Apron Elevation	45.0
Length (feet)	10.0
Velocity on Crest (fps)	3.9
Velocity on Slope (fps)	6.8
Velocity on Toe with No Tailwater (fps)	7.6
Natural Grade	
Upstream Bottom Elevation	46.50
Downstream Bottom Elevation	46.50

(1) The structures and the tieback levee would be completely submerged under high discharge events

(2) Discharge would be to the wetland areas downstream of the degraded tieback levee

Note: All elevations given in feet, NGVD

TABLE A-20

S-65E OVERFLOW WEIRS
SUMMARY OF HYDRAULIC DESIGN

Structure located upstream of S-65E

Design Conditions		
Discharge (CFS)	19,000	
Headwater Elevation	27.0	
Tailwater Elevation	22.0	
Optimum Conditions		
Headwater Elevation	18.6/23.0	
Tailwater Elevation	18.6/23.0	
SPF Conditions		
Discharge (CFS)	19,000	
Headwater Elevation	27.0	
Tailwater Elevation	22.0	
Maximum Head Difference		
Headwater Elevation	27.0	
Tailwater Elevation	19.0	
Weir Data		
First Step Section		
Crest Length (feet)	190	(1)
Crest Elevation	18.00	
Second Step Section		
Crest Length (feet)	200	(2)
Crest Elevation	23.50	
Total Crest Length (feet)	390	
Maximum Head on Crest (feet)	9.0	
Shape	Vertical Wall	
Stilling Basin		
Apron Elevation	3.6	
Length (feet)	70.0	
End Sill Elevation	6.0	
Baffle Block Elevation	8.4	
Rows of Baffle Blocks	1	
Velocity Over the End Sill (fps)	4.5	
Canal Section		
Side Slopes (Vert. on Hor.)	1 on 2	
Upstream Bottom Width	225	
Upstream Bottom Elevation	-11.00	
Downstream Bottom Width	225	
Downstream Bottom Elevation	-11.00	
Riprap Requirements		
Upstream Length (feet)	N/A	
Upstream Protection Elevation	N/A	
Downstream Length (feet)	20.0	
Downstream Protection Elevation	27.0	
Protection Elevation	30.00	

Note: All elevations given in feet, NGVD

(1) Center or lowest section of Weir Crest

(2) Weir to be in two equal sections on each side of the center crest, See drawing provided

TABLE A-21

INLET CULVERTS AT ISTOKPOGA LEVEE
SUMMMARY OF HYDRAULIC DESIGN DATA

Levee Station	1360+00
Natural Grade Elevation	40
Levee Crown Elevation	44.6
Design Conditions	
Discharge (cfs)	800
Headwater (feet)	40.00
Tailwater (feet)	39.50
Culvert Design	
Barrel Number-Size	5-108"
Length (feet)	120.0
Invert Elevation	31.5
Type Control	Flapgate
Riprap Requirements	
Upstream Length (feet)	N/A
Upstream Elev (feet)	N/A
Downstream Length (feet)	20.0
Downstream Elevation	40.0

Note: All culverts are standard design corregated metal pipes with headwalls and wingwalls upstream and downstream

All elevations are in feet, NGVD.

TABLE A-22

INLET CULVERTS AT YATES MARSH LEVEE
SUMMARY OF HYDRAULIC DESIGN DATA

Levee Station	798+41	765+21
Natural Grade Elevation	36.5	36.0
Levee Crown Elevation	37.1	36.8
Design Conditions		
Discharge (cfs)	131	595
Headwater (feet)	28.50	28.00
Tailwater (feet)	26.50	26.20
Culvert Design		
Barrel Number-Size	2-48″	8-48″
Length (feet)	120.0	120.0
Invert Elevation	24.0	23.5
Type Control	Flapgate	Flapgate
Riprap Requirements		
Upstream Length (feet)	N/A	N/A
Upstream Elev (feet)	N/A	N/A
Downstream Length (feet)	20.0	20.0
Downstream Elevation	35.0	35.0

Note: All culverts are standard design corregated metal pipes
All elevations are in feet, NGVD.

TABLE A-23

INLET CULVERTS AT POOL E
SUMMARY OF HYDRAULIC DESIGN DATA

Culvert Designation Levee Station	CS-1	CS-2	CS-3
Natural Grade Elevation	22.6	22.2	25
Levee Crown Elevation	27	31	N/A
Design Conditions			
Discharge (cfs)	30	30	30
Headwater Elevation	21.50	20.90	20.30
Tailwater Elevation	21.00	20.40	15.50
Culvert Number-Size	2-36″	2-36″	1-54″
Length (feet)	130.0	130.0	130.0
Invert Elevation	16.0	16.0	5.0
Type Control	Flapgate	Flapgate	1-96″ Riser
Riprap Requirements			
Upstream Length (feet)	N/A	N/A	N/A
Upstream Elevation	N/A	N/A	N/A
Downstream Length (feet)	N/A	N/A	N/A
Downstream Elevation	N/A	N/A	N/A

Note: All culverts are standard design corregated metal pipes with headwalls and wingwalls upstream and downstream

All elevations are in feet, NGVD.

TABLE A-24

HYDRAULIC DESIGN DATA FOR LEVEES
YATES MARSH\CHANDLER SLOUGH
100-YEAR DESIGN

Location	Levee Station	Natural Grade Ft, NGVD	100-Yr WSEl Ft, NGVD (1)	Levee Crest Elevation Ft, NGVD (2)	Levee Height Feet	Freeboard Ft, NGVD
Begin	0+00	41.0	37.92	41.0	0.0	0.0
@ SR 98	20+00	37.0	37.92	41.0	4.0	3.1
	100+00	38.0	37.92	40.9	2.9	3.0
	150+00	38.0	37.80	40.8	2.8	3.0
	180+00	35.0	37.40	40.4	5.4	3.0
	200+00	37.0	37.00	40.0	3.0	3.0
	250+00	35.0	36.13	39.4	4.4	3.3
	260+00	30.0	36.13	39.2	9.2	3.1
	282+00	30.0	36.13	39.1	9.1	3.0
CSX RxR	Bridge					
	282+50	30.0	35.00	38.2	8.2	3.2
Culvert 1	297+00	28.0	34.50	37.6	9.6	3.1
	310+00	30.0	34.50	37.4	7.4	2.9
	320+00	31.0	34.10	37.1	6.1	3.0
	330+00	30.0	34.10	37.0	7.0	2.9
Culvert 2	335+00	29.0	34.10	36.8	7.8	2.7
	355+00	31.0	34.00	36.6	5.6	2.6
	378+00	31.0	33.80	36.3	5.3	2.5
	400+00	32.0	33.40	35.9	3.9	2.5
	413+00	31.0	33.30	35.7	4.7	2.4
	430+00	33.0	33.10	35.4	2.4	2.3
End of Levee	431+00	33.0	33.10	33.1	0.1	0.0

(1) Water Surface Calculated on Floodway Roughness = 0.3

(2) Levee Height Calculated on Floodway Roughness = 0.5

(3) Levee termination at Station 431+00 is on the north bank of an open drainage slough.

TABLE A-25

HYDRAULIC DESIGN DATA FOR LEVEES
ISTOKPOGA LEVEE
100-YEAR DESIGN

Location	Levee Station	Natural Grade Ft, NGVD	100–Yr WSEI Ft, NGVD (1)	Levee Crest Elevation Ft, NGVD (2)	Levee Height Feet	Freeboard Ft, NGVD
Begin	0+00	44.8	41.90	45.0	0.2	0.0
@ SR 98	25+00	44.0	41.80	45.0	1.0	3.2
	50+00	42.0	41.70	44.9	2.9	3.2
	75+00	42.0	41.60	44.9	2.9	3.3
	100+00	41.0	41.50	44.8	3.8	3.3
Culvert	105+00	41.0	41.50	44.8	3.8	3.3
	125+00	41.0	41.50	44.6	3.6	3.1
	150+00	40.0	41.40	44.5	4.5	3.1
	173+00	44.4	41.40	44.4	0.0	3.0

(1) Water Surface Calculated on Floodway Roughness = 0.3

(2) Levee Height Calculated on Floodway Roughness = 0.5 plus 0.2 feet of Upstream Levee Superiority until Station 125+00

(3) Levee ends terminate at high ground.

TABLE A-26

BRIDGE DESIGN DATA

Remarks	Station	Design WSEl	Maximum Velocity fps	Minimum Low Cord Ft. NGVD	Design Bottom Width Feet	Design Bottom Elev. Ft. NGVD	Side Slope 1 on	Min Net Area Below WSEl Sq. Ft.	Piers
New West Bridge CSX RR	900+00	37	2.3	41.0	100	22.0	3.0	2175.0	(1)
Existing Bridge	900+00	37	2.3	41.0	250	20.0	3.0	5117.0	(1)
New East Bridge CSX RR	900+00	37	2.3	41.0	150	28.0	3.0	1593.0	(1)
Existing US 98	1040+00	38	2.3	42.0	250	20.0	3.0	5472.0	(1)
US 98	1040+00	38	2.3	42.0	400	29.0	3.0	3843.0	(1)

(1) Rounded Nose, Upstream and Downstream

TABLE A-27

SPF INDUCED FLOODING

TRIBUTARY NUMBER	TRIBUTARY NAME	STATION	INCREASED STAGE IN FEET
10	Tick Island Hammock	2340+00	0.09
11	Pine Island Slough	2233+08	0.06
12	Seven Mile Slough	2238+08	0.08
15	Duck Slough	2059+55	0.02
24	Oak Hammock	1488+00	0.12
25	Lake Istokpoga Canal	1335+43	0.14
28	Chandler Slough	988+30	0.10

FIGURES

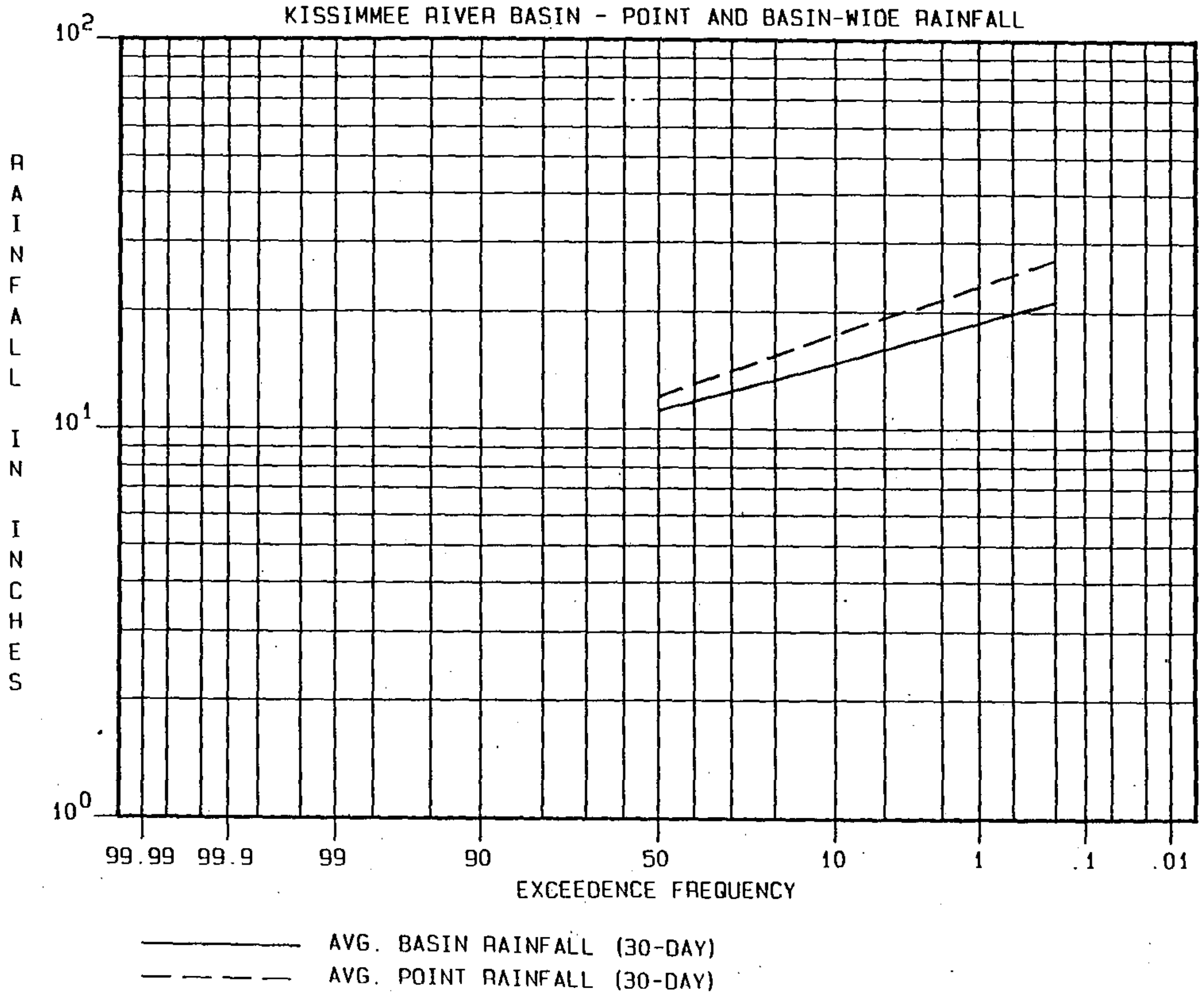

KISSIMMEE RIVER BASIN - POINT AND BASIN-WIDE RAINFALL
RAINFALL IN INCHES
10^2
10^1
10^0
99.99
99.9
99
90
50
10
1
.1
.01
EXCEEDENCE FREQUENCY
AVG. BASIN RAINFALL (30-DAY)
AVG. POINT RAINFALL (30-DAY)

FIGURE A-1

HISTORICAL RATING CURVE
LAKE KISSIMMEE OUTLET AT STATE ROAD 60

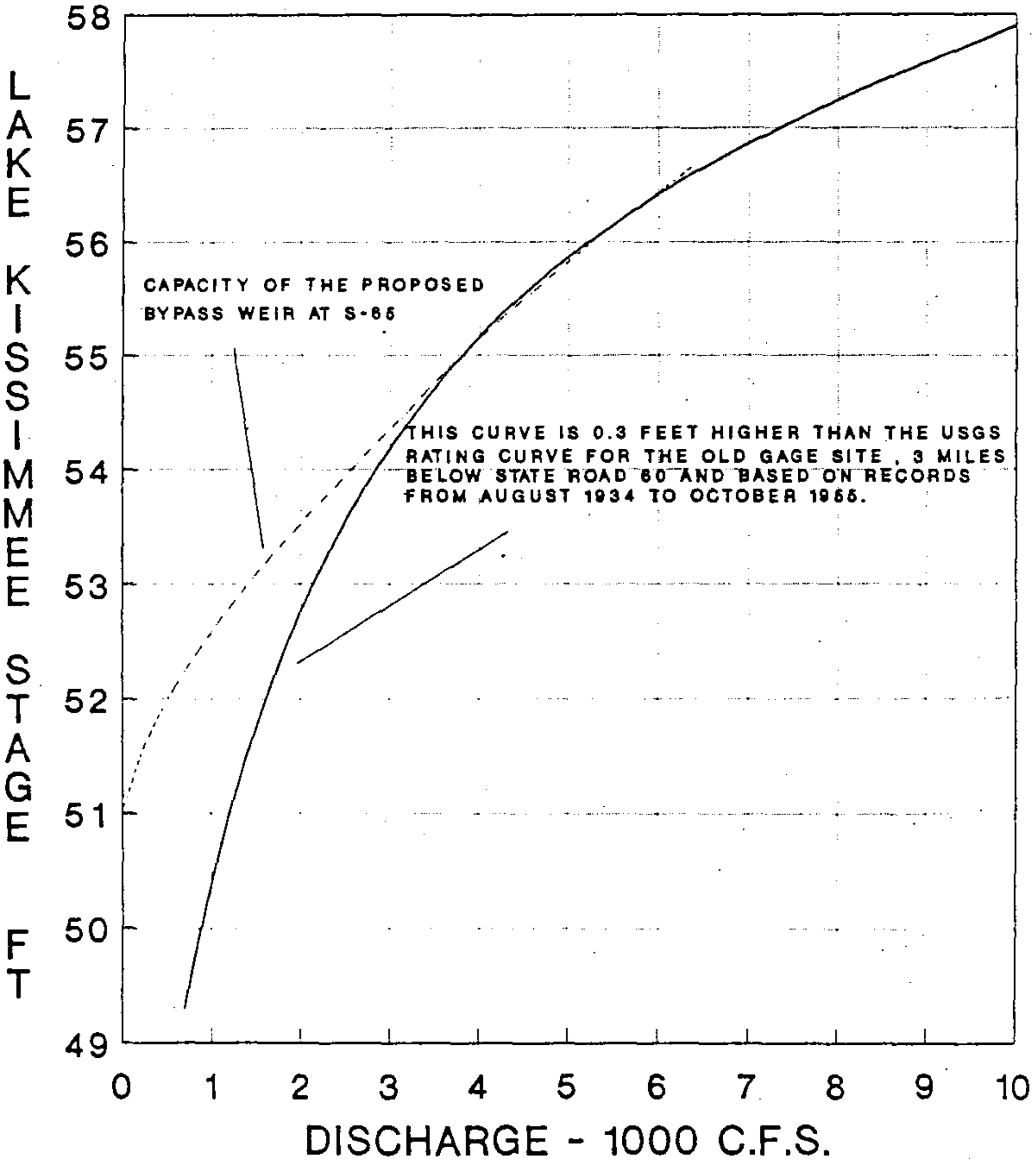
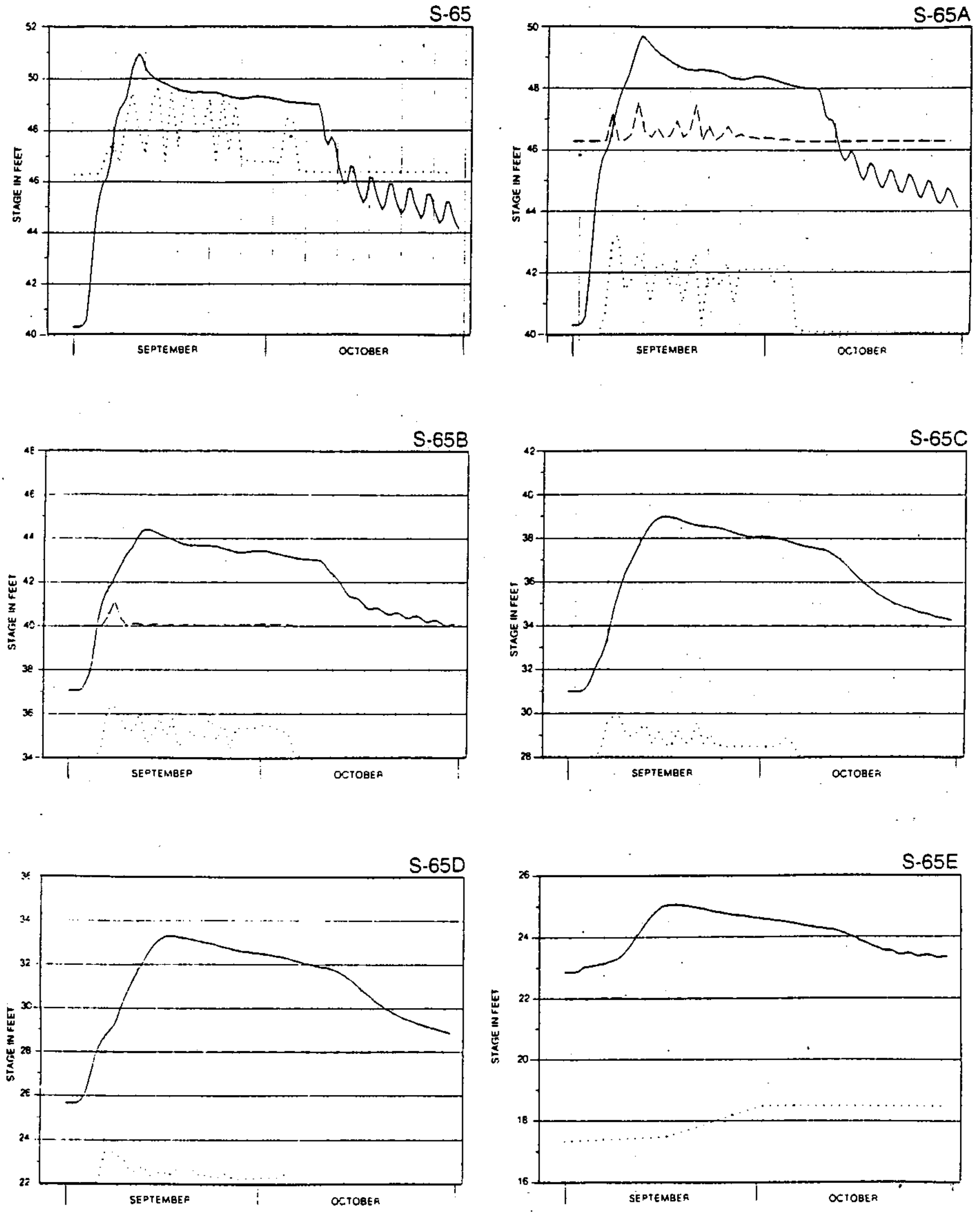


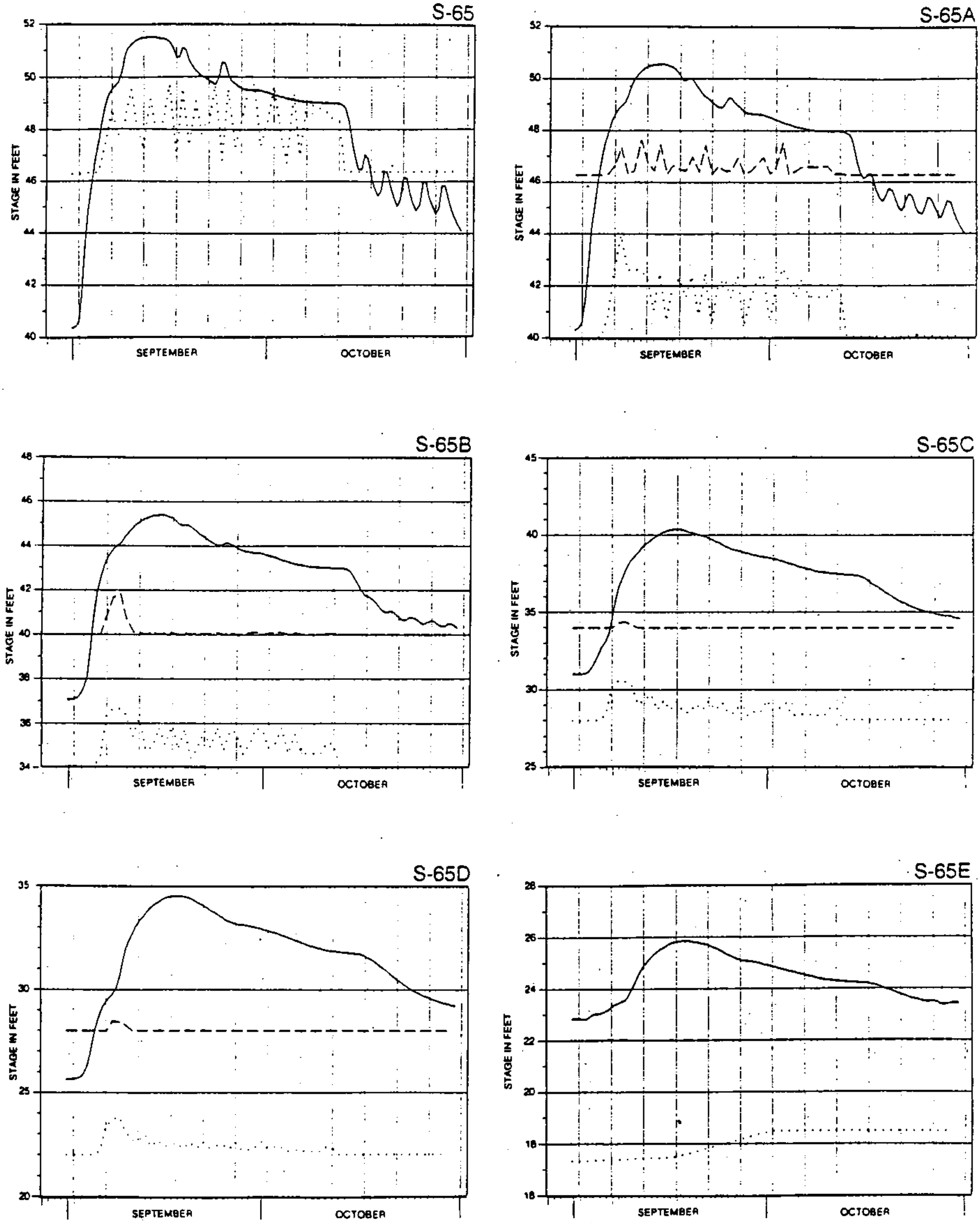
FIGURE A-2



COMPARISON OF
STAGE HYDROGRAPHS

5-YEAR FLOOD

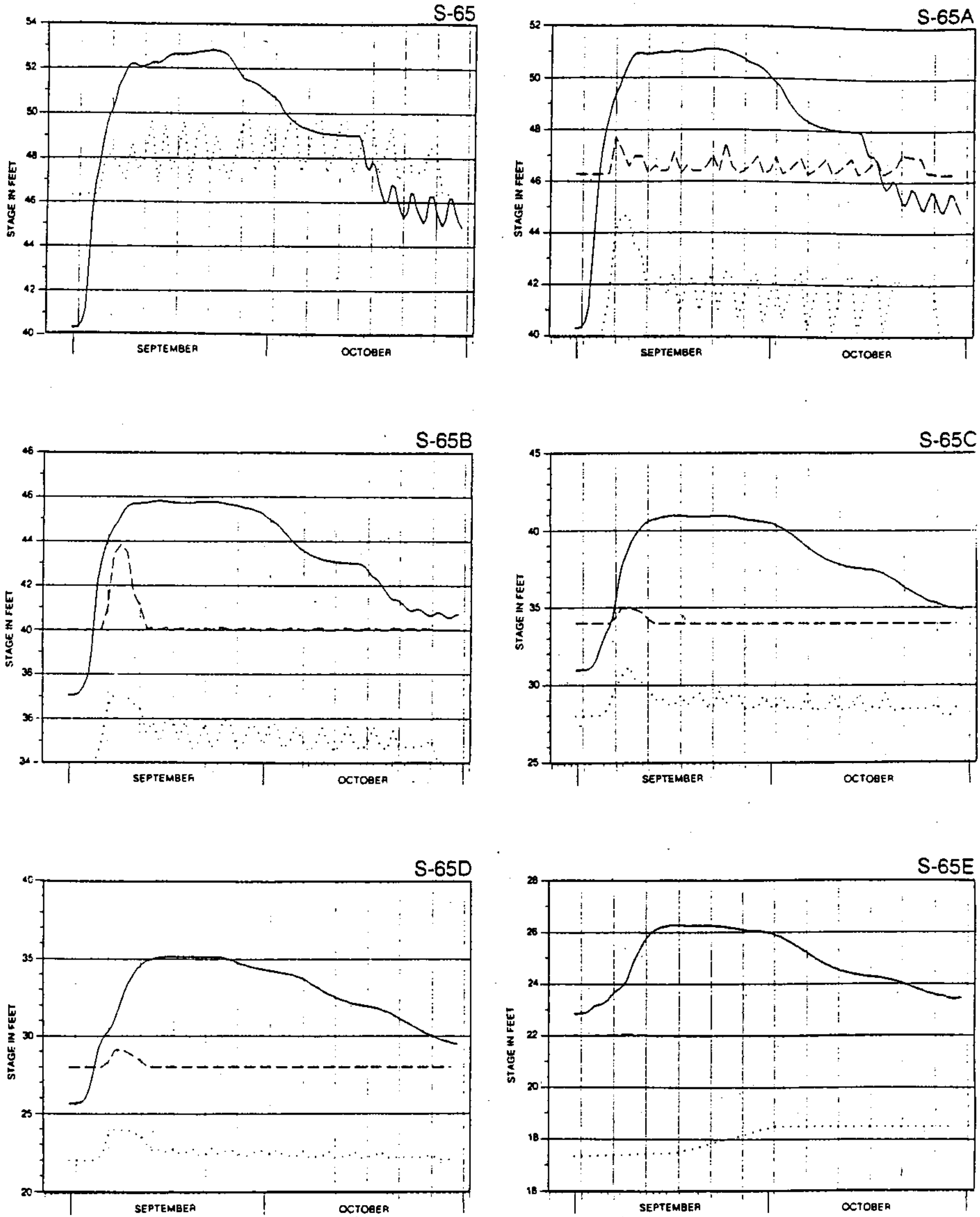
FIGURE A-3



COMPARISON OF
STAGE HYDROGRAPHS

10-YEAR FLOOD

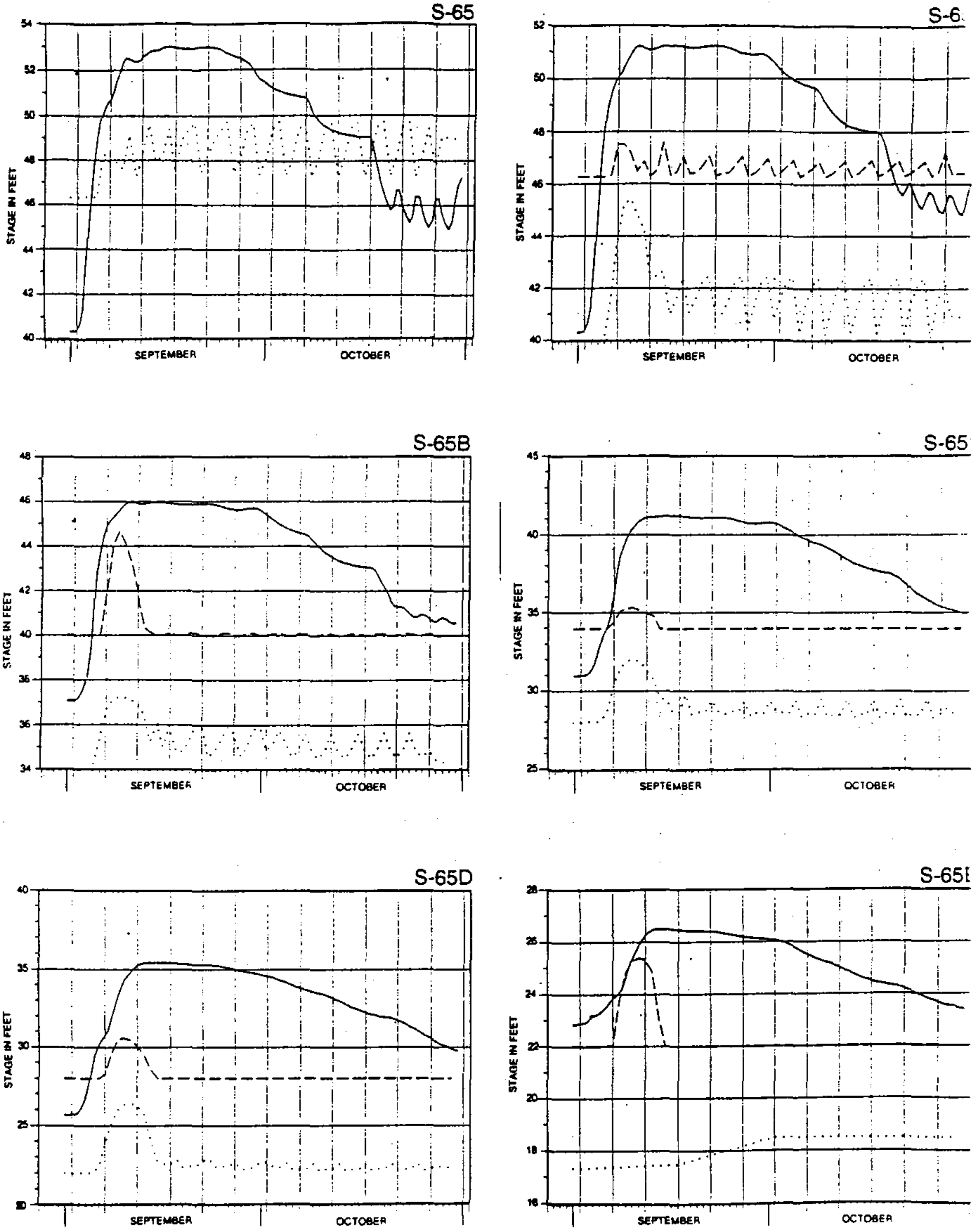
FIGURE A-4



COMPARISON OF
STAGE HYDROGRAPHS

50-YEAR FLOOD

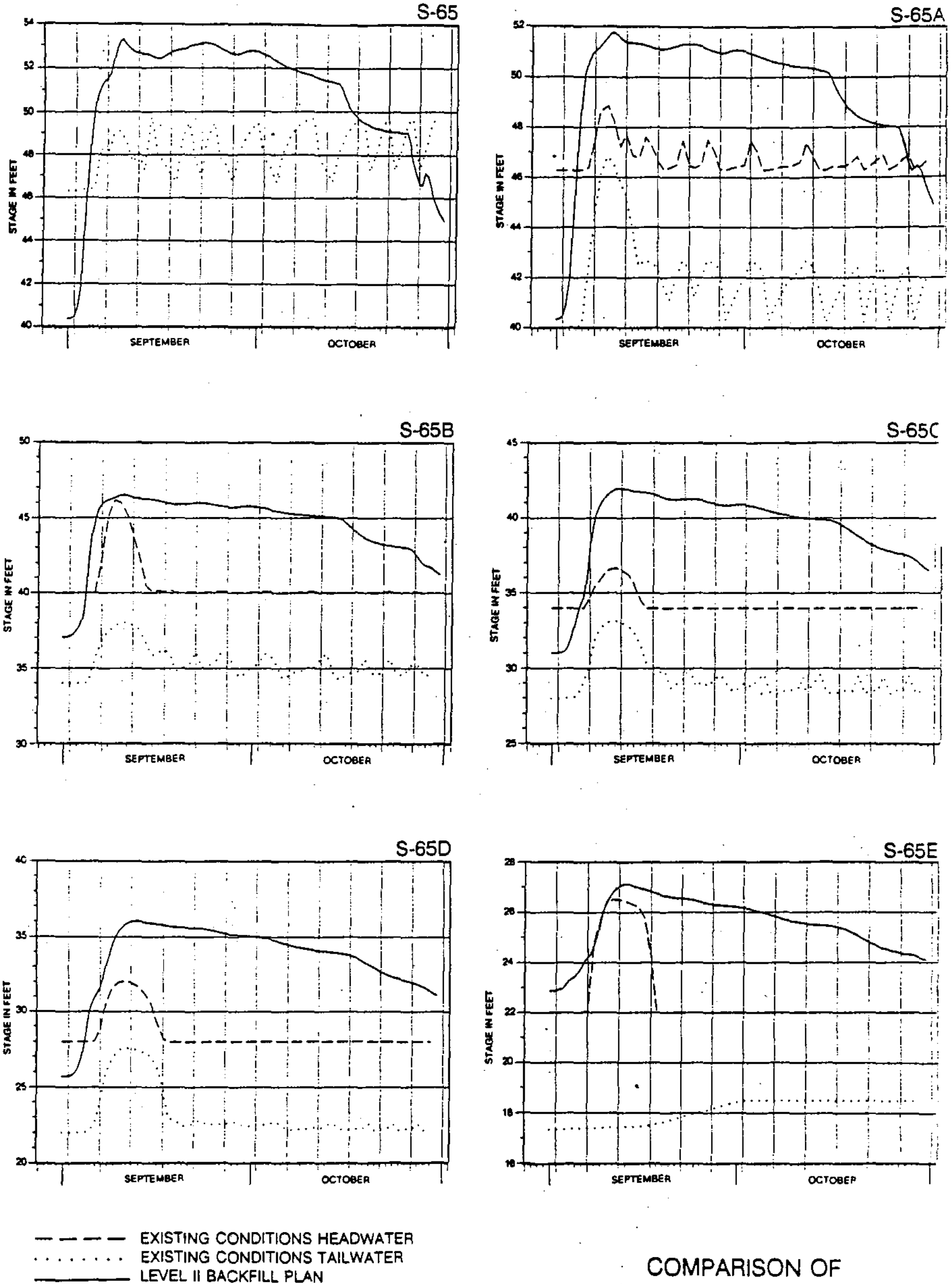
FIGURE A-5



COMPARISON OF
STAGE HYDROGRAPHS

100-YEAR FLOOD

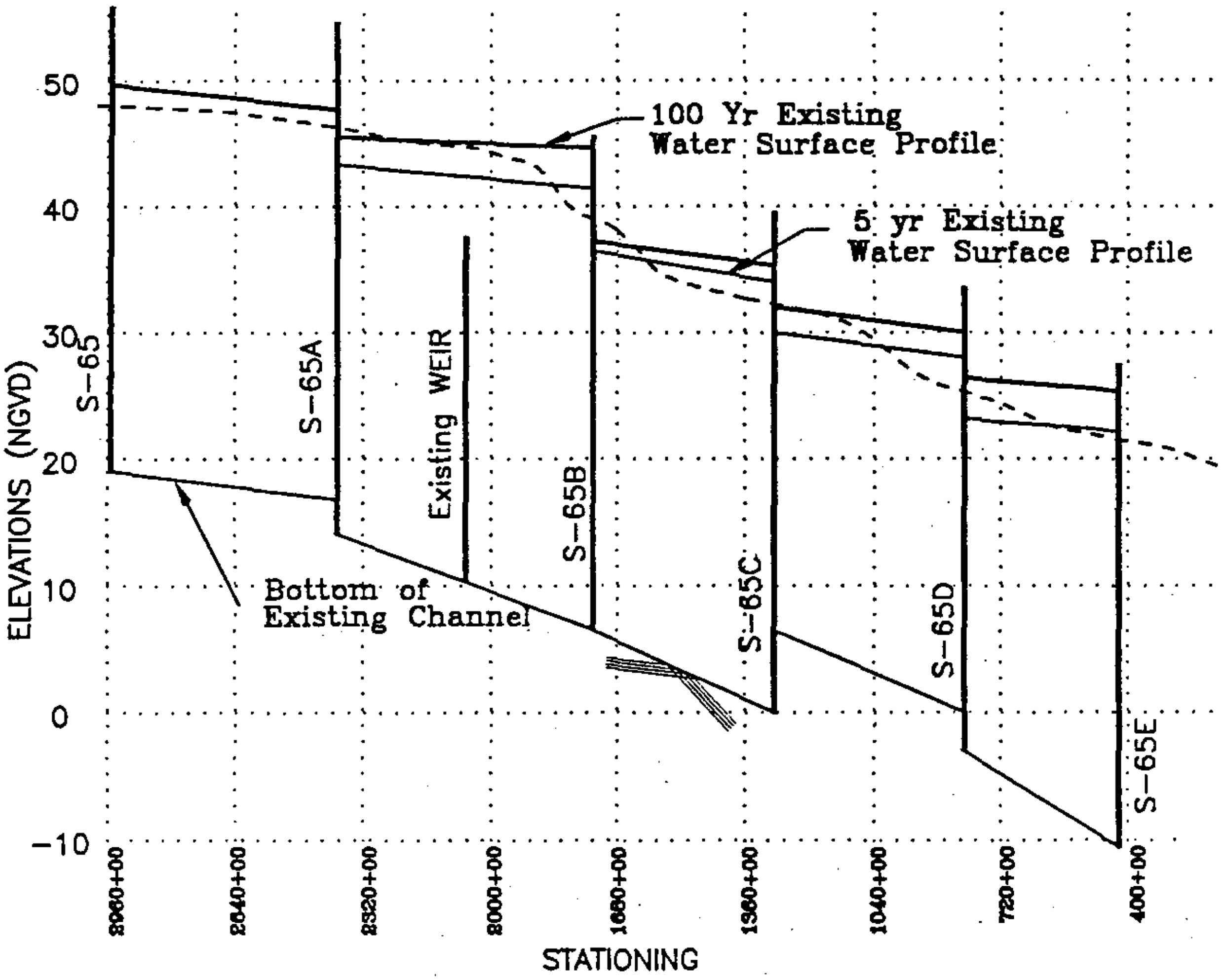
FIGURE A-6



COMPARISON OF
STAGE HYDROGRAPHS

STANDARD PROJECT
FLOOD

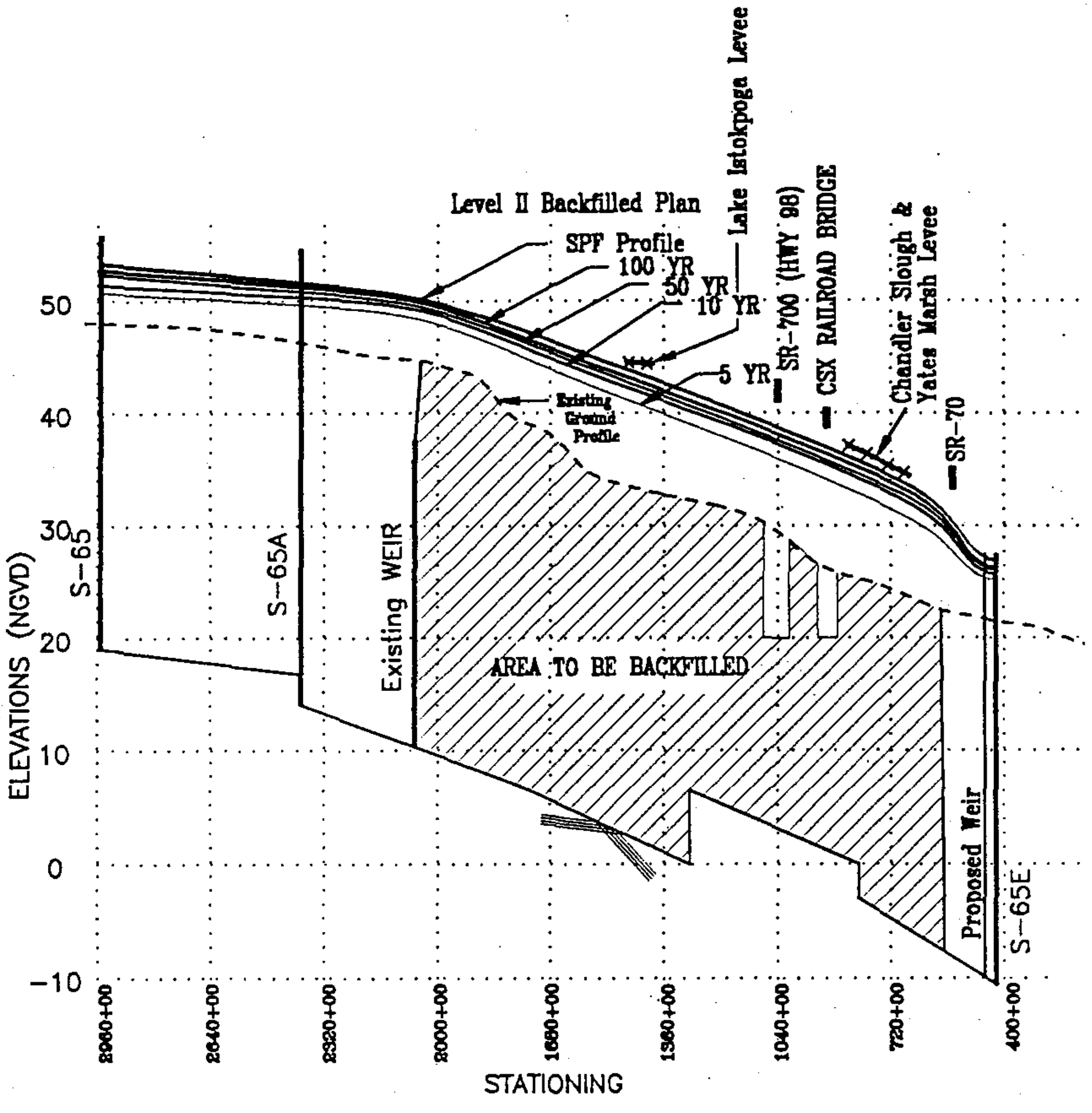
FIGURE A-7



Source from 1985 CORPS Study

EXISTING WATER SURFACE PROFILES

FIGURE A-8



DESIGN WATER SURFACE PROFILE

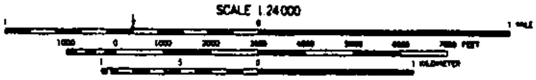
FIGURE A-9

PLATES

EXISTING

- - - 5 YEAR FLOOD

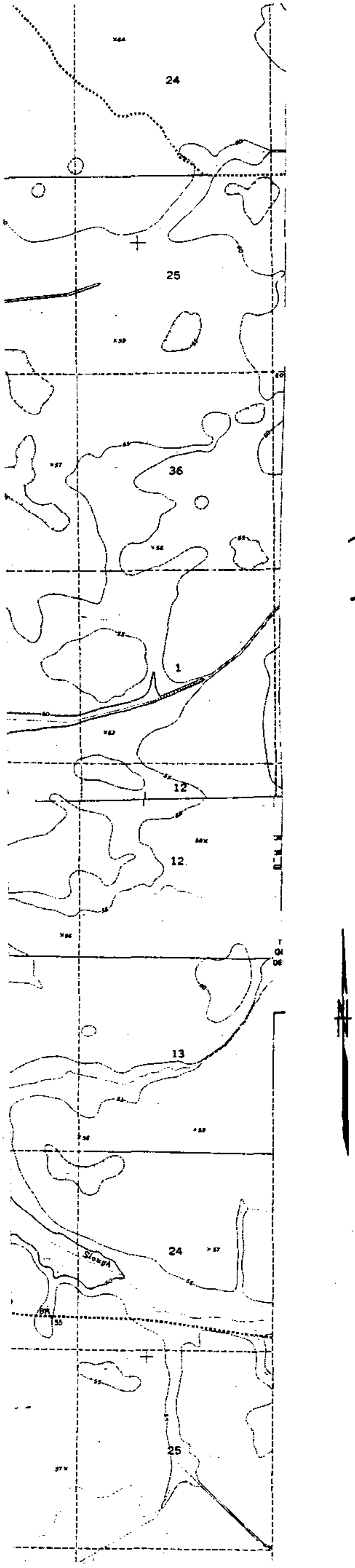
— 100 YEAR FLOOD



CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS 174 FEET

FLOODED AREAS EXISTING CONDITIONS

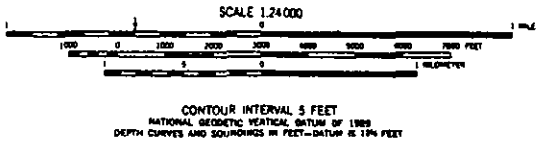
PLATE A-1



EXISTING

5 YEAR FLOOD

100 YEAR FLOOD



FLOODED AREAS
EXISTING CONDITIONS

PLATE A2

APPENDIX B
DESIGN AND COST ESTIMATES

TABLE OF CONTENTS

APPENDIX B

DESIGN AND COST ESTIMATES

INTRODUCTION

The Level II Backfilling Plan as outlined in SFWMD's Feasibility Report calls for backfill of approximately 25-30 miles of C-38 and construction of new river channel to reestablish conveyance through the original meandering river system. It also involves structural modifications at S-65, S-65A & S-65E, removal of S-65B,C & D, construction of two additional CSX Transportation Railroad (CSXT) bridges and one additional highway bridge (U.S. Highway 98). At S-65 a steel sheet pile weir with CIT type stilling basin would be constructed adjacent to the S-65 lock. At S-65A, gate extensions are proposed and at S-65B,C & D the tieback levee and structures would be removed. As a result of preliminary investigations, a grade control structure (consisting of a weir/drop structure and flood gates with tieback levees) may be required to reduce the head across S-65E. Investigations to date include preliminary stability analysis and evaluation of the proposed gate extensions and methods for structure removals. The following appendix is a brief discussion on the findings, conclusions, and recommendations pertaining to the investigations performed for the feasibility report. It also presents a discussion of applicable design considerations and construction methods utilized to establish a basis for the cost estimates.

DESIGN AND CONSTRUCTION

Dechannelization

Under the Modified Level II Backfilling Plan proposed in this report, approximately 29.0 miles of C-38 canal will be backfilled. The upstream limit of backfill in Pool B is currently proposed as Sta. 2075+00 and the downstream limit of backfill in Pool E is assumed to be sta. 544+35. The first major backfilling will be within Pool C, followed by three downstream segments of backfilling, the last terminating in Pool E about 2.5 miles upstream of S-65E. A final section will be constructed upstream of the Pool C segment and will extend about 6.4 miles into Pool B. Each construction segment will be referred to as a Reach, (1-5), in chronological order of construction. The majority of the backfill material will be obtained from the adjacent C-38 disposal mounds and from shallow borrow areas within the flood plain. Additional backfill material will be available from other project excavations, including new river channel construction and the degradation of the S-65B, C and D structure sites and tieback levees. The general mass balance by reach for the backfill is presented in Table B-1.

Plugs

Earth plugs are to be constructed at the downstream terminus of the first four backfilling segments. These segments should be backfilled by constructing the plug first and then filling the remainder of the canal reach moving upstream from the plug. The downstream terminus of the four plugs will be located at stations 1368+87 (Plug 1/Pool C), 1086+49 (Plug 2/Pool D), 874+97 (Plug 3A/Pool D), and 544+35 (Plug 4/Pool E). A fifth plug (Plug 3B/Pool D at Sta. 940+00) would be constructed during the Reach 3 backfilling subsequent to construction of the downstream plug (Plug 3A). The plugs will be designed to resist scouring under the full range of flow conditions expected to occur. All plugs would be constructed as permanent plugs based on the design developed by Shen (refer to Figure B-8). This design calls for a slope of 4H:1V for the upstream face, a top width of not less than 50 feet, and a flat downstream slope of 16H:1V. Earth volume quantities for each plug will differ since the as-built bottom width of C-38 varies from 140 feet in Pool C (Plug 1) to 300 feet in Pool D (Plug 3B). The longitudinal length of the plugs based on the preliminary design would be about 470 feet. The crest width and downstream face would be protected with 5 foot of riprap placed atop a bedding stone and filter fabric base. Plugs 1,2,3A and 3B may be considered as "temporary " since they will eventually be stabilized and covered by backfill on both their upstream and downstream faces. During detailed design, alternative plug designs will be investigated to determine the advisability of constructing the "temporary" plugs to less stringent standards (ie., reduced erosion protection).

Backfilling

The backfilling of C-38 is to be accomplished in five construction segments, each of varying length. These construction segments, Reaches 1-5, are summarized in Table B-1 and further shown and described on Plates 1 through 5 of the main report. Each reach to be backfilled would be initiated with construction of the plug placed at its downstream limit and then backfilled from the plug, moving upstream to the previously constructed plug. Plugs 1 through 4 would be the starting points respectively for the backfill Reaches 1 through 4. Construction of Reach 5 would not require a plug but would instead commence at the upstream terminus of the initial Reach 1 backfill. The backfilling would be accomplished without dewatering or additional mechanical compaction beyond the normal compaction imposed by the earthmoving equipment. All areas disturbed due to earth moving activities are to be graded to natural contours approximating pre-canal topography. A series of shallow potholes, swales and backwater areas are recommended. Creation of these small, shallow, water areas are expected to provide a natural, seasonally-drying habitat within the river flood plain. These modifications include potholes left within the filled portions of C-38. At a depth of 3-5 feet, each would be 1 - 2 acres and spaced approximately 2 per mile. Other modifications include backwater sloughs within the filled portion of C-38. These slough areas are larger than the potholes. Each slough would be 5 - 10 feet deep and aerially 4 - 6 acres, and be 400 - 500 yards from where the restored river crosses the filled portion of C-38. On average, approximately 53,000 cubic yards of material per mile would be available from this specified environmental contouring, resulting in an overall reduction of 1,529,000 cubic yards for the required C-38 backfill. Should the requirement for fill material still exceed existing volumes in adjacent spoil mounds, additional material should be excavated from the adjacent flood plain rather than trucking the material from other pool areas or from sources outside the flood plain. These pits would mimic historical topographic contouring in the area.

C-38 Volume Requirements

Earthwork volumes related to the backfilling were developed from existing Corps of Engineers survey cross-sections taken in 1979. Approximately 86 cross-sections extending across C-38 and the adjacent flood plain were used to estimate the canal backfill volume as well as the quantity of material in the adjacent disposal mounds. Average length of the cross-sections was 10,000 feet and spacing between sections averaged about 3,000 feet. Each survey cross-section and its corresponding canal fill requirement is listed in Table B-2. The initial canal backfill requirement assumes that fill would be placed within the canal section up to an elevation which closely approximates natural ground prior to the construction of C-38. Only in the partial backfill reaches (fill to elevation 20.0 feet) and transition zones associated with the U.S. Highway 98 and CSXT Railroad bridges sections would the final fill elevation be substantially lower than natural ground. The final canal backfill requirement, as indicated in Tables B-1 and B-2, incorporates an additional 10% geotechnical contingency factor to accommodate material density change during canal backfilling and post construction consolidation. Based on the above assumptions, it is estimated that 49,000,000 cubic yards of fill material will be required to backfill the 29.0 miles of C-38 under the Modified Level II Backfill Plan.

C-38 Disposal Mounds

During the initial construction of C-38, excavated material was placed in a series of disposal mounds on alternating sides of the canal bank. A total of 30 self-contained disposal mounds were placed adjacent to C-38 from S-65 downstream to S-65E (refer to Plates 1 through 5,main report). Twenty of the disposal mounds are within the 29 mile reach of the Modified Level II Backfill Plan; the remaining ten are located in the uppermost 16.5 miles of C-38 below S-65. For tabulation purposes each mound has been given a alphanumeric designation (i.e., B-3(E), indicates the third mound downstream in Pool B and located on the east side of C-38). The mounds vary in shape from largely rectangular to highly irregular shapes bounded by the original meandering river system. Regardless of shape however the majority of material within each disposal mound is situated less than 1000 feet from the bank of canal. As with the backfilled canal, the intent of the restoration project is to return all disturbed areas to pre-C-38 topography, thus the mound would be degraded to contours closely approximating natural ground. SFWMD reports that portions of the disposal mounds have been commercially sold since initial C-38 construction and that other portions have been utilized by SFWMD to construct roadbeds. Although SFWMD does not consider the overall amount of removed material to be significant, there does appear to be localized shortfalls of disposal mound material along particular reaches which will necessitate that alternative borrow sources be utilized, thus affecting construction costs. The most severe shortage of disposal mound material appears to be in Reach 4 in which the fill requirements apparently exceed the available material by about 4.5 million cubic yards (see Table B-1). As noted, it is proposed that the deficiency be satisfied by excavating additional shallow borrow potholes/sloughs within the existing disturbed areas. Estimates of material within each disposal mound based on the 1979 cross-sections are detailed in Table B-3. Typical cross-sections showing the canal fill section and disposal mound cut section for the full and partial backfill reaches are shown on Figures B-1 through B-7.

Railroad and Highway Bridge Crossings

There are two bridges located in Pool D (CSXT Railroad & U.S. Highway 98) that provide only a single opening for flow at each location. The causeway crossing the flood plain for each bridge would be modified to provide additional openings for flow and additional bridges would be constructed to span the openings. Two new railroad bridges would be provided in the CSXT causeway east and west of the existing CSXT railroad bridge. On the east side, the bridge would be approximately 300 ft. in span length and on the west side the bridge would be approximately 285 ft. in span length. An additional U.S. Highway 98 bridge (approximately 440 ft. in span length) would be provided east of the existing bridge to allow for additional flow across the flood plain. Temporary bypasses would be provided at all bridges to maintain existing highway and rail traffic during construction.

The railroad bypass is necessary as a temporary measure to provide for continued operations of the railroad during construction of the new bridges. The railroad bypass requirements were based on a similar bypass built by the railroad for construction of the bridge over C-38. The centerline of the proposed bridge opening to the east would be located approximately 1500 feet from the centerline of C-38. This will provide ample room for the construction of the railroad bypass. Both railroad bridges will be constructed along the existing railroad alinement to allow continued high speed rail operations through this area once construction is completed.

New River Channel Construction

Approximately 11.6 miles of new river channel will be created in order to reconnect and replace portions of the original meandering river system which were destroyed by the construction of C-38 and/or the placement of the disposal mounds. Eighteen new river segments totaling 2.8 million cubic yards of excavation will be constructed in the adjacent flood plain. Unlike the original SFWMD plan, which indicated that the new river channel should be constructed in portions of the adjacent flood plain previously undisturbed, the Corps proposes to recreate the segments, where possible, within the existing disposal areas in order to avoid construction impacts to virgin or pristine lands. Each new segment is to be constructed to approximate the meandering pattern, distance, gradient and cross-section of the original segment it is replacing. Where the new river channel crosses C-38, it will be constructed at nearly right angles to the canal in order to promote junction stability. The construction of the new river channel will be the first order of work for a particular backfilling reach primarily for the purpose of providing some flow bypass capability around the backfill construction sites. Material obtained from the new river channel excavations will be stockpiled within the existing disposal areas for subsequent use in backfilling C-38. Pertinent data for the new river channel segments is summarized in Table B-4. Location and preliminary configuration of the new river channel segments are shown (in blue) on Plates 1 through 5.

S-65 Bypass Weir

Approach and outlet channels would be constructed for the S-65 Bypass Weir, which is to be constructed adjacently west of the existing S-65 Lock Structure. The 700 foot length approach channel would start upstream of S-65 and vary in bottom width from 80 feet to 165 feet at a design invert of elevation 44.0; the 1000 feet length outlet channel would discharge downstream of existing S-65 and is designed with a 165 foot bottom width at an invert of

42.0. The excavation quantity for the complete channel is estimated at 68,000 cubic yards. Approximately 15,000 cubic yards of this material would be used to construct tieback levees for the bypass weir. The east tieback levee would form closure with the S-65 lock embankment and the west tieback levee would extend from the bypass weir and parallel the west bank of the approach channel before tieing into high ground at the existing S-65 west tieback levee. Preliminary design of the levee calls for a crest elevation of 62.0 feet, a 15 foot crest width and 3H:1V sideslopes. Berm separation between the levee toe and the channel bank would be a minimum 25 feet. The structure would be a steel pile weir and concrete drop structure constructed with a 165 ft. crest length and a fix crest elevation of 51.0 ft. NGVD. The weir would be designed with flash boards to extend to elevation 53.5 ft. NGVD and construction of a bridge is proposed on the downstream side of the weir to provide access to the flash boards. Riprap would be provided upstream and downstream of the weir for erosion protection. The design of this structure will be further evaluated during the preparation of the FDM to determine if other alternatives can be used in place of the bridge for access.

Shallowing Outlet Channel

The shallowing of the outlet channel would consist of tapering the depth of C-38 from 30 feet immediately downstream of S-65 to between 10 to 12 feet at S-65A. Downstream of S-65A, shallowing will continue from a depth of 10 to 12 feet to natural ground elevation at the upstream limit of backfill (sta. 2075+00). The shallowing reach length would be 16.57 miles and approximately 8.1 million cubic yards of earthen material from the ten adjacent disposal mounds would be required for the tapering backfill. The amount of material in the disposal mounds adjacent to the shallowing reach is estimated at 16.8 million cubic yards, therefore additional flood plain or offsite borrow will not be required. SFWMD has requested that any surplus disposal mound material remaining after shallowing be removed from the flood plain. However, a project cost has not been assigned to this removal item since the assumption is that the remaining 8.7 million cubic yards of material would be sold by SFWMD or else made available to outside parties who would remove the material at their cost. This appears to be a reasonable assumption considering the current demand for commercial fill material in the area and SFWMD's acknowledgement of this market. Shallowing backfill volumes are presented in Tables B-1 (Summary) and B-2 (Detailed). The shallowing reach and corresponding final water depth in C-38 after shallowing is shown on Plates 1 through 5.

Structure Modifications

S-65A Tieback Levee

The S-65A tieback levees on both sides of C-38 would be degraded from their existing grade of elevation 54.5 feet to between elevation 48 and 49 feet. The degrading would start near the S-65A structure and extend along the length of the levees to the edge of the flood plain. Approximately 9500 feet of levees would be partially degraded with an estimated 86,000 cubic yards of material to be placed in the adjacent borrow canal. Selected reaches of the levee would remain at full height (elevation 54.5 feet) including the lock tender's residence, spillway, boat lock, and auxiliary structure, in effect forming "islands" during flood flows. The majority of the levee crest would be degraded to elevation 49 feet, however the proposed design calls for six openings at elevation 48 feet which would be subject to frequent overtopping and would discharge the majority of the overflow. The openings (three to the west of S-65A and three to the east) would be a minimum 200 feet removed from S-65A and spaced apart 500 feet. The openings would have a bottom width of 200 feet and transition at 10H:1V sideslopes back to the levee crest elevation of 49 feet. On the downstream side of the levee the outlets would transition at a 15H:1V slope down to an average existing ground of elevation 46.5 feet. The crest and downstream face of the outlet would be surfaced with a concrete apron to protect against erosive velocities as well as provide continued vehicular access atop the levees to S-65A. The remaining levee at a crest elevation of 49 feet (total length of 8500 feet and average height of 2.5 feet), would be treated with an synthetic erosion mat to stabilize the soil allowing the establishment of natural vegetation to reduce the potential for erosion.

Gate Extensions

The SFWMD report (pg. 73 & 95) states high velocities may occur at locations where water enters back into the collection channel just upstream of a spillway structure where backfilling has occurred. As a result, potential erosion may require protective measures to be taken. One proposed measure is to maintain higher (Deeper) Optimum water surfaces to reduce the overall velocities. Gate extensions would be required if the optimum headwater is increased 2 ft. as proposed. Structures S-65B, C, and D currently have gate extensions and would not require additional gate extensions or structural modifications. Preliminary investigations were performed to evaluate the impacts on the lock & spillway structures at S-65A & S-65E for proposed increased water surface conditions. Based on the preliminary analysis as summarized in figures B-9 thru B-11, structure S-65A will require a 2 foot gate extension whereas structure S-65E will not require any gate extension for the proposed 2 foot increase in optimum water levels.

Two primary concerns associated with the proposed headwater increase were evaluated. The first was the sliding stability of the structures and the second was the ability of the structures to function under the new hydraulic condition.

Stability Analysis

A stability analysis was conducted on S-65A and S-65E spillway structures. The Corps of Engineers (C-Slide Software) computer program was used to evaluate factors of safety against sliding for the increased water surface elevations. Results of these findings are presented in the table below.

	Headwater Elev.	Tailwater Elev.	Safety Factor
S-65A	48.0	33.2	1.39(without anchors)
S-65E	23.0	9.0	1.29

Accepted Sliding Criteria used for short term loadings was 1.5 and 2.0 for long term loadings. The load cases shown are considered extreme and are unlikely to occur.

Mechanical and Electrical

The lifting and operating capacities of the wire rope, hydraulic unit and electrical system for spillways S-65A and S-65E were evaluated for the 2 foot gate extension. The analysis was based on the latest design and safety criteria. Also, since spillways S-65B, S-65C and S-65D currently have gate extensions, these gates were analyzed for the increased load as well. A 100 lb/ft was assumed to be the weight of a 2 foot high gate extension and the minimum safety factor of 5 (Machinery's Handbook edition 21, page 485 recommends safety factor between 5 and 12) was used to analyze the lifting strength of gate wire rope. The safety factor is defined as the ratio between the breaking strength of wire rope and the wire rope load. Results of the analysis are summarized below.

The wire rope system for spillway structures S-65A and S-65E, for a 2 foot gate extension and 2 foot rise in the optimum water level, will have a safety factor of 3.04 and 2.92 respectively, which is below the current minimum safety factor of 5. However, the present wire rope safety factors for S-65A and

S-65E without any gate extension are 3.67 and 3.47 respectively, which does not meet the current design criteria either. The safety factor can be improved by providing a new hydraulic system or by modifying the wire rope attachment to the gate by adding sheave blocks and by increasing the wire rope diameter. Another solution would be to implement a monthly inspection program to observe any fraying or excessive wear of the wire ropes and replace the rope assembly as required. This will not require any changes to the mechanical and electrical system. It should be noted that under the present design the hydraulic pressure and flow capacities of the existing hydraulic unit is sufficient to raise one gate at a time at S-65A and two gates simultaneously at S-65E. Further analysis of these options will be made during preparation of the FDM.

The wire rope system for spillway structures S-65B, S-65C and S-65D with current gate extensions and 2 foot rise in optimum water level has a safety factor of 2.64, 2.67 and 2.69 respectively. Although the safety factor is less than 5, no modification to the hoist machinery is required due to the temporary use of the structure before it is finally removed. It is recommended that during temporary operation of these structures, wire ropes be inspected every three months for any fraying or excessive wear. The existing hydraulic system and electrical system does not require any modification and is sufficient to raise 2 gates simultaneously.

Service

Another primary concern with raising the optimum headwater two feet was the ability of the structures to function properly. Structures to be removed should still function properly until they are decommissioned. Performance of the locks could be hampered if either the lock gates were overtopped or water was introduced into the machinery pit recess during flooding of the lock. Spillway gate operating ability could be hampered if equipment capacities are exceeded by weight of proposed gate extensions.

Figures B-9 thru B-11 show the effects of the 2 foot increase on the 6 lock and spillway gates for optimum conditions. Sketches indicate the proposed optimum headwater elevation will neither overtop any sector gates nor exceed the machinery pit invert elevation at any of the locks. However, because the clearance distance between the optimum water surface and the machinery pit invert has decreased, water would enter the pit on a more frequent basis at all the locks. This occurrence presents no electrical or mechanical hazards, but it may increase maintenance costs on the roller drum and appurtances for the lock structures to remain permanently (S-65, S-65A and S-65E). At S-65E the machinery pit will be flooded for headwater conditions above El. 23.29.

Spillways at S-65A would require 2 ft. gate extensions under the proposed headwater elevation. Existing spillway gates at S-65B, C, and D were not overtopped but flush (0 ft. freeboard) with the proposed optimum headwater and therefore no modifications required. Modifications to the spillway gates as a result of the headwater increase were based on whether the structure is temporary or permanent under the Level II Backfilling Plan. Since spillways S-65B, C and D are temporary, the 0 ft. freeboard was presumed acceptable. However, since spillway S-65A is to remain, gate extensions are required to achieve a reasonable freeboard under the proposed optimum headwater increase. Structure S-65E will not require any gate extension as sufficient freeboard is available for the proposed 2 foot increase in optimum water level as shown in figure B-9.

Conclusions

Structures S-65B, C, and D appear not to be a problem for changing water surfaces under the proposed backfilling construction sequence surrounding each structure. All of these structures have been constructed with stilling basin anchors and will be further evaluated during preparation of the FDM.

At S-65A the structure with anchors should be stable. Additional stability analysis would be performed during the FDM investigations to verify this structure stability.

S-65E is the controlling structure between Lake Okeechobee and the Kissimmee watershed. The stability of the spillway is borderline and needs to be improved with anchors. The design condition should provide a safety factor of approximately 2.0. Gate extensions will not be required if a Grade Control Structure is constructed in Pool E upstream of S-65E, however, anchors would be required for a headwater of El 23.0 with a concurrent tailwater of El. 9.0.

Grade Control Structure

A Grade Control Structure with a tieback levee is proposed in Pool E upstream of S-65E. This structure would consist of a steel sheet pile weir/drop structure to provide for 19,000 cfs discharge and a gated structure (similar to a hurricane gate) to prevent headwaters in excess of EL. 23.0 from flooding S-65E lock structure. A tremie concrete apron is proposed with precast baffle blocks being anchored in place. Operating machinery for each gate sector would be installed in an individual adjacent machinery house. Each gate leaf operator will consist essentially of a motor driven hydraulic pump unit, flow control valves, gear reducer and rope drum. All components of power unit will be located in the machinery house. From the drum gate, opening and closing ropes will be connected to the gate sector. Limit switch trips will be mounted on the periphery of the gate to control the open, close and change in speed operation of the gate.

Commercial and emergency power will be provided for the operation of hydraulic unit motor, controls, and lighting. Each machinery house will be equipped with a motor control center for power distribution and control console to operate the gates and lighting. This Grade Control Structure would prevent the lock machinery pit at S-65E from being flooded during high flow conditions. During the FDM preparation construction modifications to the S-65E lock, spillway & tieback levee to allow higher headwaters to be held upstream of S-65E would be evaluated to determine if the existing structure could be economically modified instead of constructing a grade control structure.

Levee Removal

S-65 (B,C,D) Tieback Levees

In conjunction with the removal of the S-65B,C, and D structures each of the associated tieback levees will be degraded to natural ground. Each structure has a predominant tieback levee and a secondary smaller embankment on the opposite side of the C-38 canal. Based on a combination of as-built drawings and topography from the 1986 SFWMD aerial surveys, degradation quantities for the S-65B,C, and D tieback levees were estimated respectively as 97,000, 134,000, and 143,000 cubic yards. The majority of the excavated material will be used to backfill the spillway, lock and bypass channels associated with each structure. Fill requirements for the S-65B,C and D bypass channels are estimated to be 153,000, 312,000, and 183,000 cubic yards respectively. In contrast to S-65A, portions of the borrow canals adjacent to the existing tieback levees would not be backfilled but left open so that recreational boaters embarking from the relocated boat launching facilities can access the original river navigation channel.

Local Levees

Locally constructed levees within the area of flood plain restoration would be degraded to natural ground elevations to promote sheet flow. It appears that nearly all of these levees were constructed from adjacent borrow canals, thus the degraded levee material will simply be used to backfill the canals. All local levees within the flood plain from S-65 to S-65E will be degraded. Prior to any backfilling of C-38, an initial and separate contract will involve degrading the levees from S-65 to sta. 1649+86 in Pool C (upstream limit of Reach 1). Thereafter, the local levees would be incorporated into each backfilling reach contract and accomplished, along with the new river channel construction, as one of the first orders of work. Based on input from SFWMD and examination of the 1986 aerial surveys, the Corps' preliminary estimate is that 40 miles of local levees/canals and 1,600,000 cubic yards of earthen material will be involved.

Structural Removal

The removal of the spillway and lock structures at S-65B, S-65C, and S-65D will be accomplished with a minimal amount of non-conventional equipment required. It is expected that minimal amounts of HTW material in the form of asbestos and fuel oil will need to be removed from the structure sites. Asbestos material will be put in proper containers and transported to a land fill in Georgia or South Carolina for processing and disposal. The fuel oil tanks will be drained and the oil taken to Tampa, Florida, where it will be recycled by blending for resale. The spillway and lock structures will be buried intact, except for the upper portion of the spillway above the spillway service bridge. An 8-10 ft. mound would be created to cover that portion of the structure which remained above final grade. The culverts in the tie-back levees, at the original river where the access roads intersect, will be removed. This will be accomplished with removal of the access roads when access to the structures is no longer necessary. Quantity estimates provided for the structural removal include access road removal only within the project limits for each structure. The removed materials, which are not buried, will be hauled to the nearest disposal site. The cost of this hauling and the disposal site is being considered.

The tie-back levees at S-65B, C, and D would be degraded to natural ground. (Kissimmee River Modeling, SFWMD, June 1990, Pp 45). The timing of this activity is critical to the removal of those structures and should be performed in conjunction with the structural removal.

Containment Levees

Yates Marsh/Chandler Slough Containment Levee

The Yates Marsh/Chandler Slough will be a two levee segment with the CSXT railroad embankment acting as the internal closure point. North of CSXT railroad the levee would protect Chandler Slough from the 100-year floodwaters; south of CSXT railroad the Yates Marsh area would be similarly protected. Total length of the levee is estimated at 43,100 feet (8.16 miles) with a required embankment of 253,300 cubic yards. The design crest elevation of the levee will vary from 41.0 feet (north end) to 33.1 feet (south end), yielding a maximum levee height of about 9 feet. Material for the levee would be obtained from an adjacently constructed borrow canal on the protected side of the levee. A 15 foot crest width, 3H:1V sideslopes and minimum 25 foot berm separation between levee toe and borrow canal are proposed. Two flapgated culvert structures, 131 CFS (2-48" diam.) and 595 CFS (8-48" diam.), would also be provided in the Yates Marsh levee to allow drainage to the Kissimmee river. Proposed alinement of the levee is shown on Plate 4 & 5. Design quantities for the levee are presented in Table B-5.

Lake Istokpoga Containment Levee

The Istokpoga levee will be a 100-year protection continuous levee which will prevent the Kissimmee River from backflowing to Lake Istokpoga through the Istokpoga Canal. The levee will parallel the north side of the CSXT railroad embankment and tie in to the embankment at locations 10,400 feet to the west of the Istokpoga Canal and 6,900 feet to the east for a total length of 17,300 feet (3.28 miles). The design crest elevation of the levee will vary between 44.4 and 44.8 feet, yielding a maximum levee height of about 4.5 feet. Total embankment required is estimated at 44,300 cubic yards which will be obtained from an adjacent borrow canal on the protected side of the levee. A 15 foot crest width, 3H:1V sideslopes and minimum 25 foot berm separation between levee toe and borrow canal are proposed. An 800 CFS flapgated culvert structure (5-108" diameter) would also be provided at the Istokpoga Canal levee juncture to allow drainage to Kissimmee River. Proposed alinement of the levee is shown on Plate 4. Design quantities for the levee are presented in Table B-6.

Pool B Weir Modifications

Three existing weirs in Pool B will be modified with the navigation notches being closed and existing crest elevation being lowered. Additional sheet piling would be welded or bolted to the existing weir to close the notch.

Navigation Aids

United States Coast Guard approved navigation aids would be provided to mark the restored channel. Approximately 68 signs would be required and the signs would be mounted on 4" PVC pipe filled with concrete and jetted into the ground.

RELOCATION OF UTILITIES

General

The existing utilities mainly consist of telephone and power lines constructed along U.S. Highway 98 and CSXT railroad causeway. These utilities cross canal C-38 as shown in Figures B-12 and B-13. Any modifications to either the existing channel and bridges, or new bridge openings along the causeway will effect the utilities. A temporary relocation of utilities during construction and thereafter a permanent installation of utilities will be required to minimize interruptions in service.

The local utility companies have been familiarized with the project scope including channel modifications and new bridge openings. Efforts were made to procure as much information as possible from the utility companies. The necessary modifications and relocations will be done by the utility companies in close coordination with the Government contractor. The utility companies will be reimbursed for the costs involved in relocations and modifications.

U.S. Highway 98

At U.S. Highway 98, north of the highway, there is a United Telephone Company submarine telephone cable crossing the channel and then installed underground along the highway. There are two (69kV and 25kV) aerial transmission lines which belong to Seminole Electric Cooperative and Glades Electric Company, respectively. The 69kV line is installed north of U.S. Highway 98 on 85 feet high concrete poles with approximately 700 feet span for channel crossing. A similar installation will be required at new bridge openings. The 25kV line is installed south of U.S. Highway 98 and is on wooden pole structures.

CSXT Railroad

Two submarine fiber optic cables cross Canal C-38 and then are installed underground parallel to the railroad. The cable installed north of the railroad bridge belongs to Williams Telecommunication Company. The cable located south of the bridge belongs to MCI Telephone Company. There is an overhead power line south of the bridge as shown on Figures B-12 and B-13.

OPERATION AND MAINTENANCE

S-65 Bypass Weir, S-65, S-65A, S-65E, Pool E Grade Control Structures and Containment Levee & Culverts

Operation and maintenance of the project features presented in this report would be the responsibility of the local sponsor, South Florida Water Management District, as specified in the project documents. These would be performed in accordance with the instructions prepared and incorporated in the Operation and Maintenance Manual, Central and Southern Florida Flood Control Project. All project features would be operated and maintained in accordance with Section 208.10, Title 33 of the Code of Federal Regulation. The measures prescribed therein, include inspection and inspection reports and provide for efficient operation and maintenance of the structures and facilities during flood periods and for continuous inspection and maintenance project works during periods of low water.

COST ESTIMATES

General

Black & Veatch working under contract with the Jacksonville District has reviewed and commented on the Government Estimates for the Kissimmee River Restoration. They have provided comments pertinent to the complete job as well as to each of the 14 contracts. The comments primarily pertained to the development of unit costs and mark ups. For contracts 2 and 9, they felt the value of construction cost exceeds that estimated by the Government. Estimates were considered to adequately cover construction costs for the other contracts.

As a result of Black & Veatch's comments, the estimates for contracts 2 and 9 were reviewed and corrected as appropriate. All comments generated by Black & Veatch have been incorporated into the Government's estimate.

Cost estimates, based on 14 construction contracts as detailed in the Project Management Plan, are included at the end of this Appendix.

VALUE ENGINEERING

General

In accordance with *Section 911 of the Water Resources Development Act of 1986 (Public Law 99-662)*, each water resource project which has a total cost in excess of $10,000,000 and on which construction has not been initiated, shall require a review of the cost effectiveness of the project design. This review shall employ cost control techniques which will ensure that such project is designed in the most cost-effective way for the life of the project. Present Corps policy requires that the required reviews be accomplished utilizing the value engineering process.

During the early part of October 1991, Black & Veatch, Engineers-Architects, working under contract with the Jacksonville District, was directed to conduct a value engineering study of the *Draft Integrated Feasibility Report and Environmental Impact Statement for the Environmental Restoration of the Kissimmee River, Florida.* Representatives from the A-E's study team visited the site on October 10, 1991 and toured the Kissimmee River from River Ranch, south to the CSXT railroad bridge, just upstream of S-65D. The A-E reviewed the project under the direction of a Certified Value Engineering Specialist, using value engineering methodology, and furnished the completed study to the Corps on October 23, 1991. On November 8, representatives of the A-E's Value Engineering team gave an oral presentation to the Jacksonville District and the SFWMD on the results of their study. The VE study provided eight alternatives for further consideration. In summary the A-E concluded:

> "that the approach described in the Feasibility Report is substantially the most cost effective of constructing the Modified Level II Backfill Plan."

APPENDIX B
DESIGN AND COST ESTIMATES

LIST OF TABLES

TABLE B-1

CONSTRUCTION SEGMENTS

CONSTRUCTION SEGMENT	SEGMENT LENGTH (MILES)	C-38 BACKFILL REQUIRED (C.Y.)	DISPOSAL MOUND MATERIAL AVAILABLE (C.Y.)	NEW RIVER CHANNEL MATERIAL AVAILABLE (C.Y.)	S-65X TIEBACK LEVEE MATERIAL AVAILABLE (C.Y.)	MATERIAL BALANCE (+/- C.Y.)
SHALLOWING REACH (2075+00 TO 2949+78)	16.57	8,116,000	16,802,000	-------	-------	8,686,000
REACH 5 (1649+86 TO 2075+00)	8.05	11,461,300	11,595,000	885,200	97,000 (S-65B)	1,115,900
REACH 1 (1368+87 TO 1649+86)	5.32	8,304,500	7,865,000	261,600	-------	(177,900)
REACH 2 (1086+19 TO 1368+87)	5.35	9,163,200	8,010,000	29,950	134,000 (S-65C)	(989,250)
REACH 3 (874+97 TO 1086+19)	4.00	5,883,900	4,468,000	770,400	-------	(645,500)
REACH 4 (544+35 TO 874+97)	6.26	14,186,000	8,635,000	853,100	143,000 (S-65D)	(4,554,900)
TOTALS	45.55	57,114,900	57,375,000	2,800,250	374,000	3,434,350

NOTES:

1. C-38 BACKFILL INCLUDES 10% GEOTECHNICAL CONTINGENCY TO ACCOUNT FOR MATERIAL BEHAVIOR UNCERTAINTIES OF THE FILL BOTH DURING AND SUBSEQUENT TO PLACEMENT WITHIN THE CANAL.

2. C-38 BACKFILL VOLUME HAS BEEN REDUCED BY AN AVERAGE 53,000 C.Y./MILE TO ACCOUNT FOR THE SPECIFIED POTHOLES AND SLOUGHS REQUESTED FOR ENVIRONMENTAL PURPOSES.

3. IT IS INTENDED THAT SHORTFALLS IN MATERIAL BALANCE FOR A PARTICULAR REACH BE SATISFIED BY EXCAVATING ADDITIONAL ENVIRONMENTAL POTHOLES/SLOUGHS WITHIN THE DISPOSAL MOUNDS ADJACENT TO THE REACH.

4. THE SURPLUS DISPOSAL MOUND MATERIAL (8,686,000 C.Y.) IN THE SHALLOWING REACH WOULD LIKELY BE LEFT IN-PLACE FOR SUBSEQUENT COMMERCIAL SALE.

TABLE B-2

C-38 BACKFILL VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	FILL ELEV. (FT.,NGVD)	CANAL FILL AREA (S.F.)	AVERAGE END AREA (S.F.)	CANAL FILL VOLUME (C.Y.)	CUMULATIVE CANAL FILL VOLUME(C.Y.)
START SHALLOWING							
S-65	2949 + 78.22		16	0			
		5711.31			38	8,842	8,842
86	2892 + 66.91		17	76			
		6713.50			141.5	38,702	47,544
85	2825 + 53.41		19	207			
		2783.30			245	27,781	75,325
84	2797 + 70.11		19.5	283			
		2725.25			350	38,860	114,186
83	2770 + 44.86		20.5	417			
		2927.19			493	58,793	172,979
82	2741 + 17.67		21.5	569			
		3322.12			334.5	45,273	218,252
81	2707 + 95.55		22.5	100			
		2195.44			341	30,500	248,752
80	2686 + 0.11		23	582			
		4995.98			653	132,912	381,664
79	2636 + 4.13		24.5	724			
		5874.86			935.5	223,908	605,572
77	2577 + 29.27		26.5	1147			
		4311.17			1246.5	218,936	824,508
76	2534 + 18.10		27.5	1346			
		6438.66			1743	457,216	1,281,724
75	2469 + 79.44		29.5	2140			
		4883.63			2328.5	463,285	1,745,009
74	2420 + 95.81		31	2517			
		3645.81			2389	354,845	2,099,854
S-65A	2384 + 50.00		32.5	2261			
		2492.17			2655.5	269,620	2,369,475
73	2359 + 57.83		33	3050			
		3675.49			3215.5	481,496	2,850,971
72	2322 + 82.34		34	3381			
		3152.50			3772	484,458	3,335,428
71	2291 + 29.84		35	4163			
		5821.22			4514	1,070,544	4,405,972
70	2233 + 8.62		37	4865			
		4937.59			4739.5	953,403	5,359,375
68	2183 + 71.03		38.5	4614			
		4869.75			5171.5	1,026,011	6,385,386
66	2135 + 1.28		40	5729			
		3210.37			7035	920,128	7,305,514
65	2102 + 90.91		41	8341			
		1835.72			7436	556,128	7,861,642
64	2084 + 55.19		41.5	6531			
		955.19			6531	254,155	8,115,797
END SHALLOWING	2075 + 0.00		42	6531			
SHALLOWING TOTALS		87,478 FT.	or 16.57 MILES			8,115,797 C.Y.	

TABLE B-2

C-38 BACKFILL VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	FILL ELEV. (FT.,NGVD)	CANAL FILL AREA (S.F.)	AVERAGE END AREA (S.F.)	CANAL FILL VOLUME (C.Y.)	CUMULATIVE CANAL FILL VOLUME(C.Y.)
U/S LIMIT LEVEL II BACKFILL	2075 + 0.00		42	6531			
		4433.89			6385.5	1,153,476	1,153,476
63	2030 + 66.11		42	6240			
		7067.59			6815	1,962,303	3,115,780
62	1959 + 98.52		42	7390			
		5715.30			6962.5	1,621,187	4,736,967
61	1902 + 83.22		42	6535			
		3579.48			6332.5	923,473	5,660,440
59	1867 + 3.74		42	6130			
		5179.78			6085	1,284,106	6,944,545
58	1815 + 23.96		39	6040			
		4500.39			6080	1,114,763	8,059,309
57	1770 + 23.57		38	6120			
		2304.04			5760	540,681	8,599,990
56	1747 + 19.53		37	5400			
		919.53			5400	202,297	8,802,287
S-65B	1738 + 0.00		37	5400			
		2754.95			6790.5	762,157	9,564,444
55	1710 + 45.05		37	8181			
		6058.85			7684.5	1,896,858	11,461,301
53	1649 + 86.20		36	7188			
		3056.53			6819.5	849,200	12,310,502
52	1619 + 29.67		35	6451			
		7313.21			6876	2,048,674	14,359,175
51	1546 + 16.46		35	7301			
		2709.90			7425	819,745	15,178,920
49	1519 + 6.56		34	7549			
		5166.72			7623.5	1,604,716	16,783,636
48	1467 + 39.84		34	7698			
		4751.22			7231.5	1,399,789	18,183,425
47	1419 + 88.62		34	6765			
		5101.62			7613.5	1,582,419	19,765,844
PLUG 1	1368 + 87.00		33	8462			
		917.41			8462	316,275	20,082,119
45	1359 + 69.59		33	8462			
		3059.03			7912.5	986,112	21,068,231
44	1329 + 10.56		32	7363			
		4410.56			7244.5	1,301,760	22,369,992
S-65C	1285 + 0.00		30	7126			
		2094.75			7126	608,145	22,978,137
43	1264 + 5.25		29	7126			
		6232.86			7712	1,958,318	24,936,455
42	1201 + 72.39		30	8298			
		2284.55			8395	781,358	25,717,813

TABLE B-2

C-38 BACKFILL VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	FILL ELEV. (FT.,NGVD)	CANAL FILL AREA (S.F.)	AVERAGE END AREA (S.F.)	CANAL FILL VOLUME (C.Y.)	CUMULATIVE CANAL FILL VOLUME(C.Y.)
41	1178 + 87.84		30	8492			
		3756.89			8578.5	1,313,012	27,030,826
40	1141 + 30.95		30	8665			
		2472.16			8081.5	813,950	27,844,775
39	1116 + 58.79		28	7498			
		3039.41			8756.5	1,084,298	28,929,073
PLUG 2 (38)	1086 + 19.38		31	10015			
		919.93			10015	375,348	29,304,422
BEGIN PARTIAL FILL (EL. 20)	1076 + 99.45		20	4690			
		2340.47			4709.5	449,063	29,753,484
37	1053 + 58.98		20	4729			
		1659.53			4729	319,730	30,073,214
U.S. 98	1036 + 99.45		20	4729			
		1500.00			4729	288,994	30,362,209
END PARTIAL FILL (EL. 20)	1021 + 99.45		20	4729			
		3369.30			8254	1,133,008	31,495,217
35	988 + 30.15		29	8254			
		1847.52			8275	622,854	32,118,071
34	969 + 82.63		28	8296			
		2982.63			8296	1,008,085	33,126,155
PLUG 3B BEGIN PARTIAL FILL (EL. 20)	940 + 0.00		20	5912			
		1359.59			5912	327,470	33,453,625
33	926 + 40.41		20	5912			
		2947.78			5912	710,000	34,163,625
CSX R.R.	896 + 92.63		20	5912			
		1500.00			6199	378,828	34,542,453
END PARTIAL FILL (EL. 20)	881 + 92.63		20	6486			
		695.63			9547	270,567	34,813,020
PLUG 3A	874 + 97.00		28	9547			
		1153.80			9547	448,773	35,261,792
28	863 + 43.20		28	9547			
		3545.74			9504.5	1,372,983	36,634,775
26	827 + 97.46		28	9462			
		1647.46			9823	659,307	37,294,083
S-65D	811 + 50.00		25	10184			
		1308.60			10184	542,943	37,837,026
25	798 + 41.40		25	10184			
		3320.43			10137	1,371,301	39,208,326
24	765 + 20.97		25	10090			
		1980.91			10061	811,960	40,020,287
21	745 + 40.06		25	10032			

<u>TABLE B-2</u>

C-38 BACKFILL VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	FILL ELEV. (FT.,NGVD)	CANAL FILL AREA (S.F.)	AVERAGE END AREA (S.F.)	CANAL FILL VOLUME (C.Y.)	CUMULATIVE CANAL FILL VOLUME(C.Y.)
		4234.92			12666	2,185,313	42,205,599
20	703 + 5.14		25	15300			
		3933.93			12565.5	2,013,888	44,219,487
19	663 + 71.21		23	9831			
		6485.20			9750.5	2,576,198	46,795,685
17	598 + 86.01		23	9670			
		5451.01			9921.5	2,203,349	48,999,034
PLUG 4	544 + 35.00		21	10173			
		0.00			10173	0	48,999,034
D/S LIMIT LEVEL II BACKFILL (15)	544 + 35.00		21	10173			
LEVEL II BACKFILL TOTALS		153,065 FT.	or 28.99 MILES			48,999,034 C.Y.	

TABLE B-2

C-38 BACKFILL VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	FILL ELEV. (FT.,NGVD)	CANAL FILL AREA (S.F.)	AVERAGE END AREA (S.F.)	CANAL FILL VOLUME (C.Y.)	CUMULATIVE CANAL FILL VOLUME(C.Y.)
DOWNSTREAM REMAINDER							
D/S LIMIT LEVEL II BACKFILL	544 + 35.00		---	10173			
		2535.77			11158.5	0	0
14	518 + 99.23		---	12144			
		4064.06			10703	0	0
13	478 + 35.17		---	9262			
		3269.67			10383.5	0	0
12	445 + 65.50		---	11505			
		3284.34			15710.5	0	0
11/(S-65E)	412 + 81.16		---	19916			
		4987.82			17129	0	0
10	362 + 93.34		---	14342			
		4575.35			14687	0	0
9	317 + 17.99		---	15032			
		9590.14			14981	0	0
8	221 + 27.85		---	14930			
		3733.67			14921.5	0	0
6	183 + 94.18		---	14913			
		4445.15			14231.5	0	0
4	139 + 49.03		---	13550			
		5487.91			14269.5	0	0
2	84 + 61.12		---	14989			
		4496.40			16181	0	0
1	39 + 64.72		---	17373			
		3964.72			17373	0	0
LAKE OKEE	0 + 0.00		---	17373			
DOWNSTREAM REMAINDER TOTALS		54,435	or 10.31			0	
		FT.	MILES			C.Y.	

NOTES:

1. STATIONING REFERS TO CORPS OF ENGINEERS 1979 SURVEY BASELINE (D.O. #77-33,244).
2. APPROXIMATE STATIONING FOR S-65(A-E) STRUCTURES IS ESTIMATED FROM PROJECT BASEMAPS.
3. CANAL FILL VOLUME INCLUDES 10% GEOTECHNICAL CONTINGENCY TO ACCOUNT FOR MATERIAL LOSS, COMPACTION AND SETTLEMENT BOTH DURING AND AFTER CONSTRUCTION.
4. ALTHOUGH NO BACKFILL IS PROPOSED DOWNSTREAM OF STA. 544+35, A CANAL FILL AREA IS SHOWN FOR INFORMATION PURPOSES ONLY.

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND A-1(W)							
START	2925 + 0.00		47	5520			
		3233.09			5520	660,987	660,987
86	2892 + 66.91		47	5520			
		4316.91			5520	882,568	1,543,556
END	2849 + 50.00		47	5520			
				A-1(W) TOTALS		1,543,556	
DISPOSAL MOUND A-2(W)							
START	2834 + 50.00		50	6483			
		896.59			6483	215,281	1,758,837
85	2825 + 53.41		50	6483			
		2783.30			6278.5	647,220	2,406,057
84	2797 + 70.11		52/50	6074			
		2725.25			4913.5	495,945	2,902,002
83	2770 + 44.86		49/47	3753			
		2927.19			5971.5	647,397	3,549,399
82	2741 + 17.67		49	8190			
		1617.67			8190	490,693	4,040,092
END	2725 + 0.00		49	8190			
				A-2(W) TOTALS		2,496,537	
DISPOSAL MOUND A-3(W)							
START	2710 + 0.00		48	14807			
		204.45			14807	112,122	4,152,214
81	2707 + 95.55		48	14807			
		2195.44			11223	912,571	5,064,785
80	2686 + 0.11		48	7639			
		3300.11			7639	933,687	5,998,472
END	2653 + 0.00		48	7639			
				A-3(W) TOTALS		1,958,380	
DISPOSAL MOUND A-4(W)							
START	2638 + 0.00		48	7738			
		195.87			7738	56,135	6,054,607
79	2636 + 4.13		48	7738			
		5874.86			6623	1,441,081	7,495,688
77	2577 + 29.27		49/47	5508			
		4311.17			4689	748,707	8,244,395
76	2534 + 18.10		47/46	3870			
		6438.66			4219.5	1,006,219	9,250,614
75	2469 + 79.44		53/46	4569			
		779.44			4569	131,899	9,382,513
END	2462 + 0.00		46	4569			
				A-4(W) TOTALS		3,384,041	

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND A-5(E)							
START	2455 + 0.00		46	5225			
		3404.19			5225	658,774	10,041,287
74	2420 + 95.81		45	5225			
		2845.81			5225	550,717	10,592,004
END	2392 + 50.00		44	5225			
				A-5(E) TOTALS		1,209,491	
DISPOSAL MOUND B-1(W)							
START	2380 + 0.00		44	6043			
		2042.17			6043	457,068	11,049,072
73	2359 + 57.83		44	6043			
		2957.83			6043	662,006	11,711,078
END	2330 + 0.00		44	6043			
				B-1(W) TOTALS		1,119,074	
DISPOSAL MOUND B-2(W)							
START	2325 + 0.00		45	7700			
		217.66			7700	62,073	11,773,151
72	2322 + 82.34		45	7700			
		3152.50			6188.5	722,565	12,495,716
71	2291 + 29.84		44	4677			
		629.84			4677	109,102	12,604,818
END	2285 + 0.00		44	4677			
				B-2(W) TOTALS		893,740	
DISPOSAL MOUND B-3(E)							
START (71)	2291 + 29.84		44	5952			
		5821.22			6113.5	1,318,075	13,922,893
70	2233 + 8.62		44/43	6275			
		1408.62			6275	327,374	14,250,267
END	2219 + 0.00		44	6275			
				B-3(E) TOTALS		1,645,449	
DISPOSAL MOUND B-4(E)							
START	2216 + 50.00		45	5700			
		3278.97			5700	692,227	14,942,494
68	2183 + 71.03		46	5700			
		3121.03			5700	658,884	15,601,378
END	2152 + 50.00		45	5700			
				B-4(E) TOTALS		1,351,111	

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND B-5(E)							
START (66)	2135 + 1.28		42	7425			
		3210.37			5832.5	693,499	16,294,877
65	2102 + 90.91		43/45.5	4240			
		490.91			4240	77,091	16,371,968
END	2098 + 0.00		43	4240			
				B-5(E) TOTALS		770,590	
DISPOSAL MOUND B-6(W)							
START	2086 + 50.00		43	10810			
		194.81			10810	77,996	16,449,965
64	2084 + 55.19		44/43	10810			
		5389.08			9945.5	1,985,078	18,435,042
63	2030 + 66.11		41	9081			
		7067.59			7058	1,847,520	20,282,563
62	1959 + 98.52		42	5035			
		5715.30			5389	1,140,732	21,423,294
61	1902 + 83.22		40/42	5743			
		1583.22			5743	336,757	21,760,051
END	1887 + 0.00		42	5743			
				B-6(W) TOTALS		5,388,082	
DISPOSAL MOUND B-7(E)							
START	1873 + 0.00		42	10821			
		596.26			10821	238,968	21,999,019
59	1867 + 3.74		42	10821			
		5179.78			9037.5	1,733,787	23,732,806
58	1815 + 23.96		40	7254			
		4500.39			6399.5	1,066,676	24,799,482
57	1770 + 23.57		38	5545			
		223.57			5545	45,915	24,845,397
END	1768 + 0.00		38	5545			
				B-7(E) TOTALS		3,085,346	
DISPOSAL MOUND B-8(W)							
START	1768 + 0.00		38	9696			
		2080.47			9696	747,120	25,592,516
56	1747 + 19.53		38	9696			
		619.53			9696	222,480	25,814,997
END	1741 + 0.00		38	9696			
				B-8(W) TOTALS		969,600	

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND C-1(W)							
START	1735 + 0.00		37	9104			
		2454.95			9104	827,773	26,642,769
55	1710 + 45.05		37	9104			
		4895.05			9104	1,650,538	28,293,308
END	1661 + 50.00		36	9104			
				C-1(W) TOTALS		2,478,311	
DISPOSAL MOUND C-2(W)							
START	1653 + 0.00		36	8929			
		3370.33			8929	1,114,581	29,407,888
END (52)	1619 + 29.67		36	8929			
				C-2(W) TOTALS		1,114,581	
DISPOSAL MOUND C-3(E)							
START	1622 + 50.00		36	8929			
		320.33			8929	105,934	29,513,823
52	1619 + 29.67		36	8929			
		7313.21			8476.5	2,295,942	31,809,764
51	1546 + 16.46		35	8024			
		216.46			8024	64,329	31,874,093
END	1544 + 0.00		35	8024			
				C-3(E) TOTALS		2,466,205	
DISPOSAL MOUND C-4(E)							
START (49)	1519 + 6.56		34	7584			
		5166.72			7739.5	1,481,031	33,355,124
48	1467 + 39.84		34	7895			
		4751.22			8225.5	1,447,450	34,802,574
END (47)	1419 + 88.62		34	8556			
				C-4(E) TOTALS		2,928,481	
DISPOSAL MOUND C-5(E)							
START	1413 + 0.00		34	8931			
		5330.41			8931	1,763,181	36,565,755
45	1359 + 69.59		33	8931			
		3059.03			8595	973,791	37,539,546
44	1329 + 10.56		32	8259			
		3810.56			8259	1,165,608	38,705,154
END	1291 + 0.00		30	8259			
				C-5(E) TOTALS		3,902,580	

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND D-1(W)							
START	1269 + 0.00		29	12218			
		494.75			12218	223,884	38,929,038
43	1264 + 5.25		29	12218			
		6232.86			10110	2,333,860	41,262,898
42	1201 + 72.39		30	8002			
		2284.55			5344.5	452,214	41,715,112
END (41)	1178 + 87.84		30	2687			
				D-1(W) TOTALS		3,009,957	
DISPOSAL MOUND D-2(E)							
START	1183 + 50.00		30	5814			
		462.16			5814	99,518	41,814,630
41	1178 + 87.84		30	5814			
		3187.84			5814	686,448	42,501,078
END	1147 + 0.00		30	5814			
				D-2(E) TOTALS		785,967	
DISPOSAL MOUND D-3(E)							
START	1147 + 0.00		30	6849			
		569.05			6849	144,349	42,645,427
40	1141 + 30.95		30	6849			
		2472.16			7552	691,472	43,336,900
39	1116 + 58.79		28	8255			
		3058.79			8255	935,197	44,272,096
END	1086 + 0.00		29	8255			
				D-3(E) TOTALS		1,771,018	
DISPOSAL MOUND D-4(E)							
START (38)	1079 + 8.90		31	4374			
		2549.92			5772	545,116	44,817,213
37	1053 + 58.98		32	7170			
		758.98			7170	201,551	45,018,764
END	1046 + 0.00		30	7170			
				D-4(E) TOTALS		746,668	
DISPOSAL MOUND D-5(E)							
START	1036 + 0.00		30	2992			
		4769.85			2992	528,570	45,547,334
35	988 + 30.15		29	2992			
		180.15			2992	19,963	45,567,297
END	986 + 50.00		29	2992			
				D-5(E) TOTALS		548,533	

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND D-6(W)							
START	984 + 0.00		29	8770			
		1417.37			8770	460,383	46,027,680
34	969 + 82.63		28	8770			
		2182.63			8770	708,951	46,736,631
END	948 + 0.00		28	8770			
				D-6(W) TOTALS		1,169,333	
DISPOSAL MOUND D-7(W)							
START	945 + 0.00		28	8198			
		1859.59			8198	564,627	47,301,257
33	926 + 40.41		28	8198			
		2640.41			8198	801,707	48,102,964
END	900 + 0.00		28	8198			
				D-7(W) TOTALS		1,366,333	
DISPOSAL MOUND D-8(E)							
START	893 + 0.00		28	9547			
		2956.80			9547	1,045,503	49,148,467
28	863 + 43.20		28	9547			
		3545.74			4773.5	626,874	49,775,340
26	827 + 97.46		---	0			
		997.46			0	0	49,775,340
END	818 + 0.00		25	0			
				D-8(E) TOTALS		1,672,376	
DISPOSAL MOUND E-1(W)							
START (25)	798 + 41.40		25	8252			
		3320.43			5736	705,407	50,480,747
END (24)	765 + 20.97		25	3220			
				E-1(W) TOTALS		705,407	
DISPOSAL MOUND E-2(E)							
START	745 + 40.00		25	7029			
		4234.86			7029	1,102,475	51,583,222
20	703 + 5.14		25	7029			
		3933.93			7644	1,113,739	52,696,962
19	663 + 71.21		23	8259			
		271.21			8259	82,960	52,779,922
END	661 + 0.00		23	8259			
				E-2(E) TOTALS		2,299,175	

TABLE B-3

C-38 DISPOSAL MOUND VOLUMES

1979 SURVEY X-SECTION #	STATION (FT.)	REACH (FT.)	CUT ELEV. (FT.,NGVD)	DISPOSAL CUT X-AREA (S.F.)	AVERAGE END AREA (S.F.)	DISPOSAL CUT VOLUME (C.Y.)	CUMULATIVE DISPOSAL CUT VOLUME (C.Y.)
DISPOSAL MOUND E-3(W)							
START (19)	663 + 71.21		23	8259			
		5471.21			8259	1,673,582	54,453,504
END	609 + 0.00		23	8259			
				E-3(W) TOTALS		1,673,582	
DISPOSAL MOUND E-4(W)							
START	604 + 50.00		23	11649			
		563.99			11649	243,330	54,696,835
17	598 + 86.01		23	11649			
		4501.33			10417	1,736,680	56,433,514
15	553 + 84.68		21	9185			
		3485.45			8642	1,115,602	57,549,117
END (14)	518 + 99.23		22	8099			
				E-4(W) TOTALS		3,095,612	

TABLE B-4

NEW RIVER CHANNEL CONSTRUCTION

NEW RIVER CHANNEL SEGMENT	CONSTRUCTION SEGMENT	NEW RIVER CHANNEL LENGTH (FT.)	NEW RIVER CHANNEL X-SECT. FLOW AREA (SQ FT)	NEW RIVER CHANNEL EXCAVATION (C.Y.)
NRC-1	REACH 5	1,700	1,300	81,852
NRC-2	REACH 5	1,950	1,300	93,889
NRC-3	REACH 5	600	1,300	28,889
NRC-4	REACH 5	12,500	1,100	509,259
NRC-5	REACH 5	3,100	1,100	126,296
NRC-6	REACH 5	450	2,700	45,000
NRC-7	REACH 1	5,200	710	136,741
NRC-8	REACH 1	350	2,700	35,000
NRC-9	REACH 1	350	2,700	35,000
NRC-10	REACH 1	2,350	630	54,833
NRC-11	REACH 2	975	830	29,972
NRC-12	REACH 3	3,850	1,150	163,981
NRC-13	REACH 3	7,300	1,430	386,630
NRC-14	REACH 3	2,650	1,430	140,352
NRC-15	REACH 3	1,500	1,430	79,444
NRC-16	REACH 4	2,750	1,480	150,741
NRC-17	REACH 4	550	2,080	42,370
NRC-18	REACH 4	13,200	1,350	660,000
	TOTALS	61,325 FT. or 11.6 MILES		2,800,250

NOTES:

1. REFER TO RECOMMENDED PLAN BASE MAPS (PLATES 1 THROUGH 5) OF MAIN REPORT FOR APPROXIMATE LOCATION OF NEW RIVER CHANNEL SEGMENTS.

TABLE B-5

YATES MARSH/CHANDLER SLOUGH CONTAINMENT LEVEE QUANTITIES

STATION	DESCRIPTION	REACH LENGTH (FEET)	DESIGN CREST ELEVATION (FT-MSL)	AVERAGE GROUND ELEVATION (FT-MSL)	DESIGN LEVEE HEIGHT (FT)	LEVEE CREST WIDTH (FT)	SIDESLOPE (_H : 1V)	DESIGN LEVEE BASE (FT)	DESIGN LEVEE X-AREA (FTxFT)	DESIGN LEVEE VOLUME (C.Y.)
0 + 0	Begin - North End		41.00	41.0	0.00	15.0	3.0	15.0	0	
		2000							54	4000
20 + 0			41.00	37.0	4.00	15.0	3.0	39.0	108	
		8000							87	25707
100 + 0			40.80	38.0	2.80	15.0	3.0	31.8	66	
		5000							62	11556
150 + 0			40.60	38.0	2.60	15.0	3.0	30.6	59	
		3000							109	12133
180 + 0			40.20	35.0	5.20	15.0	3.0	46.2	159	
		2000							116	8560
200 + 0			40.00	37.0	3.00	15.0	3.0	33.0	72	
		5000							98	18156
250 + 0			39.40	35.0	4.40	15.0	3.0	41.4	124	
		1000							258	9556
260 + 0			39.20	30.0	9.20	15.0	3.0	70.2	392	
		2200							378	30810
282 + 0	CSX RAILROAD		38.80	30.0	8.80	15.0	3.0	67.8	364	
		50							345	638
282 + 50			38.20	30.0	8.20	15.0	3.0	64.2	325	
		1450							373	20010
297 + 0	Culvert 1		37.60	28.0	9.60	15.0	3.0	72.6	420	
		1300							348	16750
310 + 0			37.40	30.0	7.40	15.0	3.0	59.4	275	
		1000							239	8859
320 + 0			37.10	31.0	6.10	15.0	3.0	51.6	203	
		1000							228	8428
330 + 0			37.00	30.0	7.00	15.0	3.0	57.0	252	
		500							276	5107
335 + 0	Culvert 2		36.80	29.0	7.80	15.0	3.0	61.8	300	
		2000							239	17689
355 + 0			36.60	31.0	5.60	15.0	3.0	48.6	178	
		2300							171	14560
378 + 0			36.30	31.0	5.30	15.0	3.0	46.8	164	
		2200							134	10914
400 + 0			35.90	32.0	3.90	15.0	3.0	38.4	104	
		1300							120	5799
413 + 0			35.70	31.0	4.70	15.0	3.0	43.2	137	
		1700							95	5983
430 + 0			35.40	33.0	2.40	15.0	3.0	29.4	53	
		100							27	101
431 + 0	South End		33.10	33.0	0.10	15.0	3.0	15.6	2	
	TOTALS	43100			LEVEE FOOTPRINT AREA			42.24	ACRES	235316

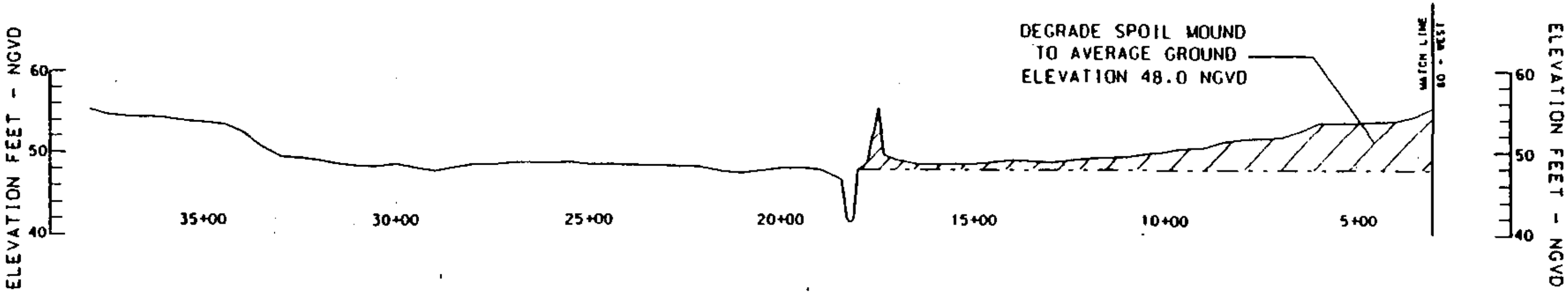
TABLE B-6

LAKE ISTOKPOGA CONTAINMENT LEVEE QUANTITIES

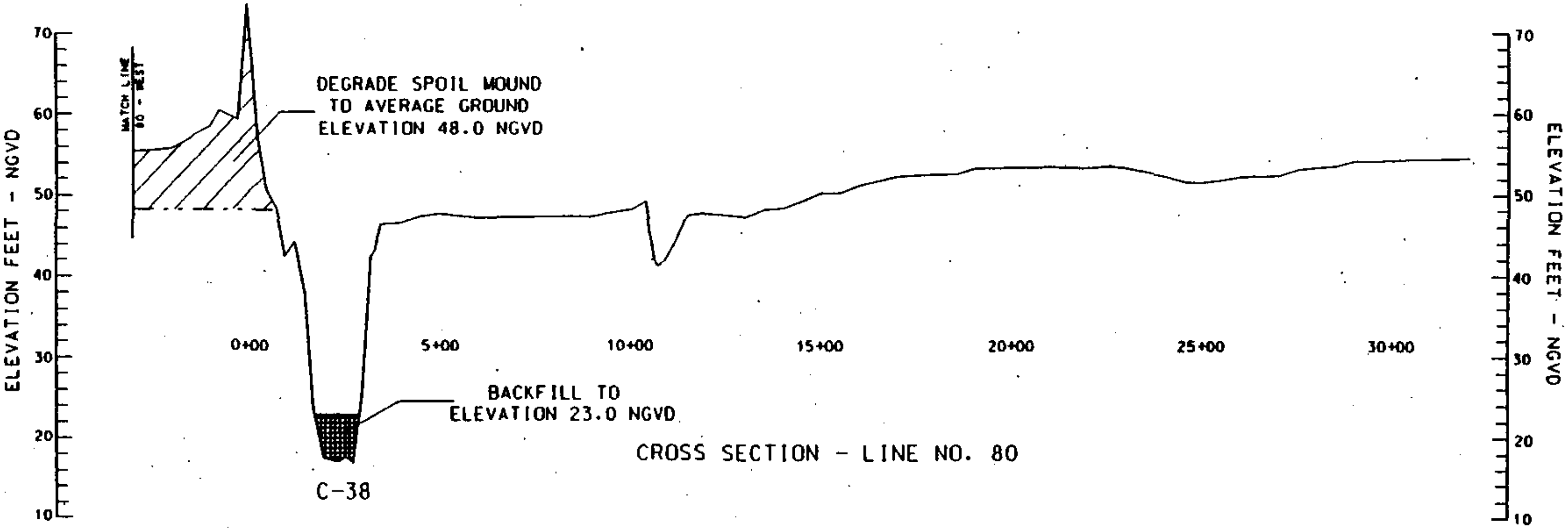
STATION	DESCRIPTION	REACH LENGTH (FEET)	DESIGN CREST ELEVATION (FT-MSL)	AVERAGE GROUND ELEVATION (FT-MSL)	DESIGN LEVEE HEIGHT (FT)	LEVEE CREST WIDTH (FT)	SIDESLOPE (_H : 1V)	DESIGN LEVEE BASE (FT)	DESIGN LEVEE X-AREA (FTxFT)	DESIGN LEVEE VOLUME (C.Y.)
0 + 0	Begin – West End		44.80	44.8	0.00	15.0	3.0	15.0	0	
		2500							7	644
25 + 0			44.80	44.0	0.80	15.0	3.0	19.8	14	
		2500							38	3532
50 + 0			44.70	42.0	2.70	15.0	3.0	31.2	62	
		2500							79	7358
75 + 0			44.70	41.0	3.70	15.0	3.0	37.2	97	
		2500							95	8771
100 + 0			44.60	41.0	3.60	15.0	3.0	36.6	93	
		500							93	1720
105 + 0	Culvert #3		44.60	41.0	3.60	15.0	3.0	36.6	93	
	Istokpoga Canal	2000							91	6746
125 + 0			44.50	41.0	3.50	15.0	3.0	36.0	89	
		2500							109	10069
150 + 0			44.50	40.0	4.50	15.0	3.0	42.0	128	
		2300							64	5463
173 + 0	East End		44.40	44.4	0.00	15.0	3.0	15.0	0	
	TOTALS	17300			LEVEE FOOTPRINT AREA			12.37 ACRES		44303

APPENDIX B
DESIGN AND COST ESTIMATES

LIST OF FIGURES



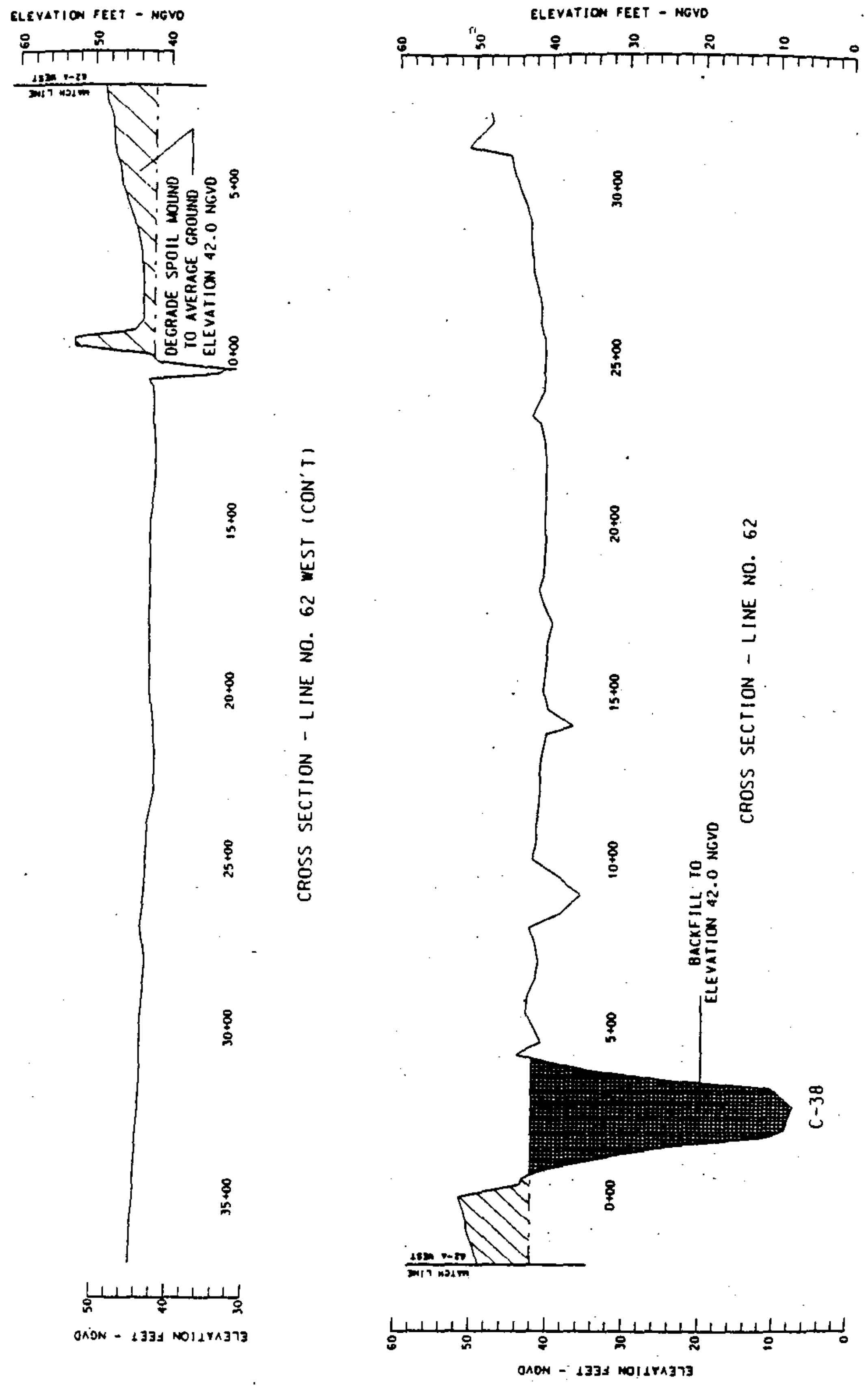
CROSS SECTION - LINE NO. 80 WEST (CON'T)



CROSS SECTION - LINE NO. 80

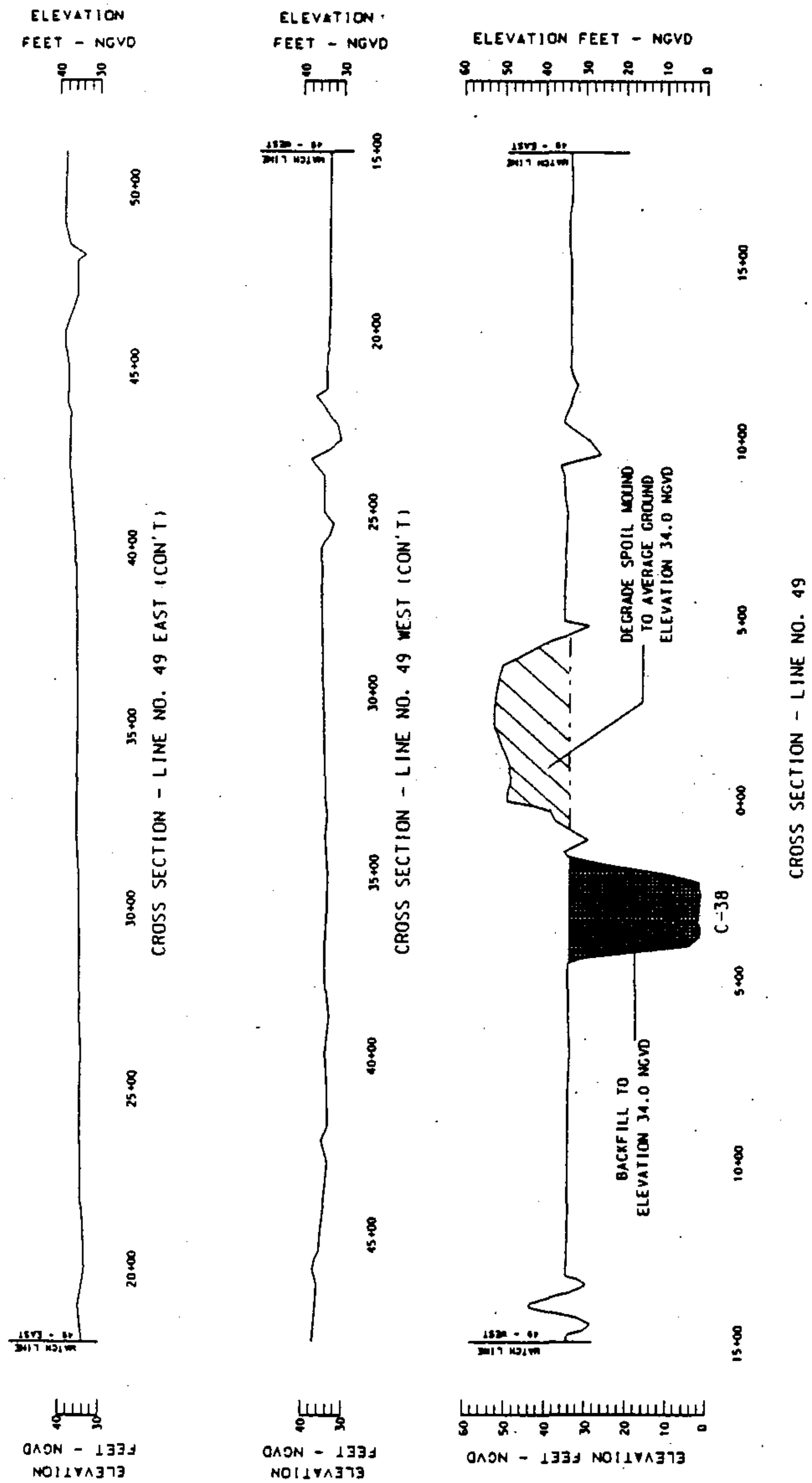
TYPICAL CROSS SECTION
SHALLOWING REACH
LINE NUMBER 80 - STATION 2686+00.11

FIGURE B-1



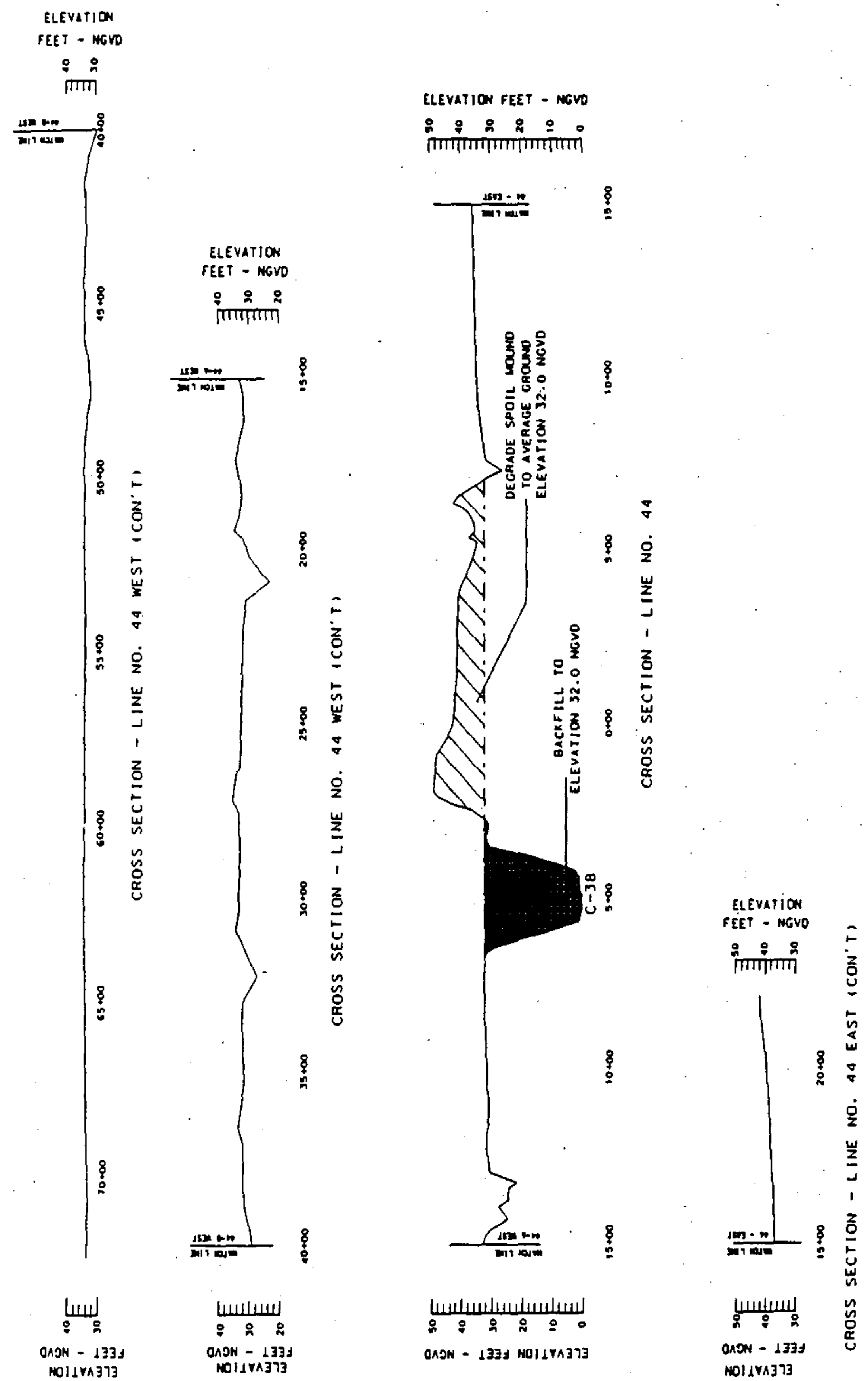
TYPICAL CROSS SECTION
REACH 5
LINE NUMBER 62 - STATION 1959+98.52

FIGURE B-2



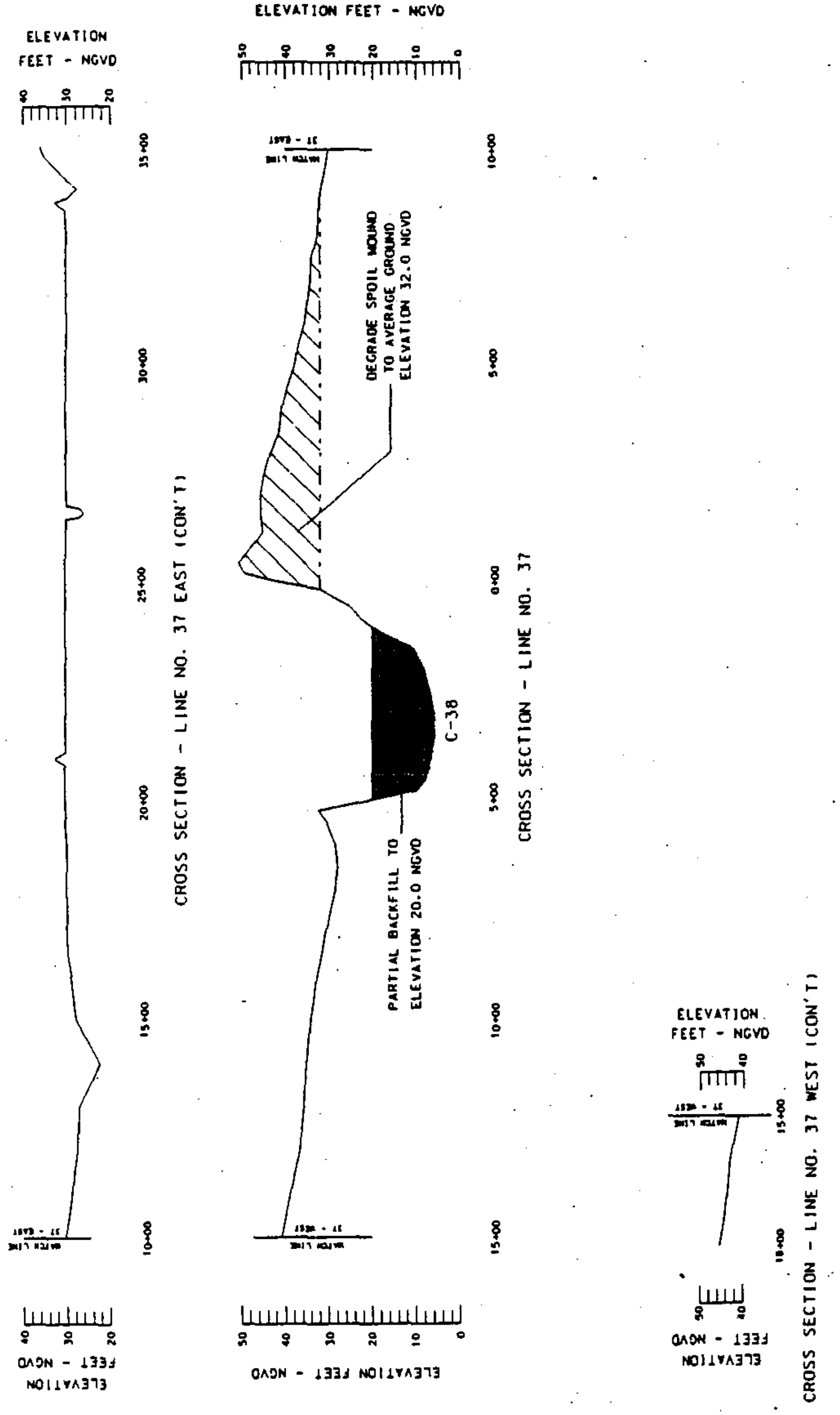
TYPICAL CROSS SECTION
REACH 1
LINE NUMBER 49 - STATION 1519+06.56

FIGURE B-3



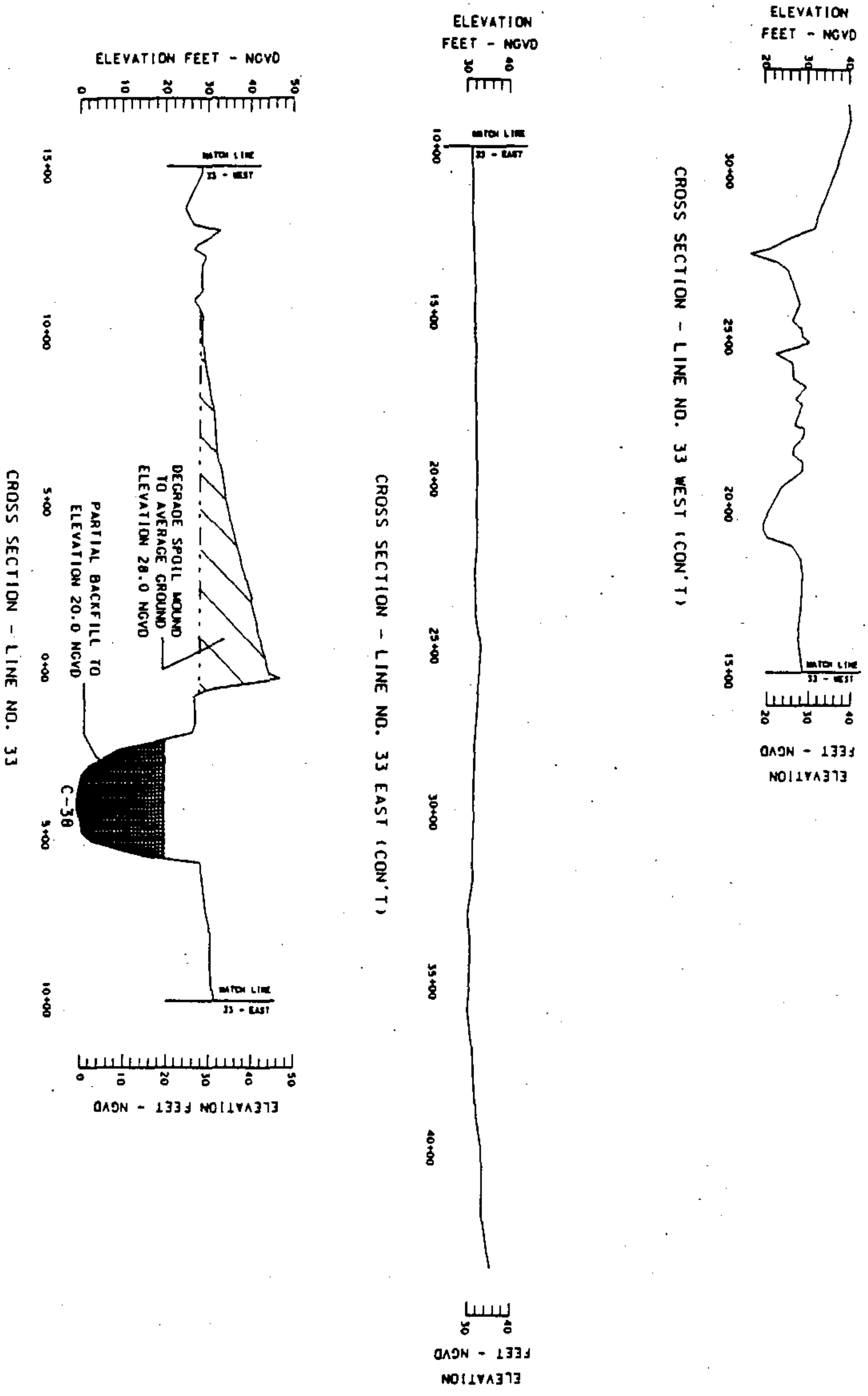
TYPICAL CROSS SECTION
REACH 2
LINE NUMBER 44 - STATION 1329+10.56

FIGURE B-4



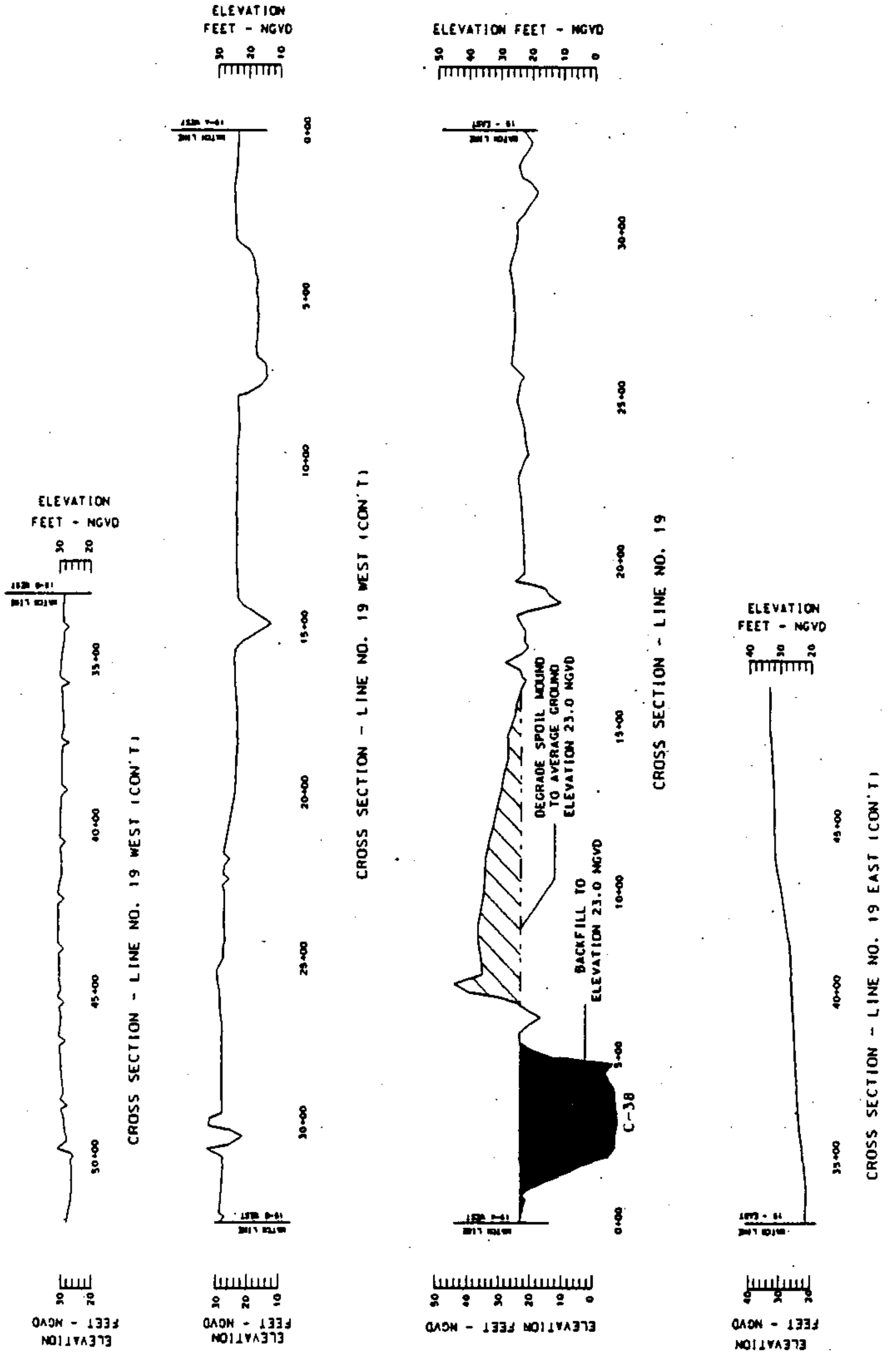
TYPICAL CROSS SECTION
REACH 3B
LINE NUMBER 37 - STATION 1053+58.98

FIGURE B-5



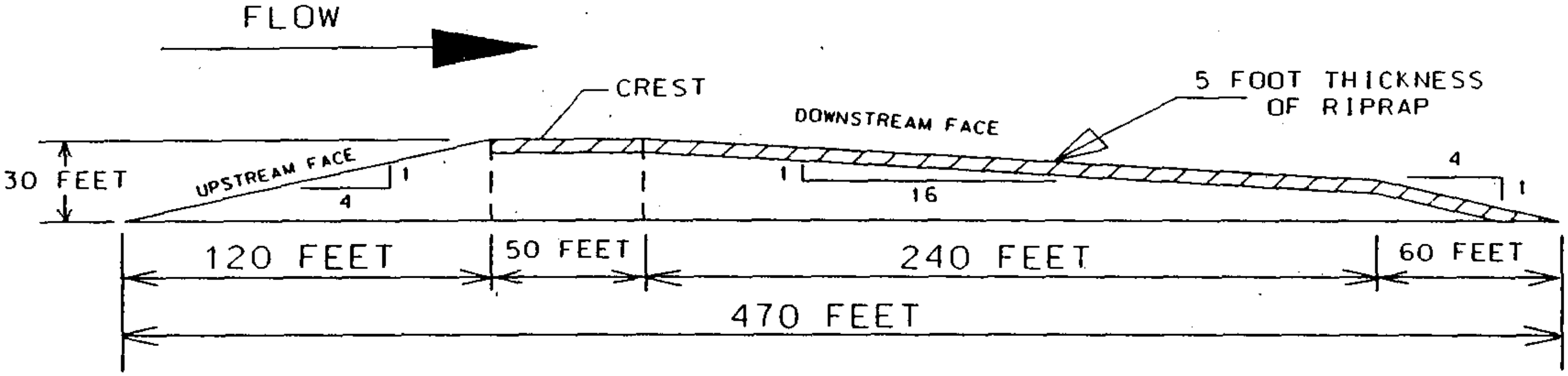
TYPICAL CROSS SECTION
REACH 3A
LINE NUMBER 33 - STATION 926+40.4

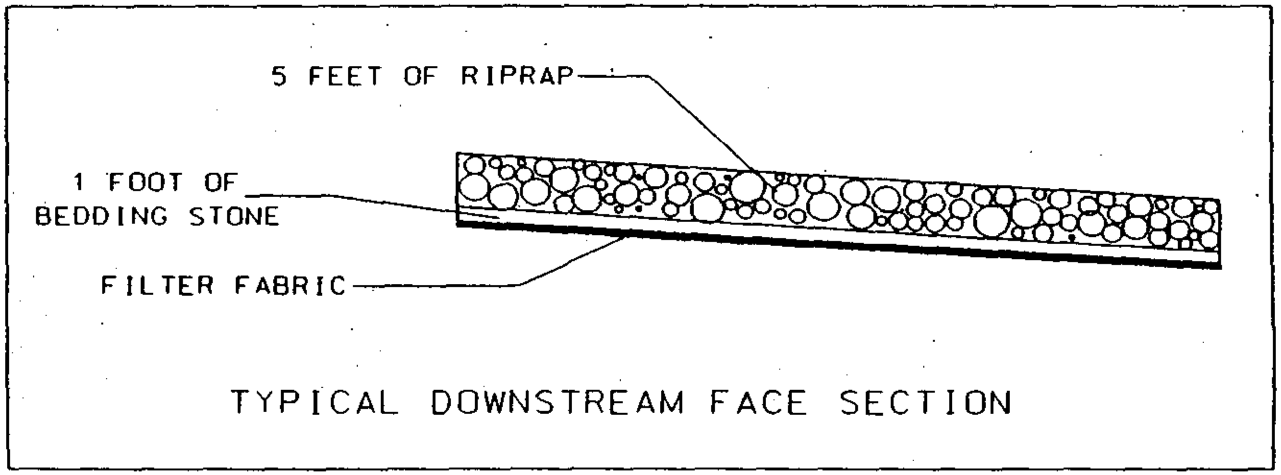
FIGURE B-6



TYPICAL CROSS SECTION
REACH 2
LINE NUMBER 19 - STATION 633+71.21

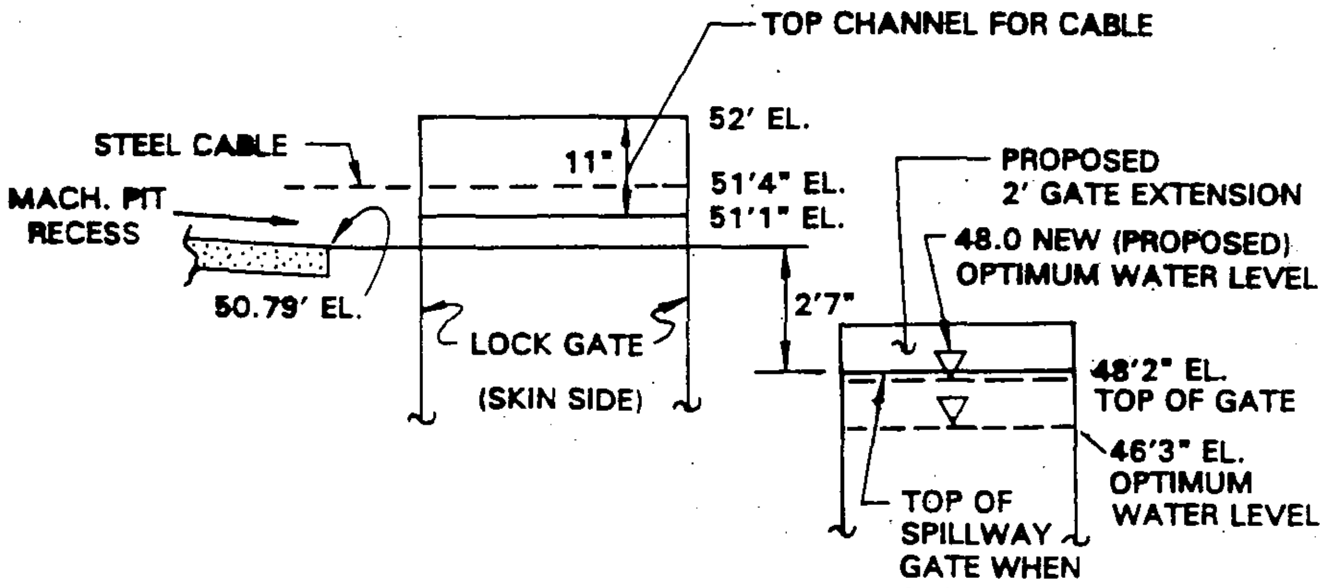
FIGURE B-7



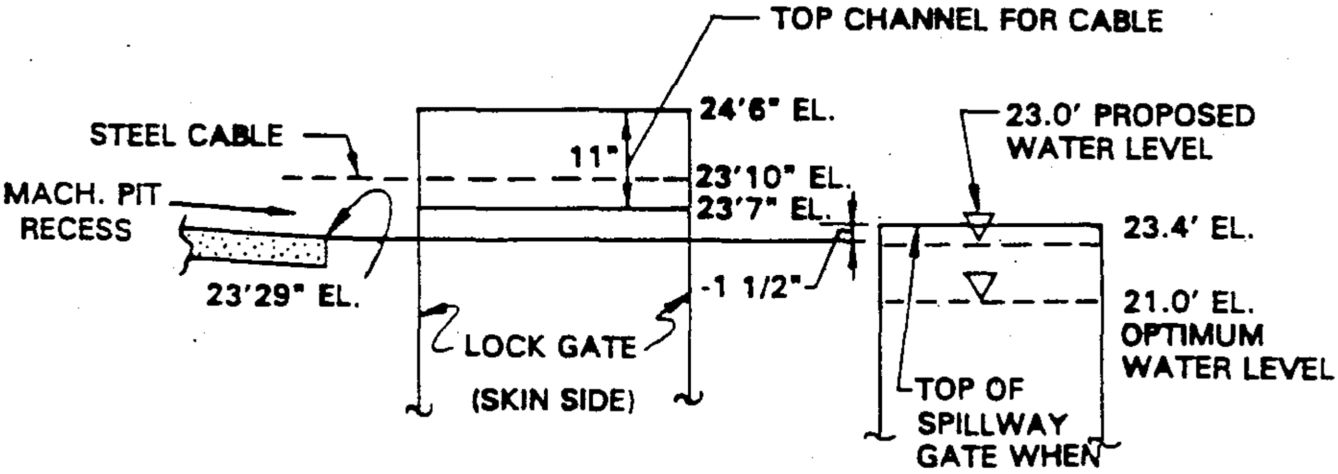


TYPICAL CROSS SECTION
EARTHEN PLUG

FIGURE B-8



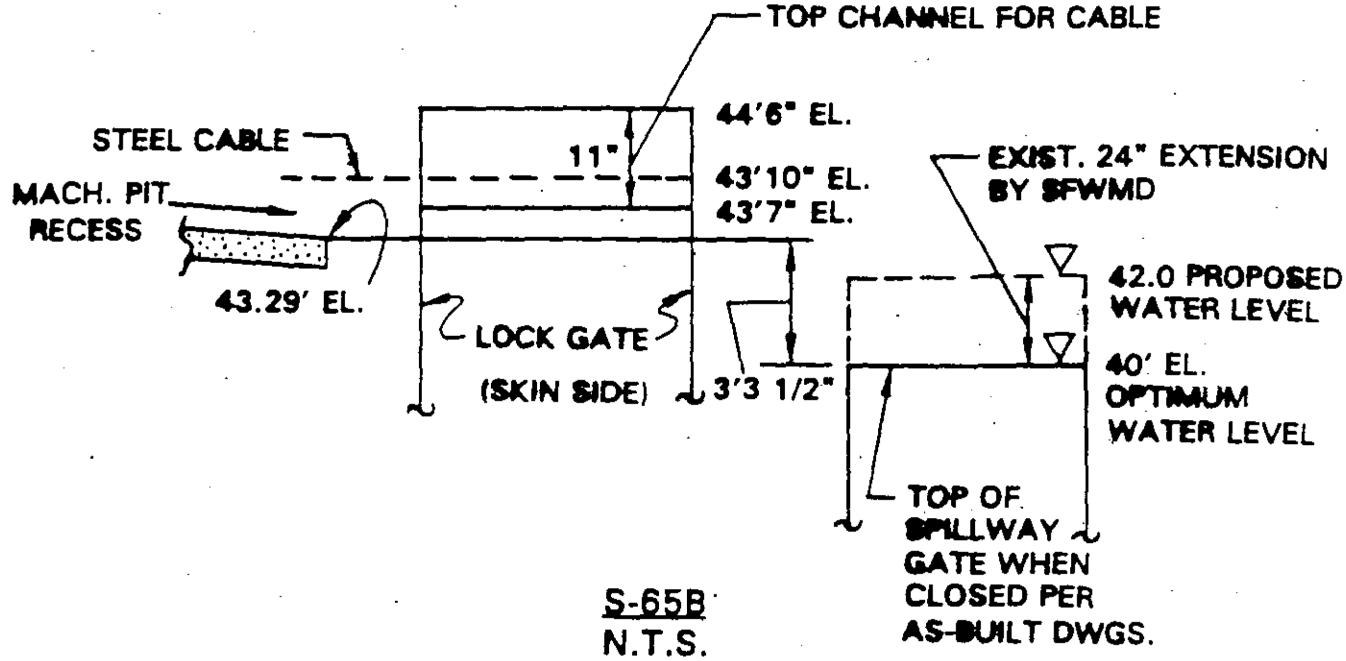
S-65A
N.T.S.



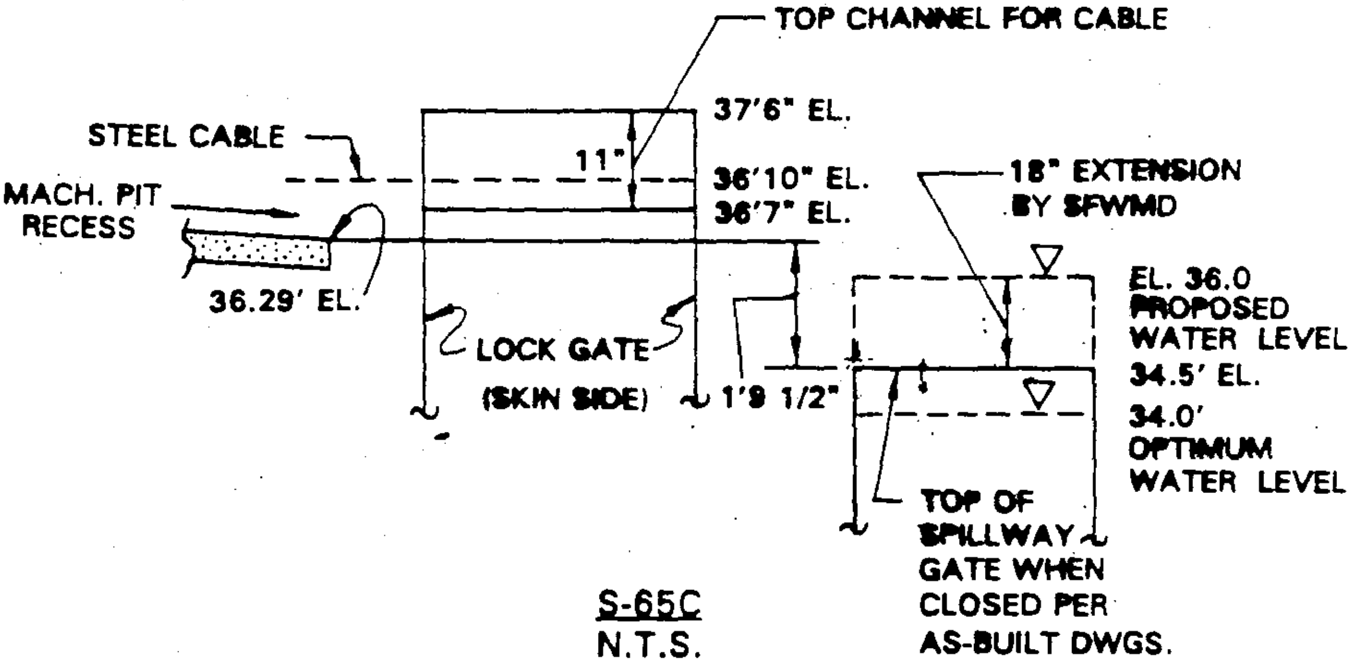
S-65E
N.T.S.

GATE EXTENSIONS
COORDINATION OF ELEVATIONS

FIGURE B-9



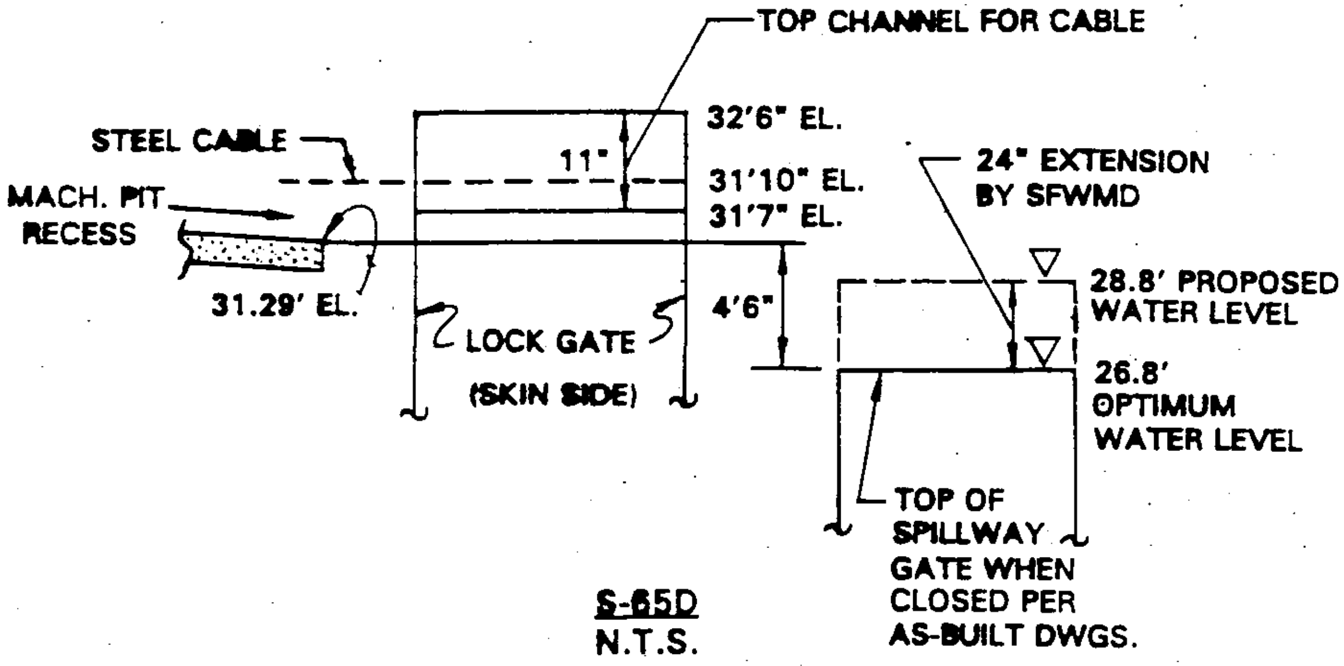
S-65B
N.T.S.



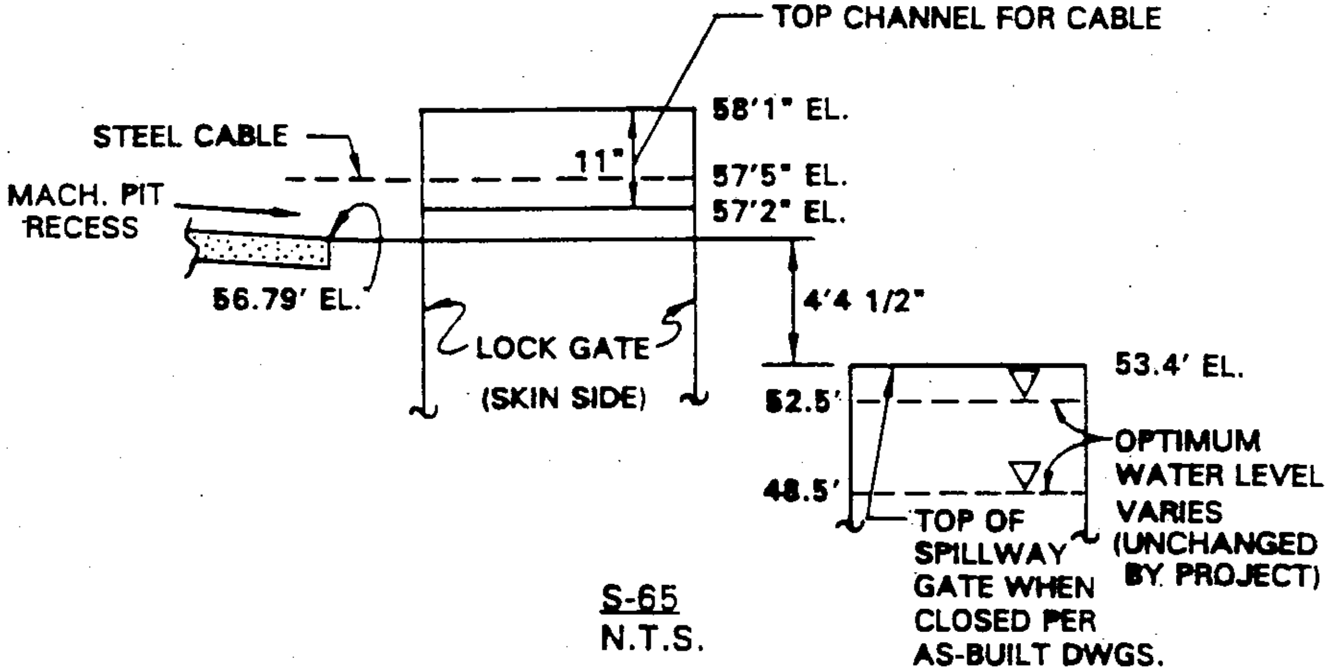
S-65C
N.T.S.

GATE EXTENSIONS
COORDINATION OF ELEVATIONS

FIGURE B-10



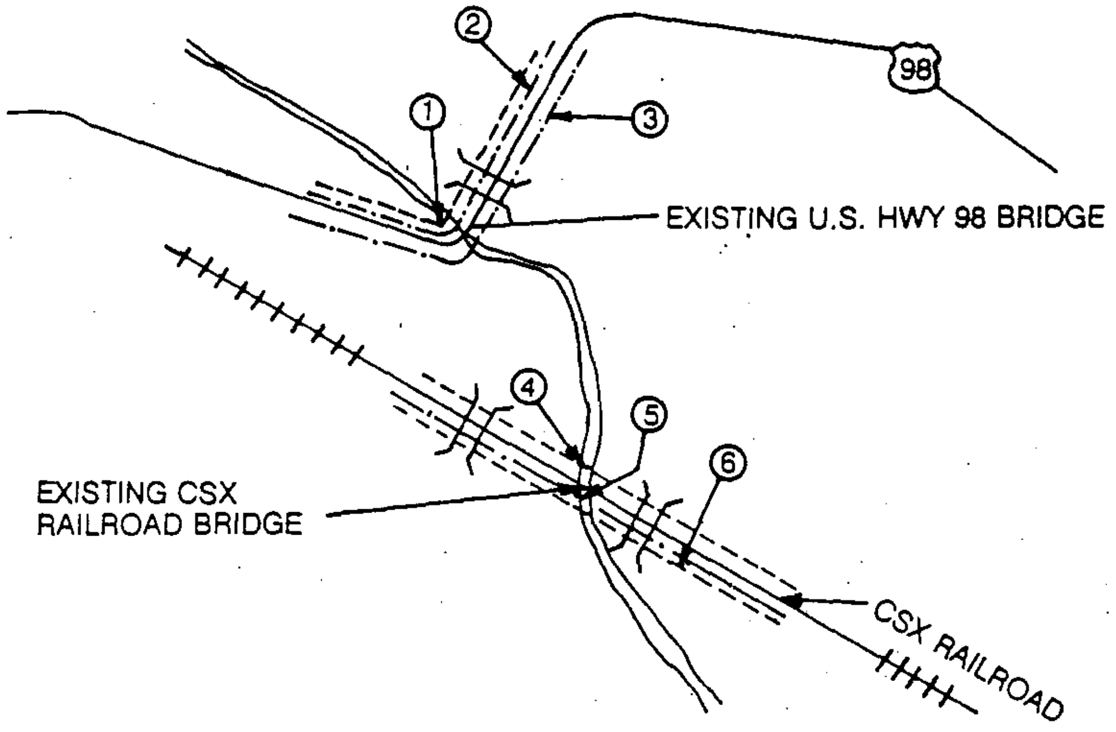
S-65D
N.T.S.



S-65
N.T.S.

GATE EXTENSIONS
COORDINATION OF ELEVATIONS

FIGURE B-11



U.S. HWY 98 AND CSX RAILROAD BRIDGE
EXISTING UTILITIES
(N.T.S.)

)(PROPOSED NEW BRIDGE OPENINGS

--- SUBMERSIBLE CABLE CROSSING AT C-38 THEN UNDERGROUND ALONG ROAD/CSX

—·— AERIAL TRANSMISSION/POWER LINES

U.S. HWY 98

① UNITED TELEPHONE CO. SUBMERSIBLE CABLE CROSSING AT C-38

② SEMINOLE ELECTRIC COOPERATIVE 69KV AERIAL TRANSMISSION LINE

③ GLADES ELECTRIC 25KV AERIAL TRANSMISSION LINE

CSX RAILROAD

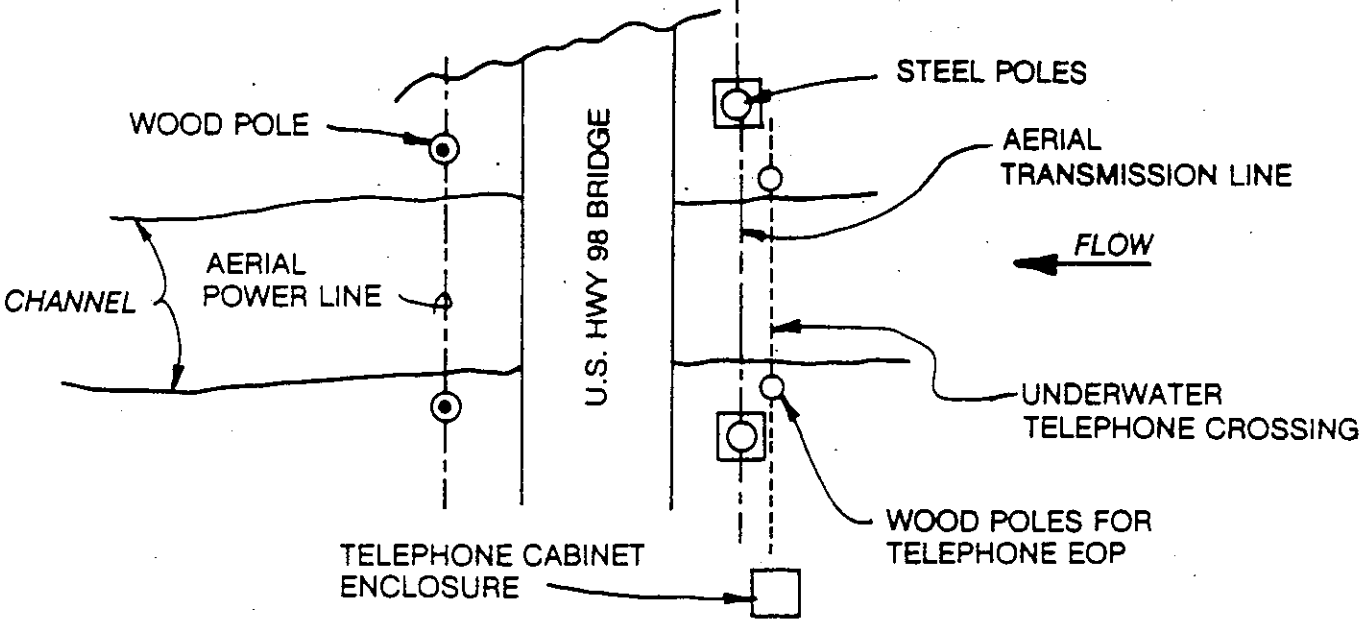
④ WILLIAMS TELECOMMUNICATIONS SUBMARINE FIBER OPTIC CABLE

⑤ MCI SUBMARINE FIBER OPTIC TELEPHONE CABLE

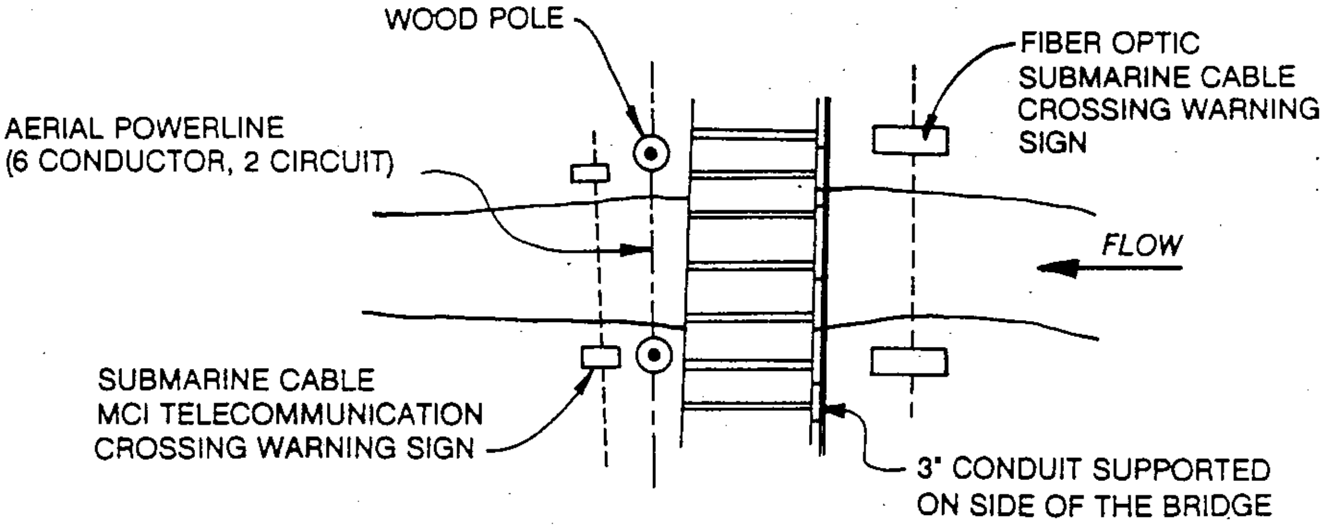
⑥ CSX AERIAL POWER LINE

EXISTING UTILITIES

FIGURE B-12



U.S. HWY 98 BRIDGE
UTILITY DETAIL
(N.T.S)



CSX RAILROAD BRIDGE
UTILITY DETAIL
(N.T.S.)

NOTES:

1. EXISTING TELEPHONE LINES ARE INSTALLED PARALLEL TO US 98 AND CSX RAILROAD. AT CHANNEL CROSSING THESE LINES ARE SUBMERSIBLE.

2. NEW BRIDGE OPENINGS WILL REQUIRE TEMPORARY AND PERMANENT RELOCATION OF UNDERGROUND AND AERIAL LINES.

UTILITY RELOCATION DETAILS

FIGURE B-13

APPENDIX B
DESIGN AND COST ESTIMATES

COST ESTIMATES

TOTAL - ALL CONTRACTS **** TOTAL PROJECT COST SUMMARIES **** PAGE 1 OF 15

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE						
02---	RELOCATIONS	$6,888,000	$1,378,000	20%	$8,266,000	$8,585,000	$1,717,000	$10,302,000
09---	CHANNELS AND CANALS	191,496,000	38,298,000	20%	$229,794,000	330,427,000	66,083,000	396,510,000
	TOTAL CONSTRUCTION COSTS =====>	198,384,000	$39,676,000	20%	$238,060,000	339,012,000	$67,800,000	$406,812,000
01---	LANDS AND DAMAGES	93,557,000	$23,389,000	25%	$116,946,000	112,989,000	$28,248,000	$141,237,000
30---	MONITORING	$14,220,000	$1,422,000	10%	$15,642,000	$26,360,000	$2,636,000	$28,996,000
30---	TEST FILL	$1,323,000	$265,000	20%	$1,588,000	$1,557,000	$312,000	$1,869,000
30---	PLANNING, ENGINEERING AND DESIGN	$24,204,000	$2,420,000	10%	$26,624,000	$44,869,000	$4,484,000	$49,353,000
31---	CONSTRUCTION MANAGEMENT	$19,838,000	$3,969,000	20%	$23,807,000	$45,609,000	$9,124,000	$54,733,000
	TOTAL PROJECT COSTS ==========>	351,526,000	$71,141,000	20%	$422,667,000	570,396,000	112,604,000	$683,000,000

TOTAL FEDERAL COSTS ==============> $221,300,000

TOTAL NON-FEDERAL COSTS ==========> $461,700,000

DISTRICT APPROVED:

________________________ CHIEF, COST ENGINEERING
________________________ CHIEF, REAL ESTATE
________________________ CHIEF, PROGRAMS MANAGEMENT
________________________ PROJECT MANAGER
________________________ DDE (PM)

DIVISION APPROVED:

________________________ CHIEF, COST ENGINEERING
________________________ DIRECTOR, REAL ESTATE
________________________ CHIEF, PROGRAMS MANAGEMENT
________________________ DIRECTOR OF PPMD

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
30---	PED	$1,203,000	$241,000	20%	$1,444,000	SEP 93	17.7%	$1,415,000	$284,000	$1,699,000
	TOTAL CONSTRUCTION COSTS =====>	$1,203,000	$241,000	20%	$1,444,000			$1,415,000	$284,000	$1,699,000
30---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
30---	CONSTRUCTION MANAGEMENT	$120,000	$24,000	20%	$144,000	SEP 93	18.1%	$142,000	$28,000	$170,000
	TOTAL PROJECT COSTS ==========>	$1,323,000	$265,000	20%	$1,588,000			$1,557,000	$312,000	$1,869,000

CONTRACT No. 2 Degrade Local Levees from Sta 1649+86 to S-65 **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$641,000	$128,000	20%	$769,000	SEP 97	26.0%	$808,000	$161,000	$969,000
	TOTAL CONSTRUCTION COSTS =====>	$641,000	$128,000	20%	$769,000			$808,000	$161,000	$969,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$64,000	$13,000	20%	$77,000	SEP 97	50.6%	$97,000	$19,000	$116,000
	TOTAL PROJECT COSTS ==========>	$705,000	$141,000	20%	$846,000			$905,000	$180,000	$1,085,000

CONTRACT No. 3 Modification to S-65A and Weirs (3) in Pool B **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA
DATE PREPARED: 3 SEPTEMBER 1991

DRAFT GDM

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$711,000	$142,000	20%	$853,000	JUN 97	24.9%	$888,000	$177,000	$1,065,000
	TOTAL CONSTRUCTION COSTS =====>	$711,000	$142,000	20%	$853,000			$888,000	$177,000	$1,065,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$71,000	$14,000	20%	$85,000	JUN 97	48.2%	$105,000	$21,000	$126,000
	TOTAL PROJECT COSTS ==========>	$782,000	$156,000	20%	$938,000			$993,000	$198,000	$1,191,000

CONTRACT No. 4 Containment Levee & Structure @ Istopoga **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$401,000	$80,000	20%	$481,000	AUG 97	25.6%	$503,000	$101,000	$604,000
	TOTAL CONSTRUCTION COSTS =====>	$401,000	$80,000	20%	$481,000			$503,000	$101,000	$604,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$40,000	$8,000	20%	$48,000	AUG 97	52.1%	$61,000	$12,000	$73,000
	TOTAL PROJECT COSTS ==========>	$441,000	$88,000	20%	$529,000			$564,000	$113,000	$677,000

CONTRACT No. 5 (Pool C 1368+87 to 1649+86)(Reach 1) **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA
DATE PREPARED: 3 SEPTEMBER 1991

DRAFT GDM

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
02---	RELOCATIONS	$13,000	$3,000	23%	$16,000	MAR 99	31.3%	$17,000	$4,000	$21,000
09---	CHANNELS AND CANALS	$22,932,000	$4,586,000	20%	$27,518,000	MAR 99	32.6%	$30,408,000	$6,081,000	$36,489,000
	TOTAL CONSTRUCTION COSTS =====>	$22,945,000	$4,589,000	20%	$27,534,000			$30,425,000	$6,085,000	$36,510,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$2,295,000	$459,000	20%	$2,754,000	MAR 99	63.7%	$3,757,000	$752,000	$4,509,000
	TOTAL PROJECT COSTS ==========>	$25,240,000	$5,048,000	20%	$30,288,000			$34,182,000	$6,837,000	$41,019,000

CONTRACT No. 6 US 98 Highway Bridge Construction W/Utility Relocations**** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
02---	RELOCATIONS	$2,192,000	$438,000	20%	$2,630,000	MAY 97	24.3%	$2,726,000	$544,000	$3,270,000
	TOTAL CONSTRUCTION COSTS =====>	$2,192,000	$438,000	20%	$2,630,000			$2,726,000	$544,000	$3,270,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$219,000	$44,000	20%	$263,000	MAY 97	47.9%	$323,000	$66,000	$389,000
	TOTAL PROJECT COSTS ==========>	$2,411,000	$482,000	20%	$2,893,000			$3,049,000	$610,000	$3,659,000

CONTRACT No. 7 CSX Railroad Bridges (2) Construction W/Utility Relocations **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
02---	RELOCATIONS	$4,644,000	$929,000	20%	$5,573,000	JUN 97	24.4%	$5,776,000	$1,155,000	$6,931,000
	TOTAL CONSTRUCTION COSTS =====>	$4,644,000	$929,000	20%	$5,573,000			$5,776,000	$1,155,000	$6,931,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$464,000	$93,000	20%	$557,000	JUN 97	48.7%	$690,000	$138,000	$828,000
	TOTAL PROJECT COSTS ==========>	$5,108,000	$1,022,000	20%	$6,130,000			$6,466,000	$1,293,000	$7,759,000

CONTRACT No. 8 (Pool D - 1086+19 to 1368+87)(Reach 2) **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA
DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
02---	RELOCATIONS	$13,000	$3,000	23%	$16,000	JAN 05	56.3%	$20,000	$5,000	$25,000
09---	CHANNELS AND CANALS	$29,248,000	$5,850,000	20%	$35,098,000	JAN 05	62.1%	$47,416,000	$9,484,000	$56,900,000
	TOTAL CONSTRUCTION COSTS =====>	$29,261,000	$5,853,000	20%	$35,114,000			$47,436,000	$9,489,000	$56,925,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$2,926,000	$585,000	20%	$3,511,000	JAN 05	114.2%	$6,269,000	$1,253,000	$7,522,000
	TOTAL PROJECT COSTS ==========>	$32,187,000	$6,438,000	20%	$38,625,000			$53,705,000	$10,742,000	$64,447,000

CONTRACT No. 9 Containment Levee & 2 Structures @ Yates Marsh **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$734,000	$147,000	20%	$881,000	FEB 03	51.8%	$1,113,000	$224,000	$1,337,000
	TOTAL CONSTRUCTION COSTS =====>	$734,000	$147,000	20%	$881,000			$1,113,000	$224,000	$1,337,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$73,000	$15,000	21%	$88,000	FEB 03	96.6%	$144,000	$29,000	$173,000
	TOTAL PROJECT COSTS ==========>	$807,000	$162,000	20%	$969,000			$1,257,000	$253,000	$1,510,000

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA
DATE PREPARED: 3 SEPTEMBER 1991

DRAFT GDM

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$23,962,000	$4,792,000	20%	$28,754,000	MAR 04	57.5%	$37,746,000	$7,548,000	$45,294,000
	TOTAL CONSTRUCTION COSTS =====>	$23,962,000	$4,792,000	20%	$28,754,000			$37,746,000	$7,548,000	$45,294,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$2,396,000	$479,000	20%	$2,875,000	MAR 04	106.4%	$4,945,000	$989,000	$5,934,000
	TOTAL PROJECT COSTS ==========>	$26,358,000	$5,271,000	20%	$31,629,000			$42,691,000	$8,537,000	$51,228,000

CONTRACT No. 11 Work Upstream of S-65E & Stilling Basin Anchors Added to S-65E **** TOTAL PROJECT COST SUMMARIES **** PAGE 12 OF 15

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991
PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$5,127,000	$1,025,000	20%	$6,152,000	AUG 06	71.2%	$8,780,000	$1,755,000	$10,535,000
	TOTAL CONSTRUCTION COSTS =====>	$5,127,000	$1,025,000	20%	$6,152,000			$8,780,000	$1,755,000	$10,535,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$513,000	$103,000	20%	$616,000	AUG 06	130.2%	$1,182,000	$236,000	$1,418,000
	TOTAL PROJECT COSTS ==========>	$5,640,000	$1,128,000	20%	$6,768,000			$9,962,000	$1,991,000	$11,953,000

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE PREPARED BY: JACKSONVILLE DISTRICT
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991 REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$50,277,000	$10,055,000	20%	$60,332,000	NOV 08	85.1%	$93,067,000	$18,611,000	$111,678,000
	TOTAL CONSTRUCTION COSTS =====>	$50,277,000	$10,055,000	20%	$60,332,000			$93,067,000	$18,611,000	$111,678,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$5,028,000	$1,006,000	20%	$6,034,000	NOV 08	154.5%	$12,797,000	$2,561,000	$15,358,000
	TOTAL PROJECT COSTS ==========>	$55,305,000	$11,061,000	20%	$66,366,000			105,864,000	$21,172,000	$127,036,000

CONTRACT No. 13 (Pool B - 1649+86 to 2075+00)(Reach 5)**** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
02---	RELOCATIONS	$26,000	$5,000	19%	$31,000	AUG 08	77.4%	$46,000	$9,000	$55,000
09---	CHANNELS AND CANALS	$28,624,000	$5,725,000	20%	$34,349,000	AUG 08	83.5%	$52,525,000	$10,506,000	$63,031,000
	TOTAL CONSTRUCTION COSTS =====>	$28,650,000	$5,730,000	20%	$34,380,000			$52,571,000	$10,515,000	$63,086,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	---	---	---	---	---	--- --	---	---	---
31---	CONSTRUCTION MANAGEMENT	$2,865,000	$573,000	20%	$3,438,000	AUG 08	151.7%	$7,211,000	$1,442,000	$8,653,000
	TOTAL PROJECT COSTS ==========>	$31,515,000	$6,303,000	20%	$37,818,000			$59,782,000	$11,957,000	$71,739,000

CONTRACT No. 14 Shallow C-38 from S-65 to Upstram Limit of Backfill **** TOTAL PROJECT COST SUMMARIES ****

PROJECT: KISSIMMEE RIVER RESTORATION BASELINE
LOCATION: CENTRAL AND SOUTHERN FLORIDA, FLORIDA DRAFT GDM
DATE PREPARED: 3 SEPTEMBER 1991

PREPARED BY: JACKSONVILLE DISTRICT
REVIEWED & APPROVED BY: MILTON A WITT, BRANCH CHIEF

ACCOUNT NUMBER	ITEM DESCRIPTION	ESTIMATED COST JULY 91*	CONTINGENCY AMOUNT($)	%	TOTAL EST COST JULY 91*	MID POINT OF FEATURE	OMB (%) INFLATION (+/-)	INFLATED COST AMOUNT ($)	INFLATED CONTG. AMT. ($)	FULLY FUNDED COST
		*EFFECTIVE PRICING DATE								
09---	CHANNELS AND CANALS	$28,839,000	$5,768,000	20%	$34,607,000	NOV 10	98.2%	$57,173,000	$11,435,000	$68,608,000
	TOTAL CONSTRUCTION COSTS =====>	$28,839,000	$5,768,000	20%	$34,607,000			$57,173,000	$11,435,000	$68,608,000
01---	LANDS AND DAMAGES	---	---	---	---	---	--- --	---	---	---
30---	PLANNING, ENGINEERING AND DESIGN	$3,851,000	$385,000	10%	$4,236,000	NOV 10				
31---	CONSTRUCTION MANAGEMENT	$2,884,000	$577,000	20%	$3,461,000	NOV 10	178.4%	$8,028,000	$1,606,000	$9,634,000
	TOTAL PROJECT COSTS ==========>	$35,574,000	$6,730,000	19%	$42,304,000			$65,201,000	$13,041,000	$78,242,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 1 - Test Fill Contract for PED
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
30.-.-.-	PED			
30.J.-.-	ENGINEERING DURING CONSTRUCTION	1,203,000	241,000	1,444,000
	TOTAL CONSTRUCTION COSTS	$1,203,000	$241,000	$1,444,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 1 - Test Fill Contract for PED
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
30.J.-.-	ENGINEERING DURING CONSTRUCTION							
30.J.9.-	All Other EDC							
	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	150,000	20	30,000	1
	Environmental Backfill Restoration Backfill Canal (1000 lf test section)	407,000	CY	2.56	1,041,920	20	208,384	2
	Associated General Items Clearing and Grubbing	2	ACR	600	1,200	20	240	3
	Weld Stl Plate to Close Nav Slot in Existing Sht Stl Pile	1	JOB	LS	10,000	20	2,000	3
	Subtotal, Construction Costs:				$1,203,000			
30.J.Z.-	Contingencies @ Average of 20.0 %						$241,000	
30.J.-.-	Engineering During Construction Total:						$1,444,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 2 - Degrade Local Levees from Sta 1649+86 to S-65
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	641,000	128,000	769,000
	TOTAL CONSTRUCTION COSTS	$641,000	$128,000	$769,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 2 - Degrade Local Levees from Sta 1649+86 to S-65
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	30,000	20	6,000	1
09.2.R.-	Associated General Items Environmental Grading Degrade Local Levees	925,000	CY	0.66	610,500	20	122,100	2
	Subtotal, Construction Costs:				$641,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$128,000	
09.2.-.-	Canals Total:						$769,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 3 - Modification to S-65A and Weirs(3) in Pool B.
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	711,000	142,000	853,000
	TOTAL CONSTRUCTION COSTS	$711,000	$142,000	$853,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 3 - Modification to S-65A and Weirs(3) in Pool B.
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	5,000	20	1,000	1
09.2.R.-	Associated General Items							
	Modifications to S-65A (Gate Extensions)	1	JOB	LS	37,300	20	7,460	2
	Modify Levee @ S-65A	6	EA	106,500	639,000	20	127,800	2
	Modify Pool 'B' Weirs	3	EA	10,000	30,000	20	6,000	2
	Subtotal, Construction Costs:				$711,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$142,000	
09.2.-.-	Canals Total:						$853,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 4 - Containment Levee & Structure @ Istopoga
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	401,000	80,000	481,000
	TOTAL CONSTRUCTION COSTS	$401,000	$80,000	$481,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 4 - Containment Levee & Structure @ Istopoga
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	30,000	20	6,000	1
09.2.R.-	Associated General Items							
	Environmental Grading							
	Levee	44,000	CY	2.05	90,200	20	18,040	2
	Clearing and Grubbing	12.5	ACR	600	7,500	20	1,500	3
	Culvert No. 3	1	JOB	LS	253,600	20	50,720	3
	Seeding	13	ACR	1,500	19,500	20	3,900	3
	Subtotal, Construction Costs:				$401,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$80,000	
09.2.-.-	Canals Total:						$481,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 5 - (Pool C 1368+87 to 1649+86)(Reach 1)
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
02.-.-.-	RELOCATIONS			
02.3.-.-	CEMETERIES, UTILITIES AND STRUCTURES - CONSTRUCTION ACTIVITIES	13,000	3,000	16,000
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	22,932,000	4,586,000	27,518,000
	TOTAL CONSTRUCTION COSTS	$22,945,000	$4,589,000	$27,534,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 5 - (Pool C 1368+87 to 1649+86)(Reach 1)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
02.3.-.-	CEMETERIES, UTILITIES AND STRUCTURES - CONSTRUCTION ACTIVITIES							
02.3.3.-	Structures							
	Boat Ramp	1	EA	13,000	13,000	20	2,600	3
	Subtotal, Construction Costs:				$13,000			
02.3.Z.-	Contingencies @ Average of 23.1 %						$3,000	
02.3.-.-	Cemeteries, Utilities And Structures - Construction Activities Total:						$16,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 5 - (Pool C 1368+87 to 1649+86)(Reach 1)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	1,100,000	20	220,000	1
09.2.B.-	Environmental Backfill Restoration							
	Backfill C-38 Canal	8,305,000	CY	2.34	19,433,700	20	3,886,740	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	78	ACR	600	46,800	20	9,360	3
	Hardened Plug	1	EA	1,320,000	1,320,000	20	264,000	3
	Remove Toxic Materials at S-65B	1	JOB	LS	1,500	20	300	3
	Remove S-65B & Tieback Levees	1	JOB	LS	845,000	20	169,000	3
	Install Navigation Aids	1	JOB	LS	20,000	20	4,000	3
	Degrade Local Levees	250,000	CY	0.66	165,000	20	33,000	3
	Subtotal, Construction Costs:				$22,932,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$4,586,000	
09.2.-.-	Canals Total:						$27,518,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 6 - US 98 Highway Bridge Construction w/ Utility Relocations
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
02.-.-.-	RELOCATIONS			
02.1.-.-	ROADS - CONSTRUCTION ACTIVITIES	2,192,000	438,000	2,630,000
	TOTAL CONSTRUCTION COSTS	$2,192,000	$438,000	$2,630,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 6 - US 98 Highway Bridge Construction w/ Utility Relocations
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
02.1.-.-	ROADS - CONSTRUCTION ACTIVITIES							
02.1.L.-	Bridges, Superstructures and Deck Highway Bridge Construction	1	JOB	LS	2,021,000	20	404,200	2
02.1.M.-	Bridges, Associated General Items Utility Relocations at Railroad	1	JOB	LS	171,000	20	34,200	2
	Subtotal, Construction Costs:				$2,192,000			
02.1.Z.-	Contingencies @ Average of 20.0 %						$438,000	
02.1.-.-	Roads - Construction Activities Total:						$2,630,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION

Contract No. 7 - CSX Railroad Bridges (2) Construction w/Utility Relocations

Central and Southern Florida, Florida

PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
02.-.-.-	RELOCATIONS			
02.2.-.-	RAILROADS - CONSTRUCTION ACTIVITIES	4,644,000	929,000	5,573,000
	TOTAL CONSTRUCTION COSTS	$4,644,000	$929,000	$5,573,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 7 - CSX Railroad Bridges (2) Construction w/Utility Relocations
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
02.2.-.-	RAILROADS - CONSTRUCTION ACTIVITIES							
02.2.L.-	Bridges, Superstructures and Deck							
	East Bridge	1	JOB	LS	2,348,000	20	469,600	2
	West Bridge	1	JOB	LS	1,561,000	20	312,200	2
02.2.M.-	Bridges, Associated General Items							
	Utility Relocations at Railroad	1	JOB	LS	735,000	20	147,000	2
	Subtotal, Construction Costs:				$4,644,000			
02.2.Z.-	Contingencies @ Average of 20.0 %						$929,000	
02.2.-.-	Railroads - Construction Activities Total:						$5,573,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 8 (Pool D - 1086+19 to 1368+87)(Reach 2)
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
02.-.-.-	RELOCATIONS			
02.3.-.-	CEMETERIES, UTILITIES AND STRUCTURES - CONSTRUCTION ACTIVITIES	13,000	3,000	16,000
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	29,248,000	5,850,000	35,098,000
	TOTAL CONSTRUCTION COSTS	$29,261,000	$5,853,000	$35,114,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 8 (Pool D - 1086+19 to 1368+87)(Reach 2)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
02.3.-.-	CEMETERIES, UTILITIES AND STRUCTURES - CONSTRUCTION ACTIVITIES							
02.3.3.-	Structures							
	Boat Ramp	1	EA	13,000	13,000	20	2,600	3
	Subtotal, Construction Costs:				$13,000			
02.3.Z.-	Contingencies @ Average of 23.1 %						$3,000	
02.3.-.-	Cemeteries, Utilities And Structures - Construction Activities Total:						$16,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 8 (Pool D - 1086+19 to 1368+87)(Reach 2)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	1,100,000	20	220,000	1
09.2.8.-	Environmental Backfill Restoration							
	Backfill C-38 Canal							
	Excavated (Const. Site)	8,173,750	CY	2.65	21,660,438	20	4,332,088	2
	Borrow (Const. Limit) 5 Mile Haul	989,250	CY	4.35	4,303,238	20	860,648	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	78	ACR	600	46,800	20	9,360	3
	Hardened Plug	1	EA	974,000	974,000	20	194,800	3
	Remove Toxic Materials at S-65C	1	JOB	LS	1,500	20	300	3
	Remove S-65C & Tieback Levees	1	JOB	LS	1,050,000	20	210,000	3
	Install Navigation Aids	1	JOB	LS	20,000	20	4,000	3
	Degrade Local Levees	140,000	CY	0.66	92,400	20	18,480	3
	Subtotal, Construction Costs:				$29,248,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$5,850,000	
09.2.-.-	Canals Total:						$35,098,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 9 - Containment Levee & 2 Structures @ Yates Marsh
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	734,000	147,000	881,000
	TOTAL CONSTRUCTION COSTS	$734,000	$147,000	$881,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 9 - Containment Levee & 2 Structures @ Yates Marsh
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	35,000	20	7,000	1
09.2.R.-	Associated General Items							
	Environmental Grading							
	Levee	235,000	CY	2.05	481,750	20	96,350	2
	Clearing and Grubbing	43	ACR	600	25,800	20	5,160	3
	Culvert No. 1	1	JOB	LS	24,900	20	4,980	2
	Culvert No. 2	1	JOB	LS	98,600	20	19,720	2
	Seeding	45	ACR	1,500	67,500	20	13,500	3
	Subtotal, Construction Costs:				$734,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$147,000	
09.2.-.-	Canals Total:						$881,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 10 (Pool D - 874+97 to 1086+19)(Reach 3)
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	23,962,000	4,792,000	28,754,000
	TOTAL CONSTRUCTION COSTS	$23,962,000	$4,792,000	$28,754,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 10 (Pool D - 874+97 to 1086+19)(Reach 3)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	1,300,000	20	260,000	1
09.2.8.-	Environmental Backfill Restoration							
	Backfill C-38 Canal	5,884,000	CY	3.15	18,534,600	20	3,706,920	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	60	ACR	600	36,000	20	7,200	3
	Hardened Plug	2	EA	974,000	1,948,000	20	389,600	3
	Install Navigation Aids	1	JOB	LS	15,000	20	3,000	3
	Demolition of Houses	221	EA	9,300	2,055,300	20	411,060	3
	Degrade Local Levees	110,000	CY	0.66	72,600	20	14,520	2
	Subtotal, Construction Costs:				$23,962,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$4,792,000	
09.2.-.-	Canals Total:						$28,754,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 11 (Work Upstream of S-65E & Stilling Basin Anchors Added to S-65E)
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	5,127,000	1,025,000	6,152,000
	TOTAL CONSTRUCTION COSTS	$5,127,000	$1,025,000	$6,152,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 11 (Work Upstream of S-65E & Stilling Basin Anchors Added to S-65E)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	300,000	20	60,000	1
09.2.8.-	Environmental Backfill Restoration							
	Backfill Canal	36,000	CY	1.91	68,760	20	13,752	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	14	ACR	600	8,400	20	1,680	3
	Flood Gate Structure	1	JOB	LS	2,317,575	20	463,515	3
	Drop Structure	1	EA	LS	1,709,550	20	341,910	3
	Reinforce Tieback Levee	1	JOB	LS	94,000	20	18,800	3
	Add Stilling Basin Anchors to S-65E	36	EA	7,850	282,600	20	56,520	3
	Tieback Levee F/ Borrow Area to S-65E Tieb	1	JOB	LS	16,000	20	3,200	3
	Culvert Structure	3	EA	100,000	300,000	20	60,000	3
	Seeding	20	ACR	1,500	30,000	20	6,000	3
	Subtotal, Construction Costs:				$5,127,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$1,025,000	
09.2.-.-	Canals Total:						$6,152,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 12 (Pool E - 554+35 to 874+97)(Reach 4)
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	50,277,000	10,055,000	60,332,000
	TOTAL CONSTRUCTION COSTS	$50,277,000	$10,055,000	$60,332,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 12 (Pool E - 554+35 to 874+97)(Reach 4)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	1,200,000	20	240,000	1
09.2.B.-	Environmental Backfill Restoration							
	Backfill C-38 Canal							
	Excavated (Const. Site)	9,631,000	CY	2.65	25,522,150	20	5,104,430	2
	Borrow (Const Limit) 5 Mile Haul	4,554,900	CY	4.35	19,813,815	20	3,962,763	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	87	ACR	600	52,200	20	10,440	3
	Hardened Plug	1	EA	974,000	974,000	20	194,800	3
	Remove Toxic Material at S-65D	1	JOB	LS	1,500	20	300	3
	Remove S-65D	1	JOB	LS	1,123,000	20	224,600	3
	Install Navigation Aids	1	JOB	LS	25,000	20	5,000	3
	Demolition of Houses	155	EA	9,300	1,441,500	20	288,300	3
	Degrade Local Levees	188,000	CY	0.66	124,080	20	24,816	3
	Subtotal, Construction Costs:				$50,277,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$10,055,000	
09.2.-.-	Canals Total:						$60,332,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 13 (Pool B - 1649+86 to 2075+00)(Reach 5)
Central and Southern Florida, Florida
PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
02.-.-.-	RELOCATIONS			
02.3.-.-	CEMETERIES, UTILITIES AND STRUCTURES - CONSTRUCTION ACTIVITIES	26,000	5,000	31,000
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	28,624,000	5,725,000	34,349,000
	TOTAL CONSTRUCTION COSTS	$28,650,000	$5,730,000	$34,380,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 13 (Pool B - 1649+86 to 2075+00)(Reach 5)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
02.3.-.-	CEMETERIES, UTILITIES AND STRUCTURES - CONSTRUCTION ACTIVITIES							
02.3.3.-	Structures							
	Boat Ramp	2	EA	13,000	26,000	20	5,200	3
	Subtotal, Construction Costs:				$26,000			
02.3.Z.-	Contingencies @ Average of 19.2 %						$5,000	
02.3.-.-	Cemeteries, Utilities And Structures - Construction Activities Total:						$31,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 13 (Pool B - 1649+86 to 2075+00)(Reach 5)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	1,075,000	20	215,000	1
09.2.B.-	Environmental Backfill Restoration							
	Backfill C-36 Canal	11,461,000	CY	2.34	26,818,740	20	5,363,748	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	97	ACR	600	58,200	20	11,640	3
	S-65 Bypass Weir	1	JOB	LS	652,000	20	130,400	3
	Install Navigation Aids	1	JOB	LS	20,000	20	4,000	3
	Subtotal, Construction Costs:				$28,624,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$5,725,000	
09.2.-.-	Canals Total:						$34,349,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

KISSIMMEE RIVER RESTORATION

Contract No. 14 (Shallow C-38 from S-65 to Upstream Limit of Backfill)

Central and Southern Florida, Florida

PROJECT COST SUMMARY

		Estimated Cost	Contingency	Total Cost
09.-.-.-	CHANNELS AND CANALS			
09.2.-.-	CANALS	28,839,000	5,768,000	34,607,000
	TOTAL CONSTRUCTION COSTS	$28,839,000	$5,768,000	$34,607,000

JULY 1991 PRICE LEVEL

KISSIMMEE RIVER RESTORATION
Contract No. 14 (Shallow C-38 from S-65 to Upstream Limit of Backfill)
Central and Southern Florida, Florida

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY	CONTINGENCY REASON
09.2.-.-	CANALS							
09.2.A.-	Mobilization, Demobilization and Preparatory Work	1	JOB	LS	1,275,000	20	255,000	1
09.2.B.-	Environmental Backfill Restoration Backfill C-38 Canal	8,115,800	CY	2.76	22,399,608	20	4,479,922	2
09.2.R.-	Associated General Items							
	Clearing and Grubbing	274	ACR	600	164,400	20	32,880	3
	New Weir Structures	5	EA	1,000,000	5,000,000	20	1,000,000	3
	Subtotal, Construction Costs:				$28,839,000			
09.2.Z.-	Contingencies @ Average of 20.0 %						$5,768,000	
09.2.-.-	Canals Total:						$34,607,000	

REASONS FOR CONTINGENCIES

1. MOBILIZATION DISTANCE UNCERTAIN.
2. AVAILABILITY OF PLANT AT BID OPENING UNCERTAIN.
3. DEPENDENT ON PRODUCTION OF AVAILABLE PLANT.

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

TABLE OF CONTENTS

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

INTRODUCTION

This appendix presents geotechnical investigations to define geotechnical conditions for backfilling and restoring approximately 29 miles of Kissimmee River (C-38) to its old river channel. Restoration items requiring geotechnical investigation consist of backfilling approximately 29.0 miles of C-38, approximately 11.6 miles of new river channel excavation, construction of a bypass channel at S-65, construction of Yates Marsh/Chandler Slough containment levees, construction of Lake Istokpoga containment levee, construction of new U.S. Highway 98 and CSX Transportation Railroad (CSXT) bridges, construction of hurricane gate and grade control structures upstream of S-65E, and boat ramp relocations.

GENERAL

During 1964-1970 the naturally meandering Kissimmee River was channelized between Lake Kissimmee and Lake Okeechobee into a predominantly straight canal(C-38). The canal was excavated by dredging with excavated material placed in disposal areas adjacent to the canal. Disposal areas were developed by constructing ring containment dikes and pumping dredged material inside the dikes. The disposal areas average 10-15 feet in height, 1100 feet in width and vary in length with each disposal area covering several acres. Plates C-1 to C-5 show disposal area locations and core boring locations.

RIVER CHANNEL RESTORATION AND BACKFILLING

River Channel Restoration

The river will be returned to its original existing river channel where possible. Reaches of old river channel destroyed by channelization will be reconstructed by excavating new river channel. Depth of new river channel excavation will be approximately 10 feet.

Backfilling

Material from the existing disposal areas, new river channel excavation, and "environmental pothole" excavation will be used as backfill material to backfill C-38. These areas are expected to provide enough backfill material, however, if more material is required, the existing disposal areas will be excavated below original ground surface to a shallow depth. The majority of backfill material will be placed by pushing material from adjacent disposal areas into the canal. Depth of canal backfill is approximately 25-30 feet. No dewatering of the canal will be required during backfilling operations,therefore, canal backfill will be placed in approximately 20 feet of water. New river channel within each backfill reach will be constructed prior to backfilling to provide drainage for water displaced by backfilling operations.

PREVIOUS INVESTIGATIONS

Prior to construction of C-38, core borings were drilled along the proposed alignment. Geologic sections developed from these borings are shown on exhibits A to G which follow plates. Materials encountered, excavated, and disposed of during construction of C-38 were sands, silty sands, clayey sands, silts, clays, and some organics. Predominant materials are sands and silty sands.

CURRENT INVESTIGATIONS

S-65 Bypass Channel and Weir

Five core borings were drilled along the proposed S-65 bypass channel alignment. Core boring locations are shown on plate C-1. Materials encountered were silty, clayey sands overlying clays and sands. The weir will be located at core boring CB-S65K-3. This boring indicates that no unusual subsurface conditions exist at this location to hinder weir construction. The boring logs follow the exhibits.

Laboratory Tests

Sieve analysis and atterburg tests were performed on selected samples. Laboratory test results follow the boring logs.

Canal Backfill

Twenty hand auger borings were drilled in the existing disposal areas in Pools A,B, and C. No investigations were performed in Pools D and E due to the sponsor not owning disposal area lands in these pools. Boring locations are shown on Plates C-1 to C-5. Materials encountered were sands, silty-clayey sands, and clays. At each auger boring location a 35± pound sample of material was obtained and sent to the lab for material testing. The boring logs follow the exhibits.

Laboratory Tests

Sieve analysis, atterburg limits, standard compaction tests, specific gravity, and sedimentation tests were performed on selected samples of material. Laboratory test results follow the boring logs.

Field Density Tests

Eight in-place field density tests were performed in the existing disposal areas near hand auger boring locations. Field density test locations are shown on plates C-1 to C-5. Tests were taken approximately one foot below surface elevation using the sand cone method. Samples of material were taken at each site for laboratory testing. The field density test results follow the laboratory test results.

Backfill-Subaqueous Laboratory Testing

The majority of backfill material will be placed by pushing material into the canal from adjacent disposal areas. The canal will have water in it during backfill operations, therefore, tests were performed on backfill material to simulate the change in material density going from the disposal area in-place(dry) to canal backfill in-place below water(wet). Tests were performed by computing material densities before and after placing under water. Before and after placing under water density tests were also performed on material that was vibrated as being placed underwater. The subaqueous laboratory test results follow the field density test results.

FUTURE INVESTIGATIONS

Future geotechnical investigations planned are a test backfill canal section, more borings and testing of existing disposal areas, new channel alignments, Yates Marsh/Chandler Slough containment levees and structures alignments, Lake Istokpoga containment levees and structure alignments, U.S. Highway 98 bridge site, CSXT railroad bridge site, hurricane gate structure and grade control structure sites upstream of S-65E, and relocated boat ramp sites.

CANAL BACKFILL

Material Density/Consolidation

Due to the large quantity of material required to backfill the canal, any change in material density during backfilling operations has a severe impact on material quantities. With limited borings, lab testing, and subaqueous testing available, the assumption was made for this report that required material quantities should be increased 10% to accommodate material density change during canal backfilling and post construction consolidation.

Test Backfill Section

During early stages of design, a 1000 foot long test backfill section is planned in Pool B. The purposes of the test backfill section are to define material density change during backfilling operations, determine if silty, clayey, sandy backfill materials need to be separated into finer and coarser fractions for placement underwater and to provide information for post construction consolidation analyses.

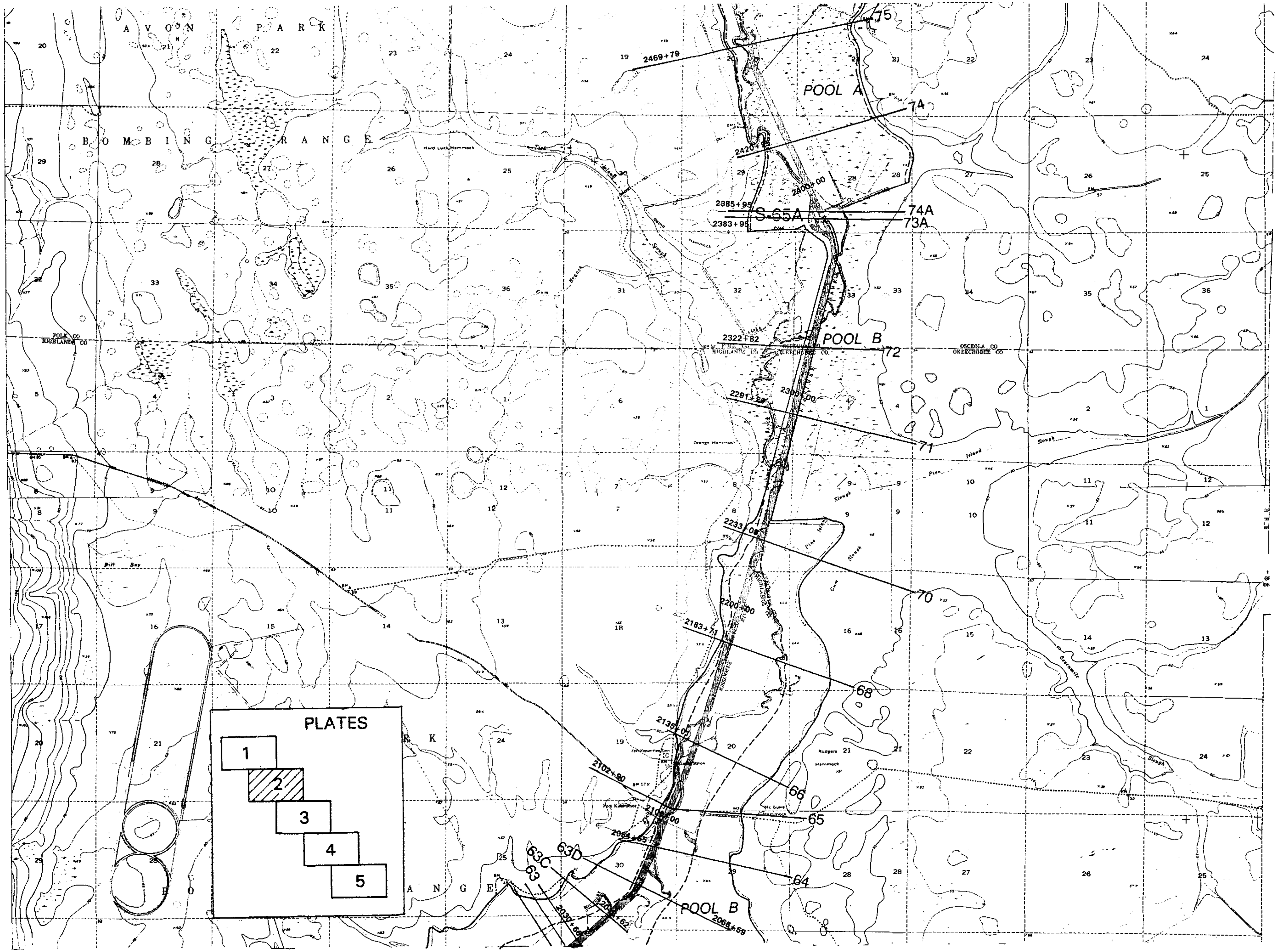
Backfill Method

Existing disposal areas adjacent to the canal will provide the bulk of backfill materials. The backfill materials will be placed by hauling and pushing material from the disposal areas into the canal. Backfill materials will be placed underwater. The canal backfill consists of predominantly sandy materials, however, some backfill materials will be finer grained silts and clays. This report assumes to facilitate backfill construction, the coarser grained sandy materials will be required to be placed underwater with finer grained materials placed above water. If it is determined during construction of the test backfill section that separation of the backfill materials into finer and coarse grained fractions is not required, this requirement will be deleted. No compactive effort other than that provided by placing equipment will be required for backfill materials.

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

LIST OF PLATES



EXIS

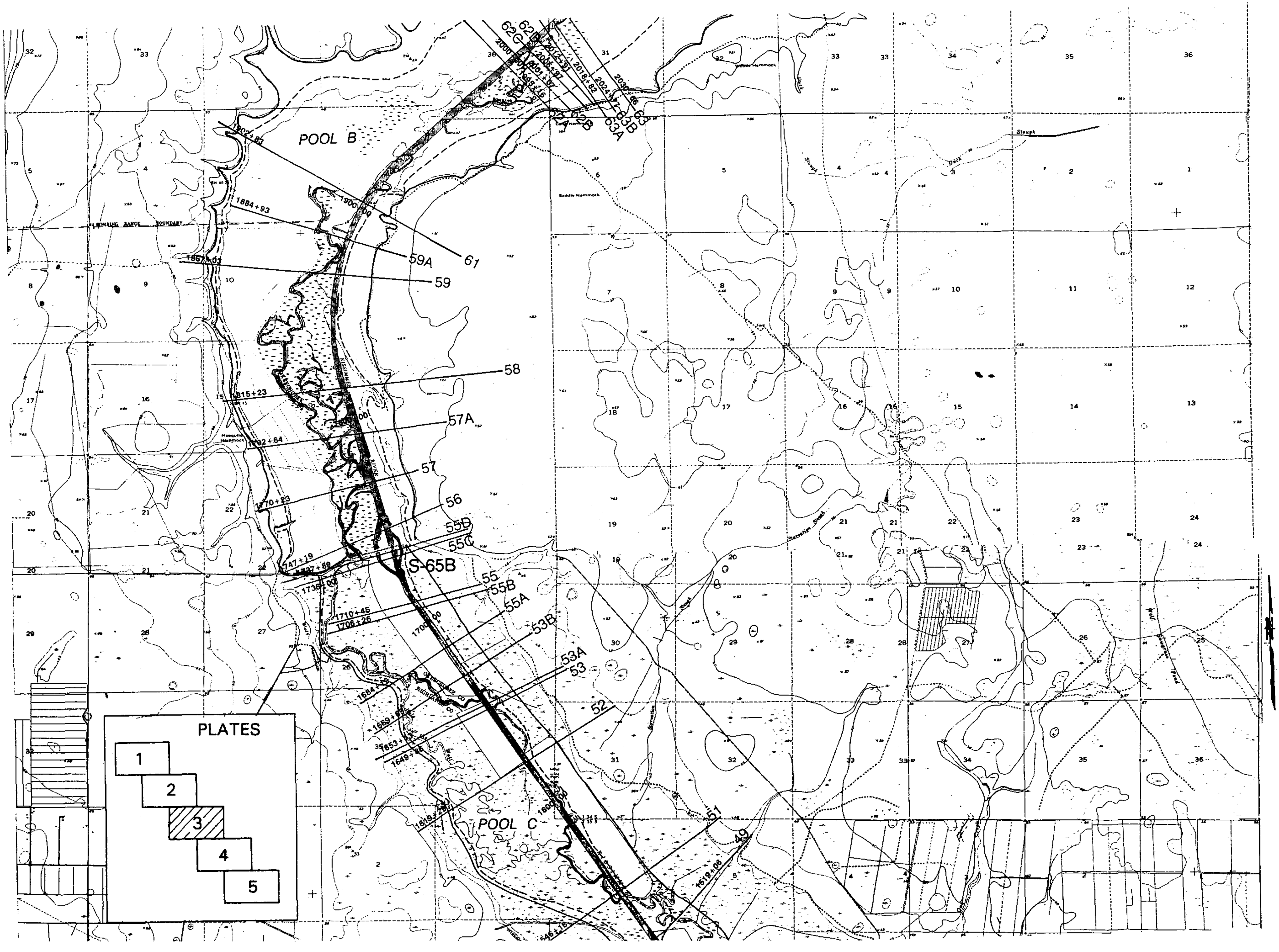
5 YE

100

Plate A2

F

EXIS



EXISTIN

5 YEAR F

100 YEA

SCALE 1:24000

CONTOUR INTERVAL 5 FE

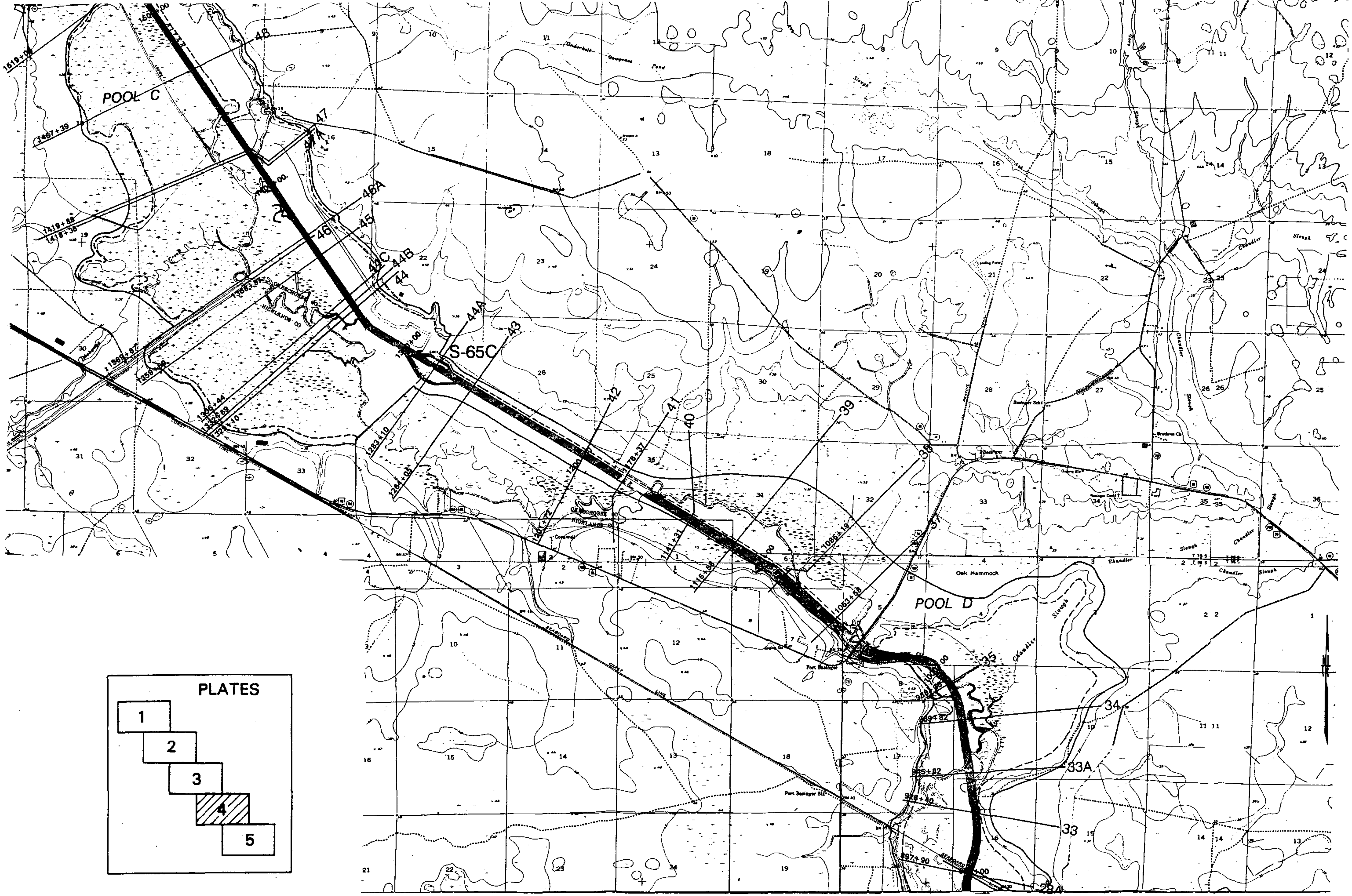
NATIONAL GEODETIC VERTICAL DATU

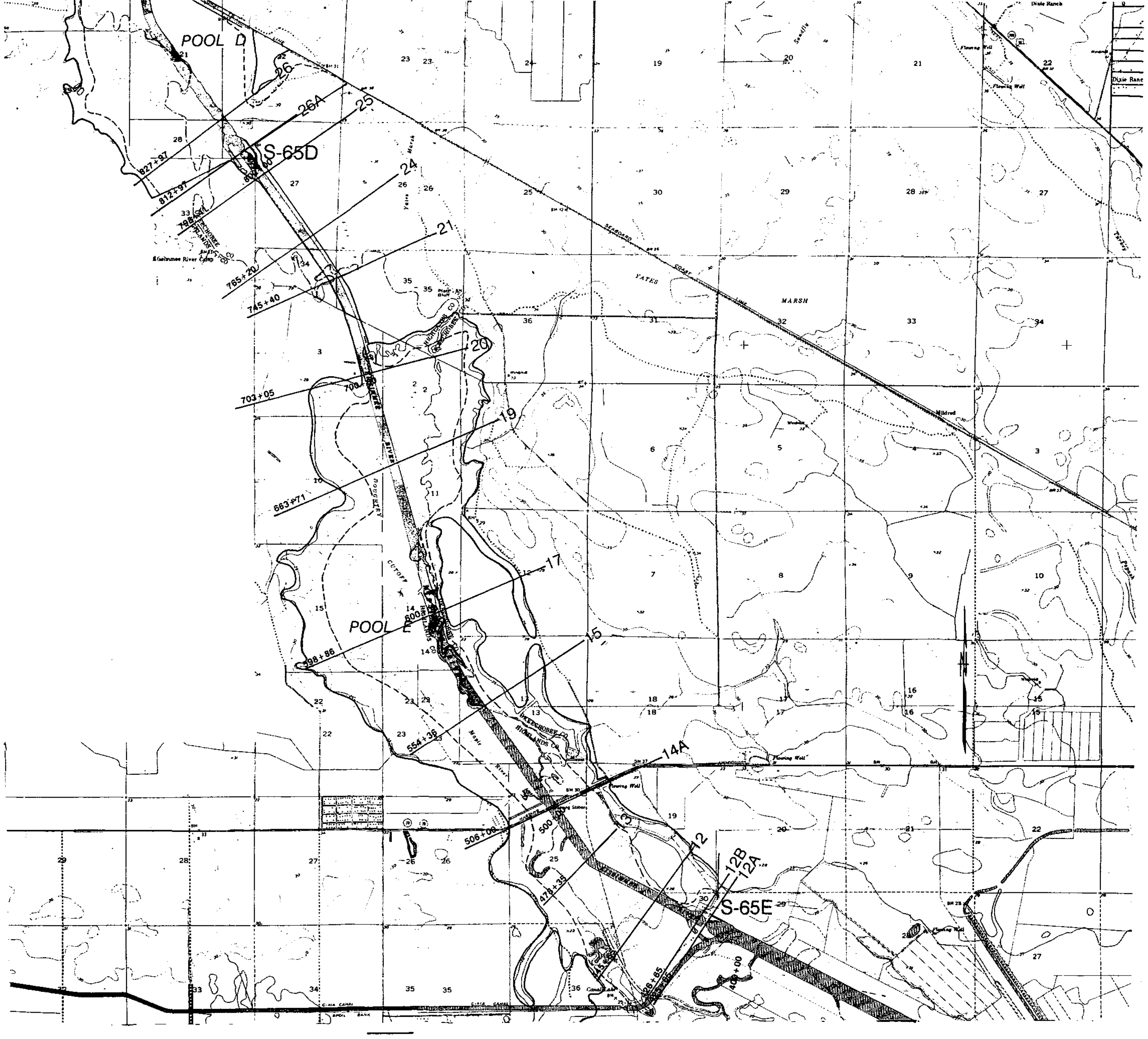
Plate A3

FLOODED

EXISTING C

Plate
A4


POOL C
48
47
46A
46
45
44C
44B
44
44A
43
S-65C
42
41
40
39
38
37
35
34
33A
33
28A
POOL D
Oak Hammock
Fort Bassinger
Chandler Slough
Underhill Sawgrass Pond
1519+00
1467+39
1419+88
1418+36
1368+87
1363+87
1359+28
1306+44
1302+69
1283+10
1264+05
1200+00
1178+37
1141+31
1116+50
1086+19
1053+58
969+82
935+82
928+40
897+90
PLATES
1
2
3
4
5



EXISTING

- - - - 5 YEAR FLOOD

——— 100 YEAR FLOOD

SCALE 1:24000

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS [illegible] FEET

FLOODED AREAS
EXISTING CONDITIONS

PLATE A-5

Plate A6

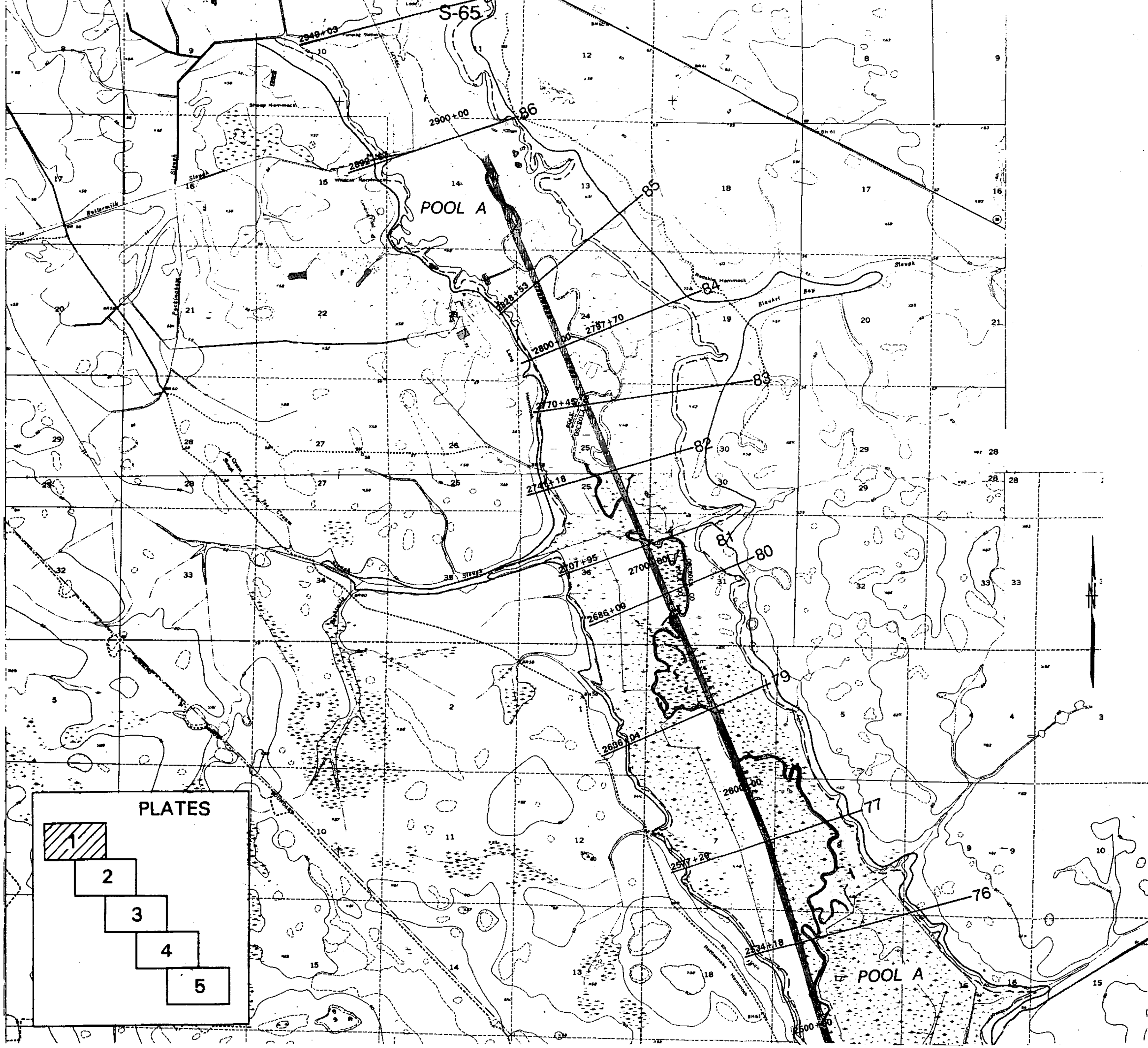

S-65
2949+03
86
2900+00
2899+88
85
POOL A
2828+53
84
2787+70
2800+00
83
2770+45
82
2747+18
81
80
2707+95
2700+00
2686+00
79
2686+04
2600+00
77
2577+29
76
2534+18
POOL A
2500+00
Buttermilk
Slough
Parkinson
Blanket Bay
Slough
PLATES
1
2
3
4
5

Plate #7

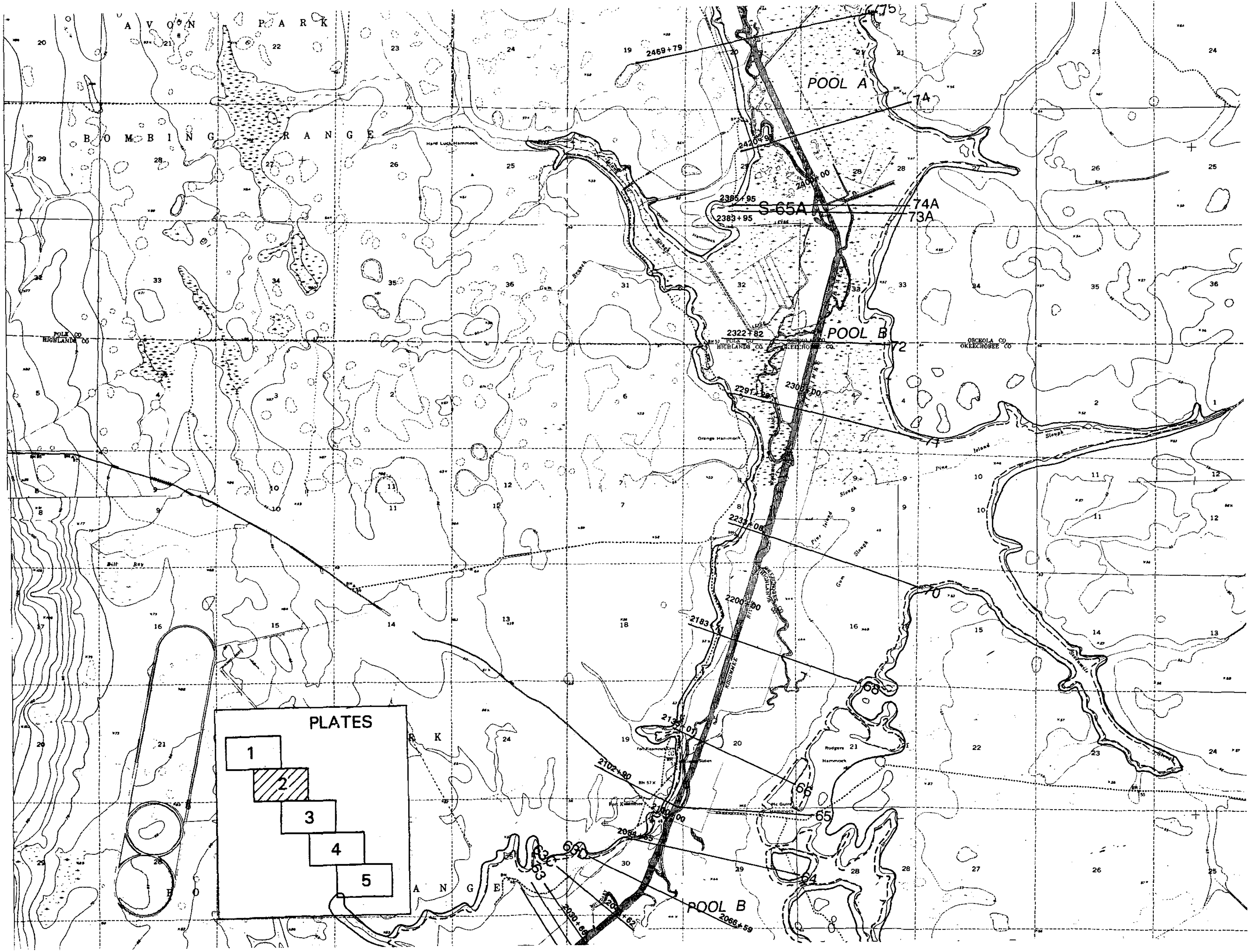

AVON PARK
BOMBING RANGE
Hard Luck Hammock
POOL A
75
74
2469+79
2420+95
2400+00
2385+95
2383+95
S-65A
74A
73A
Gum Branch
Slough
Hammock
POLK CO
HIGHLANDS CO
OSCEOLA CO
OKEECHOBEE CO
POOL B
72
2322+82
2300+00
2297+28
71
Orange Hammock
Pine Island Slough
2233+08
70
Gum Slough
2200+00
2183+71
68
KISSIMMEE
Bill Bay
2138+01
66
Fort Kissimmee
2102+80
2100+00
65
2084+53
64
McGuire Hammock
Rodgers Hammock
60
63C
63
2030+66
2056+62
2068+59
POOL B
PLATES
1
2
3
4
5
R
K
O
ANGE

Plate A8

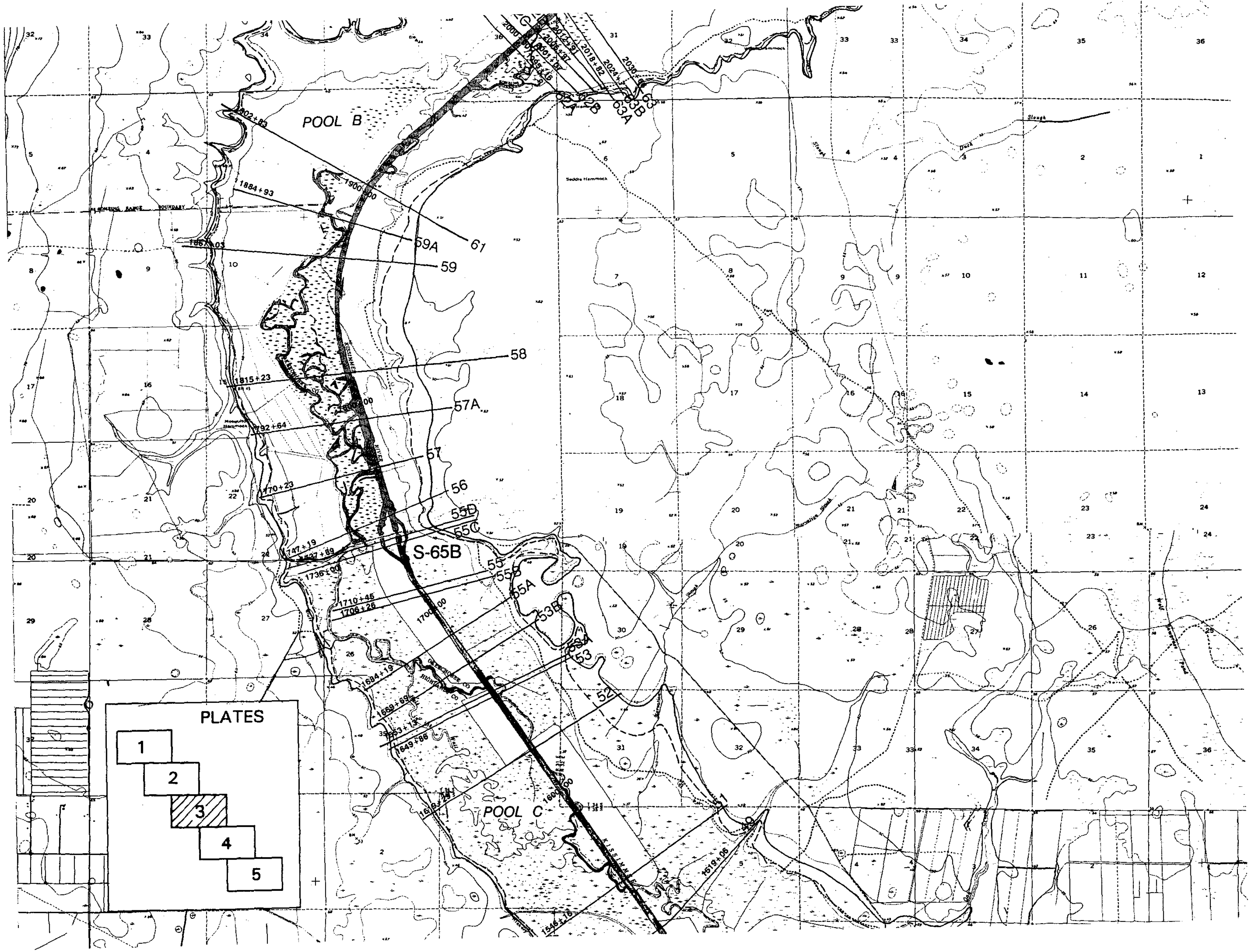

POOL B
POOL C
S-65B
PLATES
1
2
3
4
5
61
59A
59
58
57A
57
56
55D
55C
55
55B
55A
53B
53A
53
52
63
63A
63B
1902+83
1900+00
1884+93
1867+03
1815+23
1800+00
1792+64
1770+23
1747+19
1737+89
1736+00
1710+46
1706+26
1700+00
1684+19
1669+69
1653+13
1649+86
1618+29
1600+00
1546+16
1519+06
2018+82
2024+
2030
KISSIMMEE RIVER
Saddle Hammock
Mosquito Hammock
Slough
Duck Slough

Plate
A9

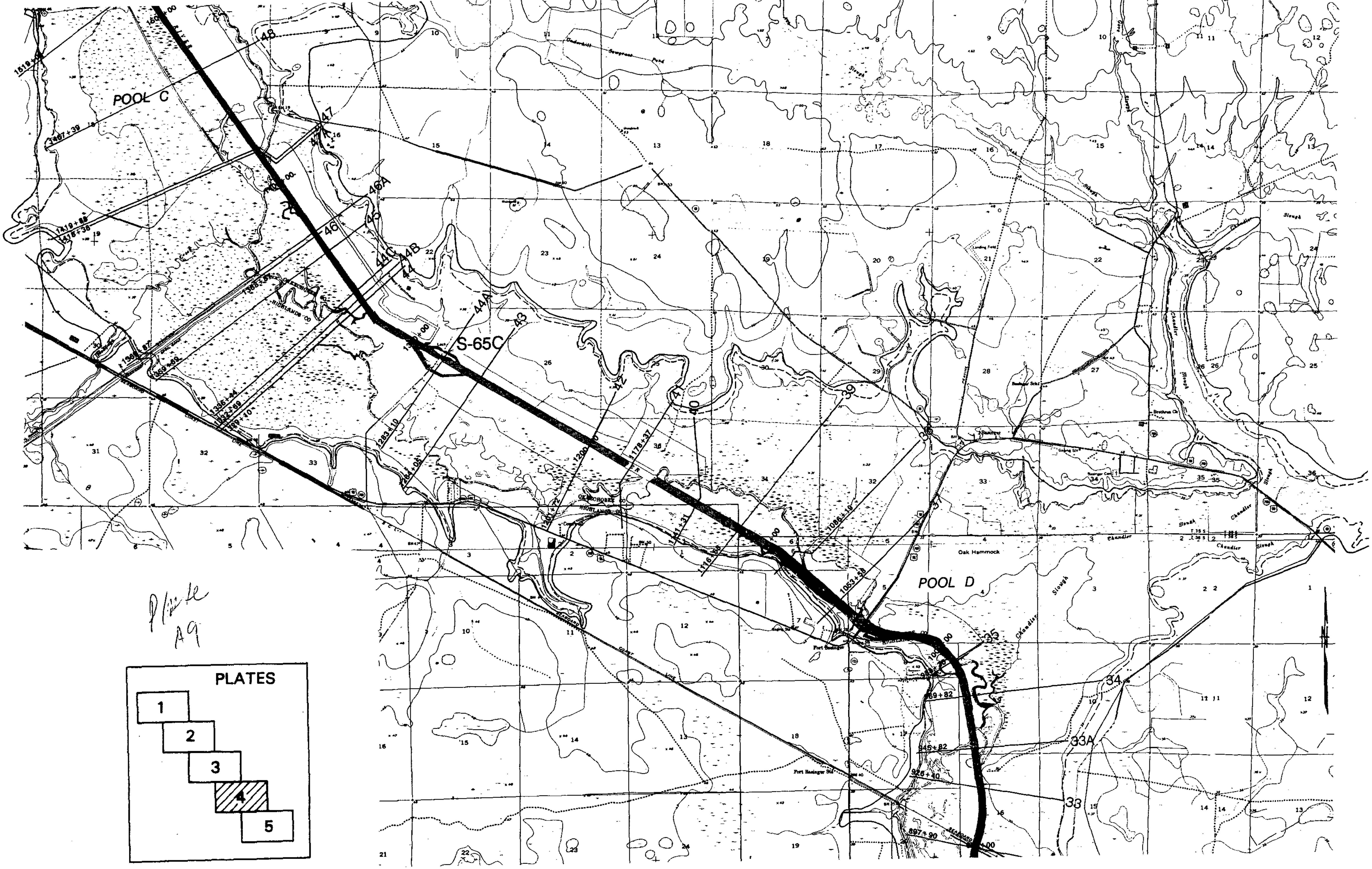
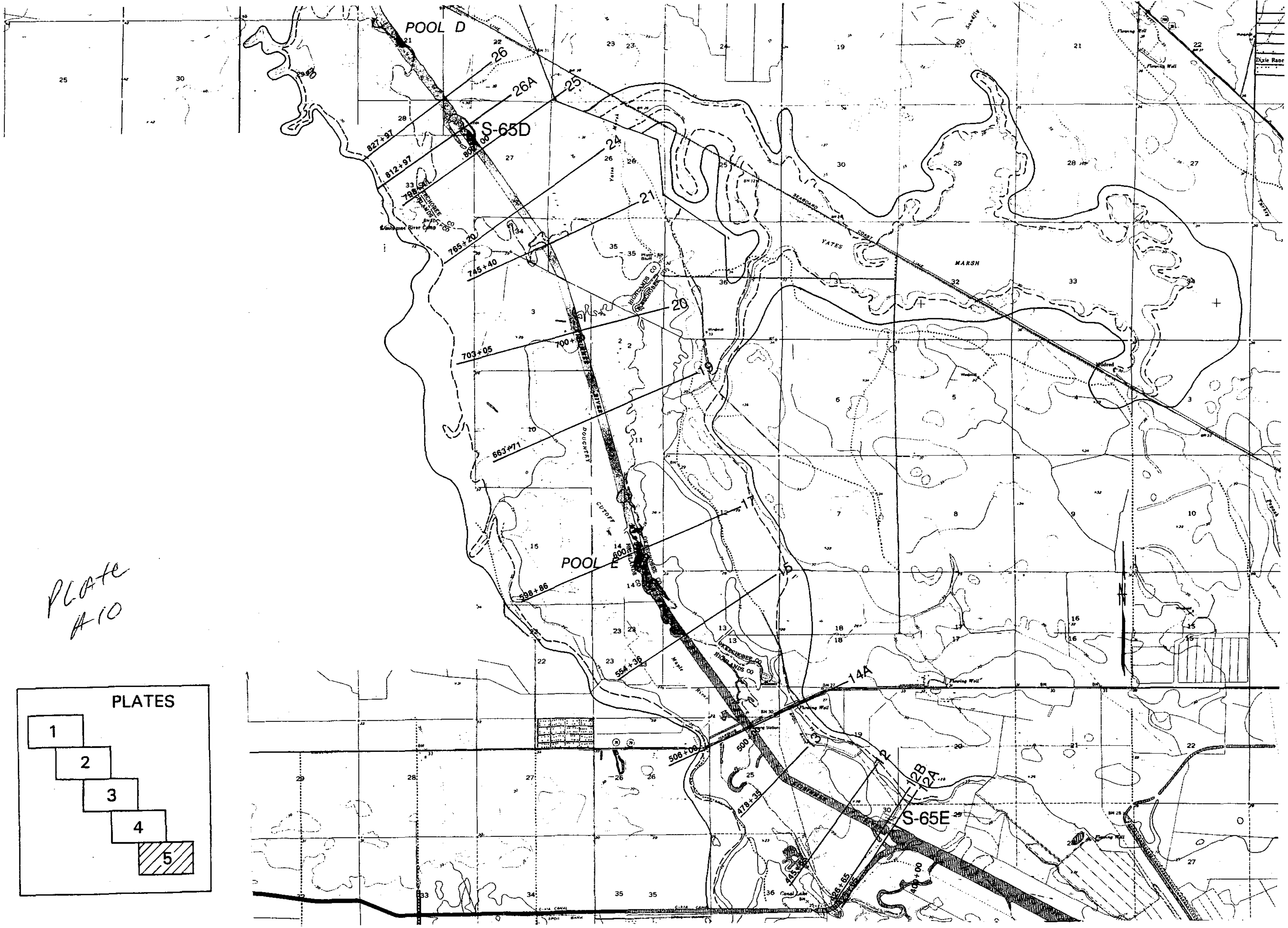
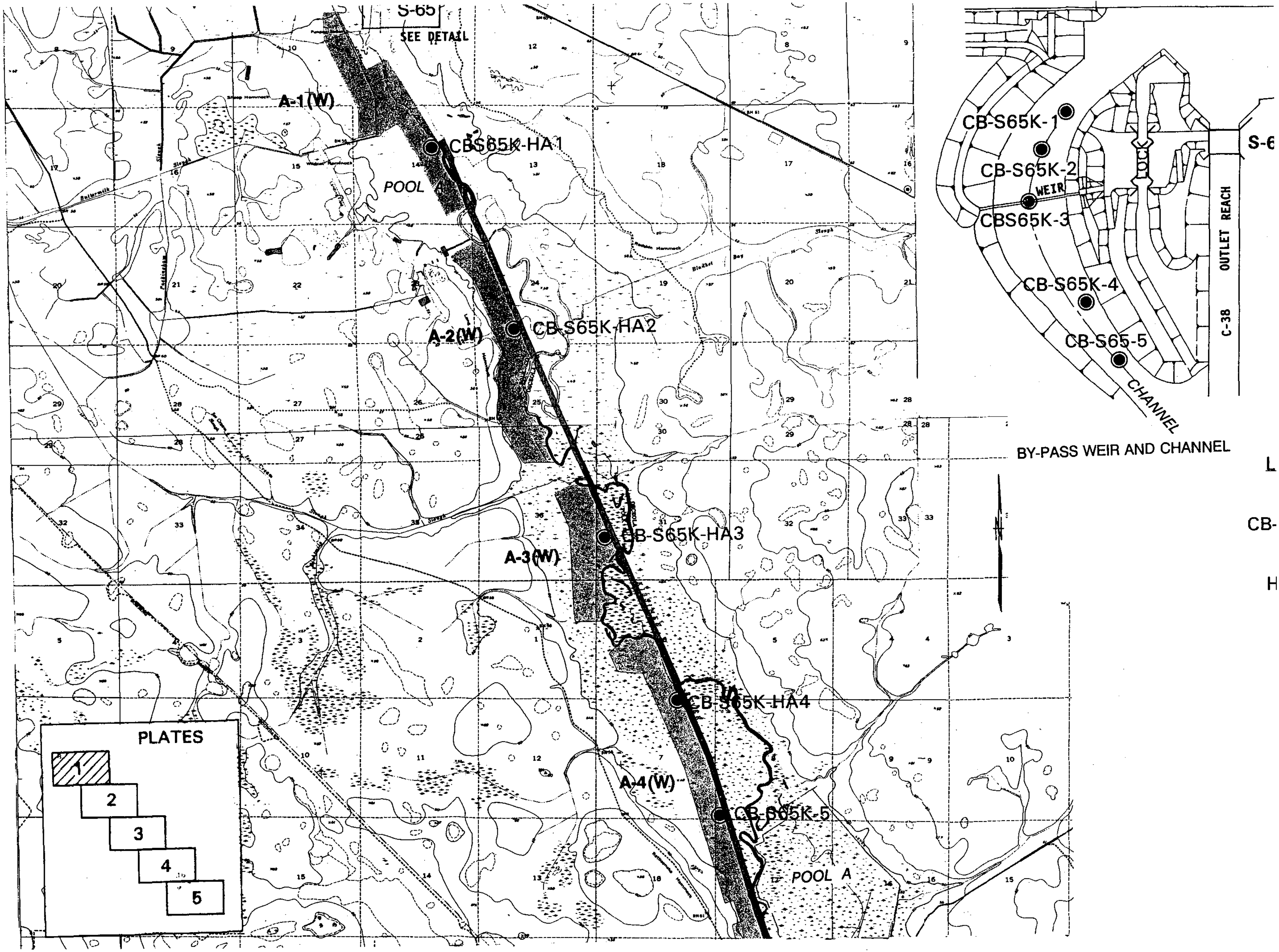

POOL C
48
47
46A
46
45
44C
44B
44
44A
43
S-65C
42
41
40
39
38
37
35
34
33A
33
POOL D
Oak Hammock
Fort Basinger
1519+39
1467+39
1419+88
1418+38
1368+54
1369+69
1396+44
1382+69
1385+10
1284+08
1283+10
1200+00
1178+37
1141+31
1116+98
1086+19
1053+58
969+82
945+82
926+40
897+90
PLATES
1
2
3
4
5

Plate A10


POOL D
POOL E
S-65D
S-65E
26
26A
25
24
21
20
19
17
15
14A
13
12
12B
12A
827+97
812+97
798+00
765+20
745+40
703+05
700+00
663+71
598+86
554+36
506+00
500+00
478+35
443+00
426+65
409+00
YATES
MARSH
SEABOARD COAST LINE
DOUGHTRY CUTOFF
OKEECHOBEE CO
HIGHLANDS CO
Kissimmee River Camp
Mildred
Canal Lake
C-41A CANAL
Flowing Well
PLATES
1
2
3
4
5

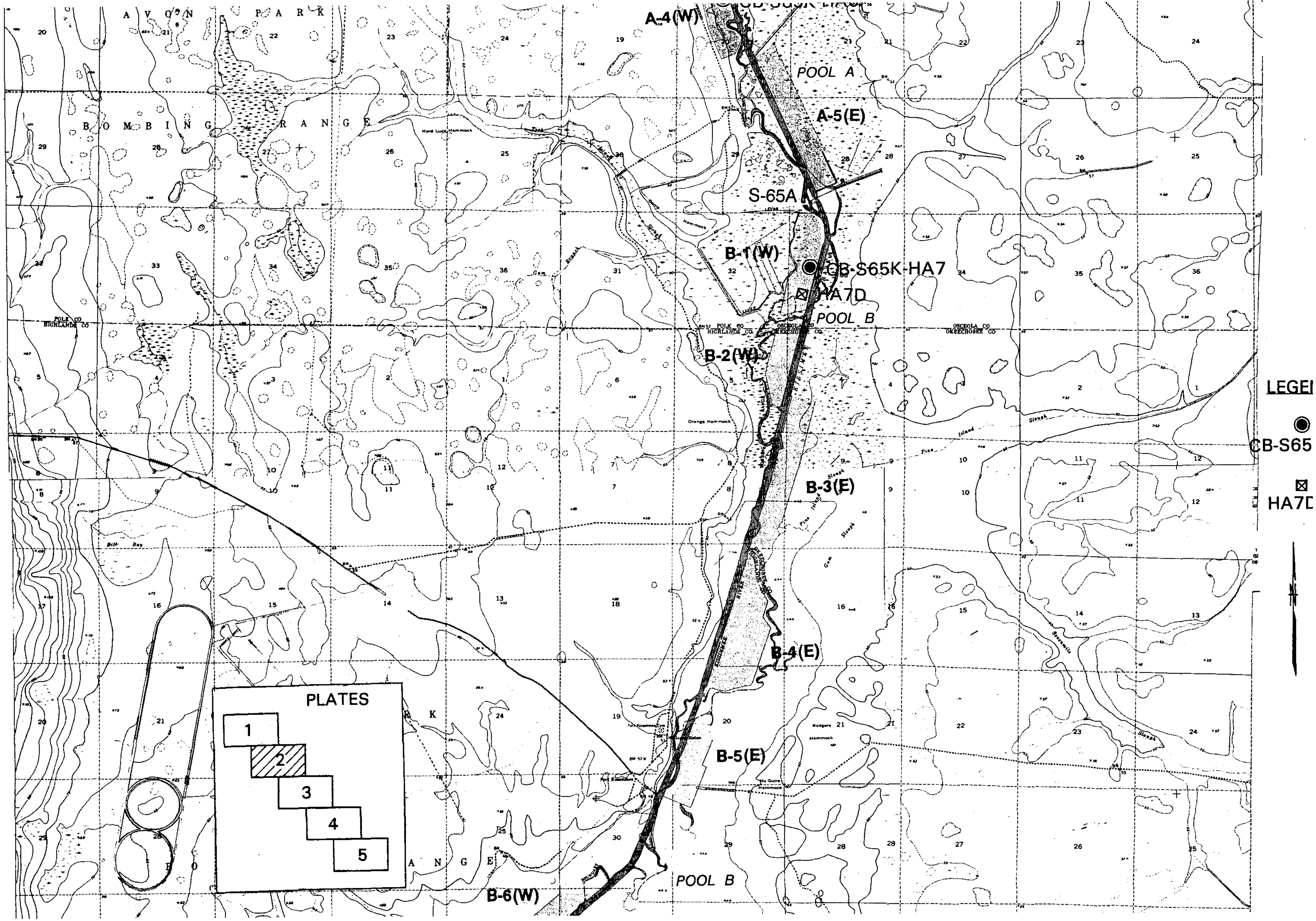
C1


S-65
SEE DETAIL
A-1(W)
CBS65K-HA1
POOL A
A-2(W)
CB-S65K-HA2
A-3(W)
CB-S65K-HA3
CB-S65K-HA4
A-4(W)
CB-S65K-5
POOL A
PLATES
1
2
3
4
5
CB-S65K-1
CB-S65K-2
WEIR
CBS65K-3
CB-S65K-4
CB-S65-5
CHANNEL
S-6
OUTLET REACH
C-38
BY-PASS WEIR AND CHANNEL

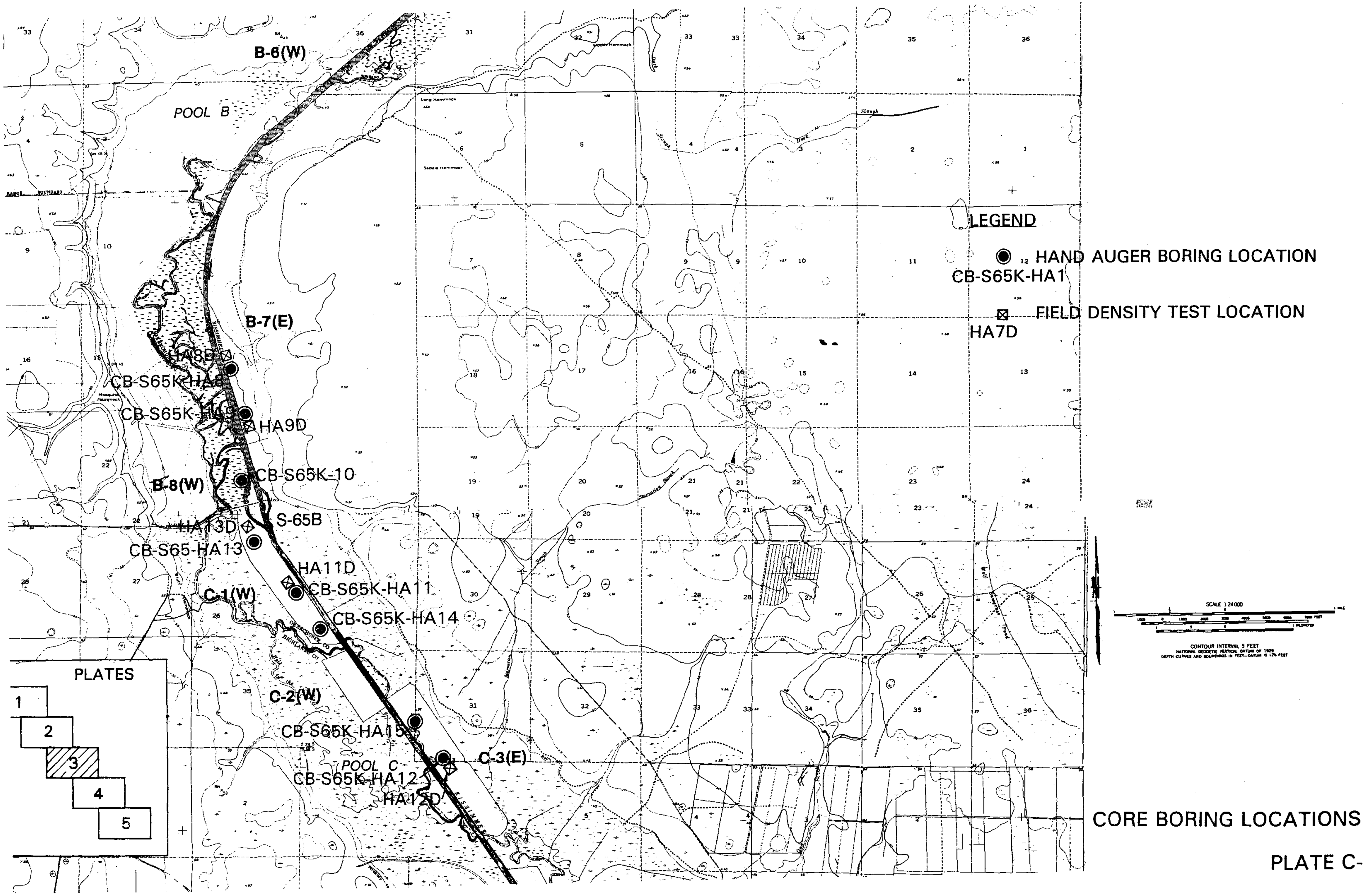
L

CB-

H


AVON PARK
BOMBING RANGE
A-4(W)
POOL A
A-5(E)
S-65A
B-1(W)
CB-S65K-HA7
HA7D
POOL B
POLK CO
HIGHLANDS CO
OSCEOLA CO
OKEECHOBEE CO
B-2(W)
B-3(E)
B-4(E)
B-5(E)
B-6(W)
POOL B
Hard Luck Hammock
Orange Hammock
Bill Bay
Pine Island Slough
Gum Slough
Rodgers Hammock
Mc Guire Hammock
Fort Kissimmee
PLATES
1
2
3
4
5
LEGE
CB-S65
HA7D

C-2



CORE BORING LOCATIONS

PLATE C-3

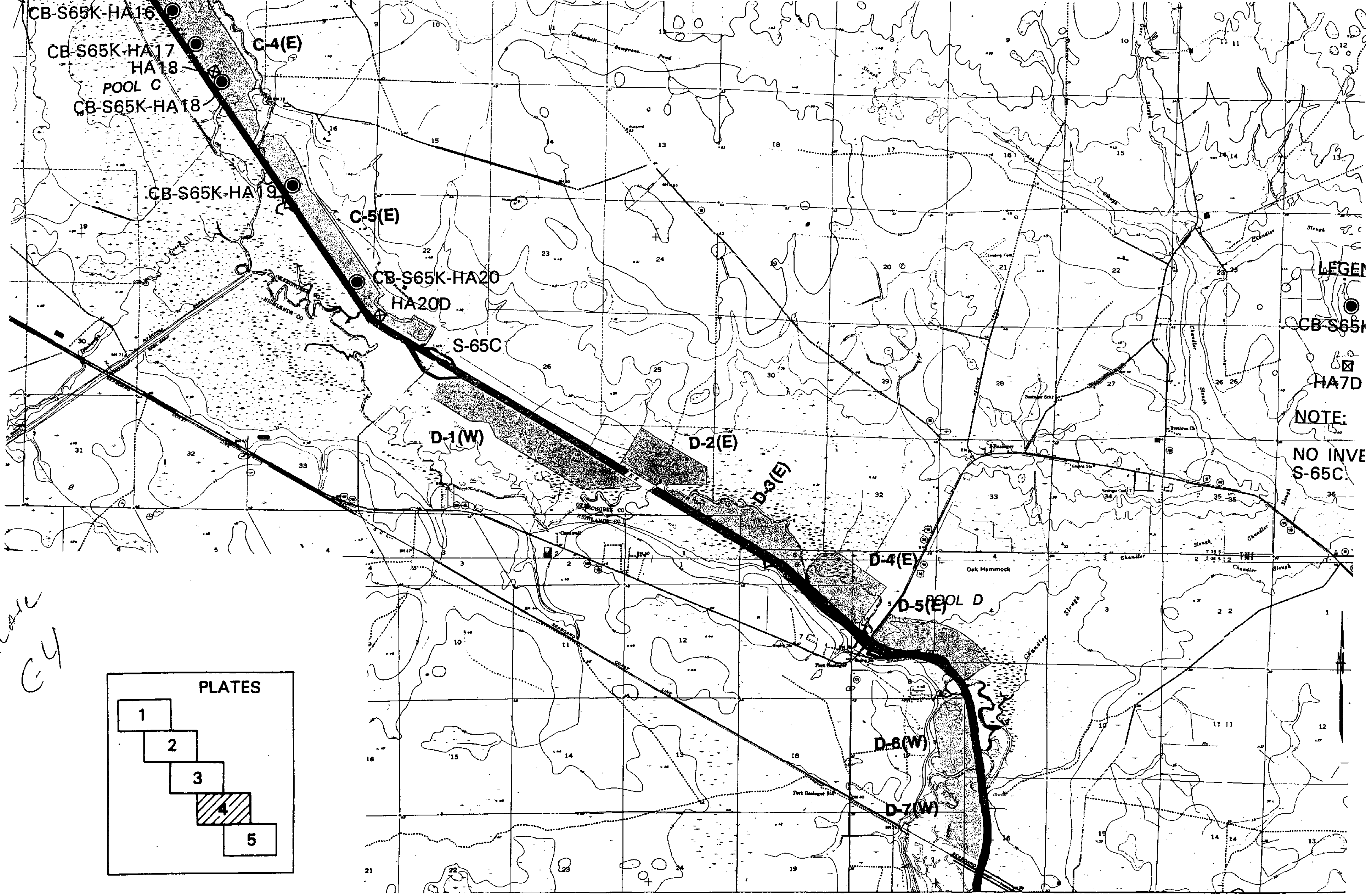
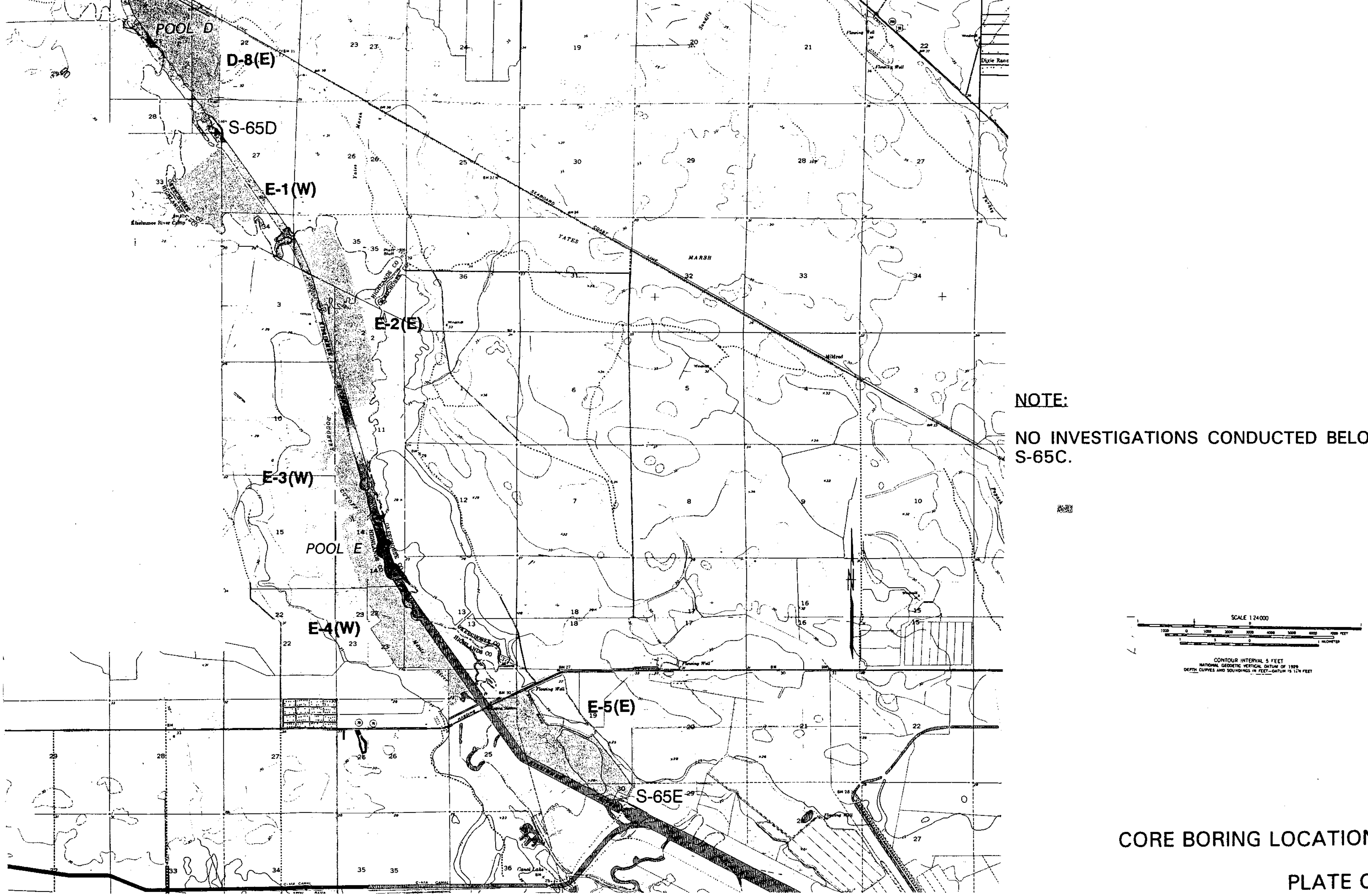

CB-S65K-HA16
CB-S65K-HA17
HA18
POOL C
CB-S65K-HA18
C-4(E)
CB-S65K-HA19
C-5(E)
CB-S65K-HA20
HA20D
S-65C
D-1(W)
D-2(E)
D-3(E)
D-4(E)
D-5(E)
POOL D
D-6(W)
D-7(W)
OKEECHOBEE CO
HIGHLANDS CO
Oak Hammock
Chandler Slough
Fort Basinger
LEGEN
CB-S65K
HA7D
NOTE:
NO INVE
S-65C.
PLATES
1
2
3
4
5

Plate C-4



NOTE:

NO INVESTIGATIONS CONDUCTED BELOW S-65C.

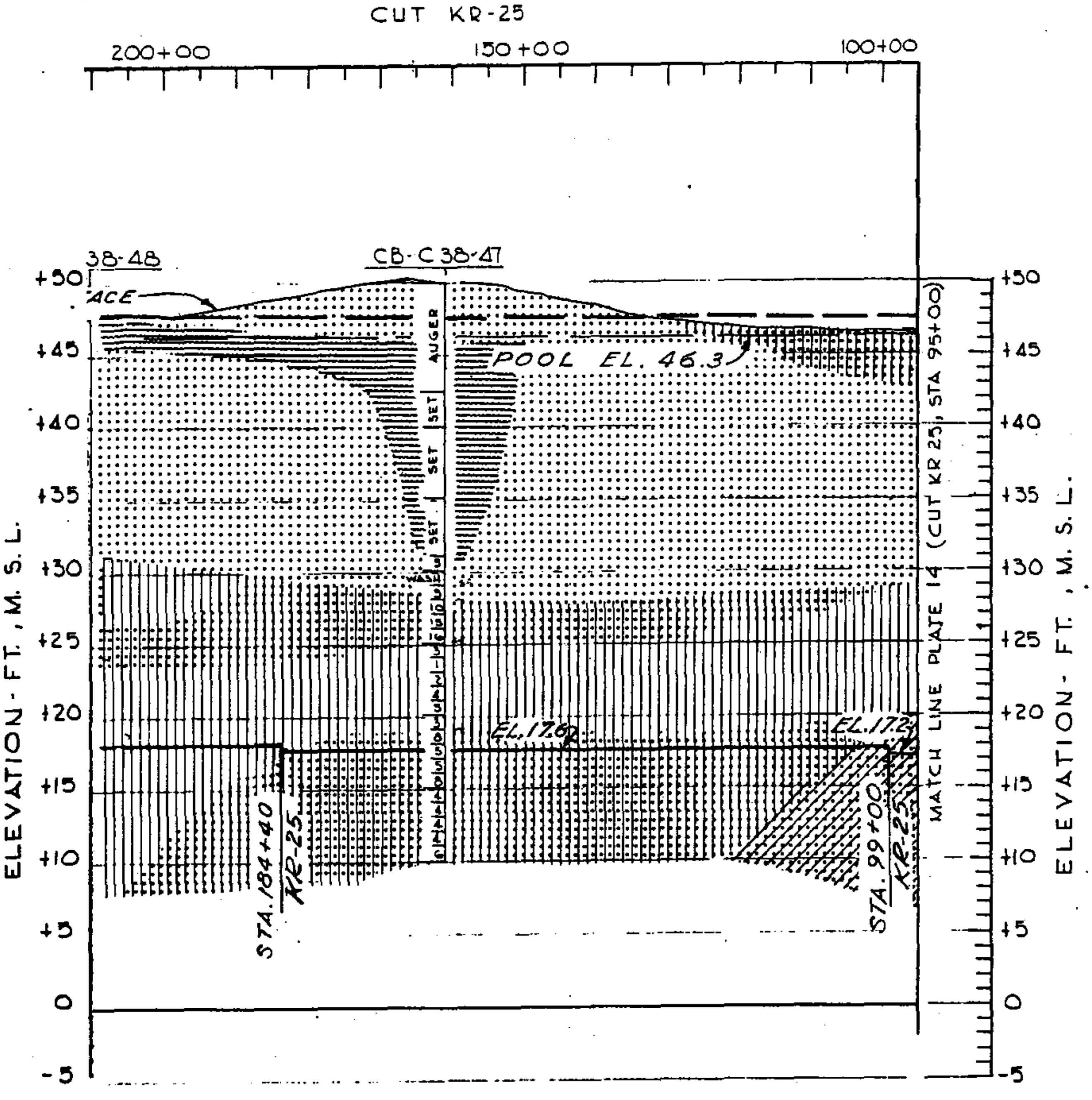
CORE BORING LOCATIONS

PLATE C-5

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

LIST OF EXHIBITS



LATE 11.

CENTRAL AND SOUTHERN FLORIDA

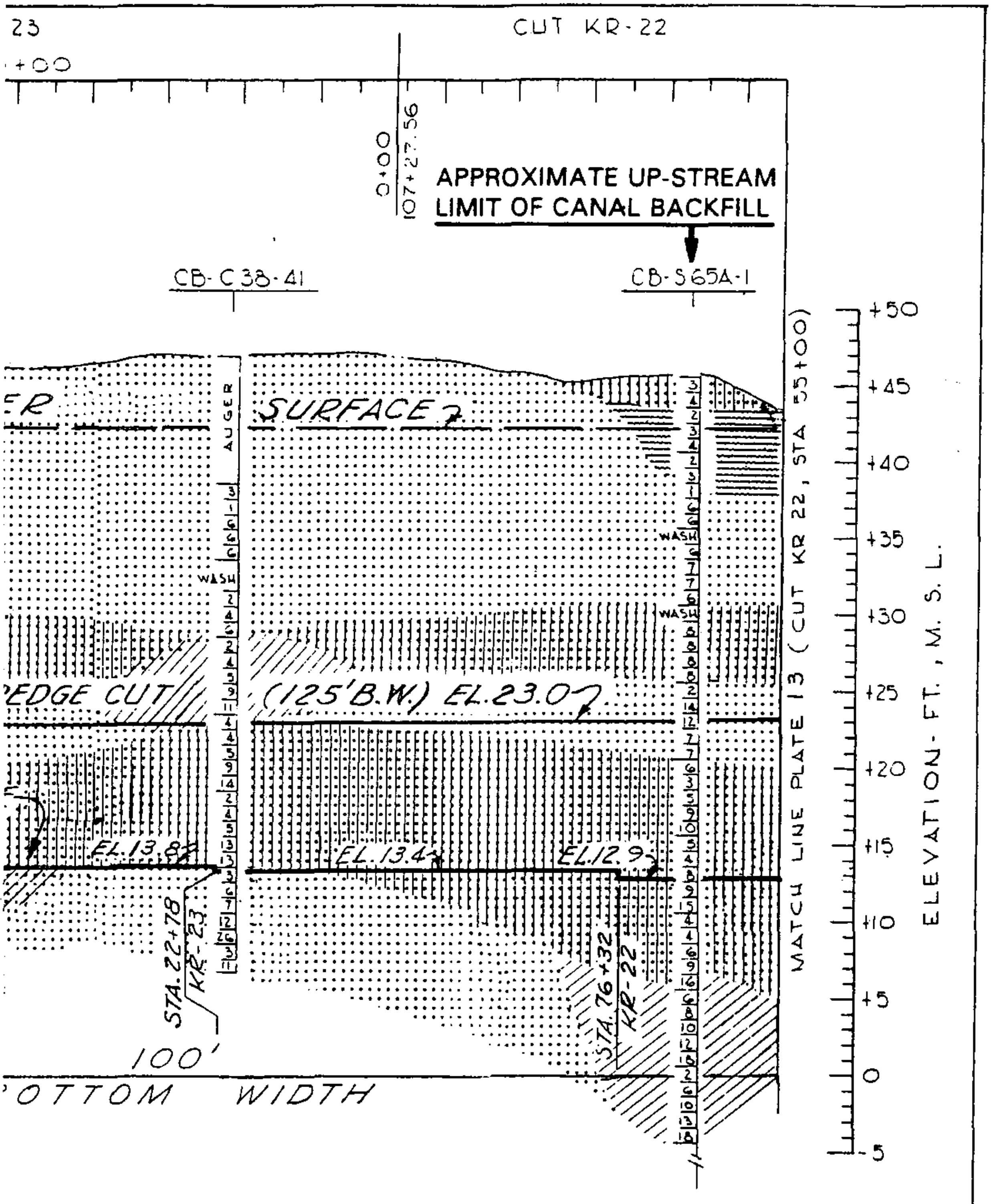
CANAL 38
SECTIONS 4, 5 AND 6
(KISSIMMEE RIVER)
GEOLOGIC SECTION

SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP. 15, DATED: FEB., 1963

FILE NO. 400-27,997

EXHIBIT A



11.

CENTRAL AND SOUTHERN FLORIDA
CANAL 38
SECTIONS 4,5 AND 6
(KISSIMMEE RIVER)
GEOLOGIC SECTION
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

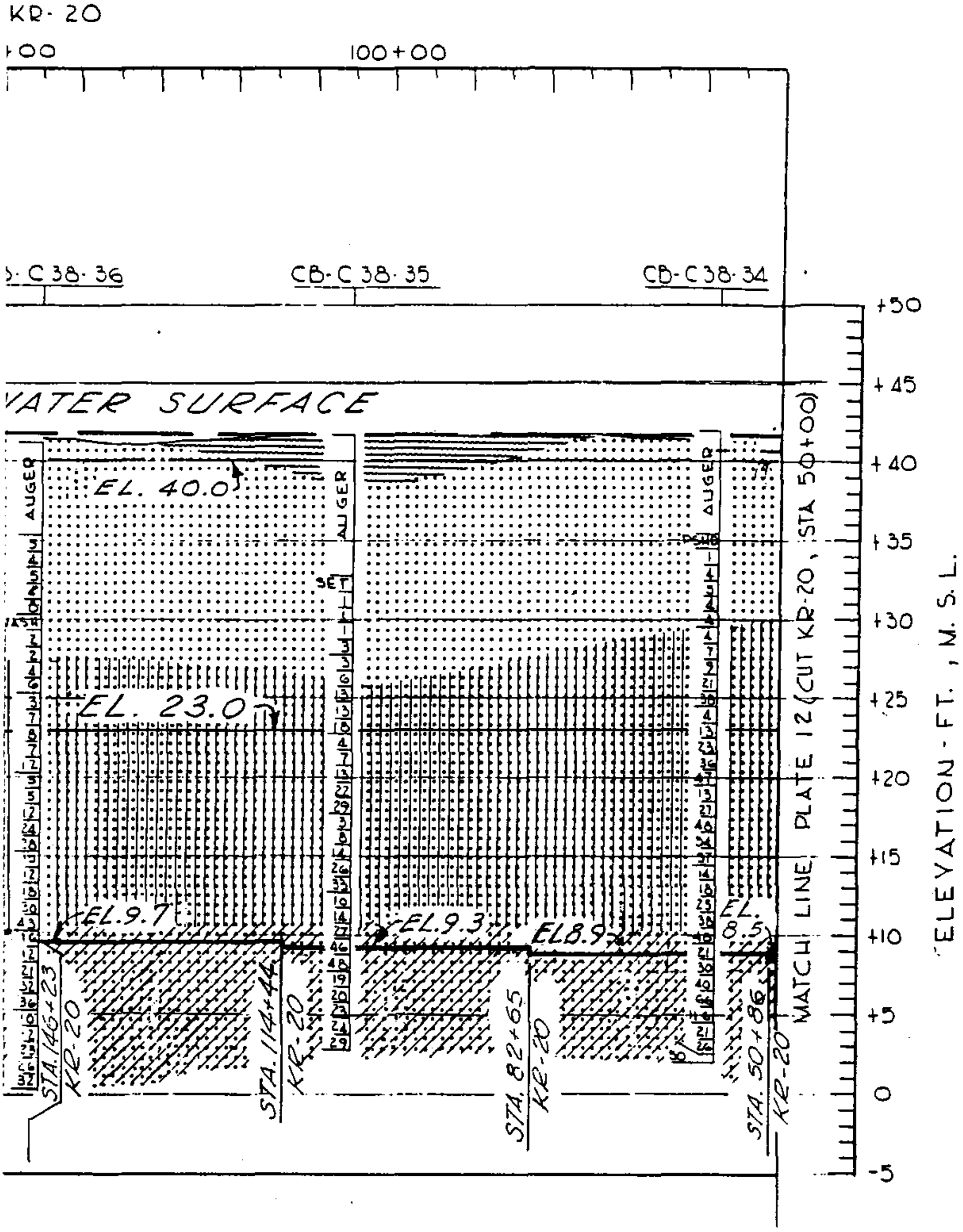
TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP. 15, DATED: FEB., 1963

FILE NO. 400-27,997

EXHIBIT B

PLATE 14

U.S. ARMY



ATE 11.

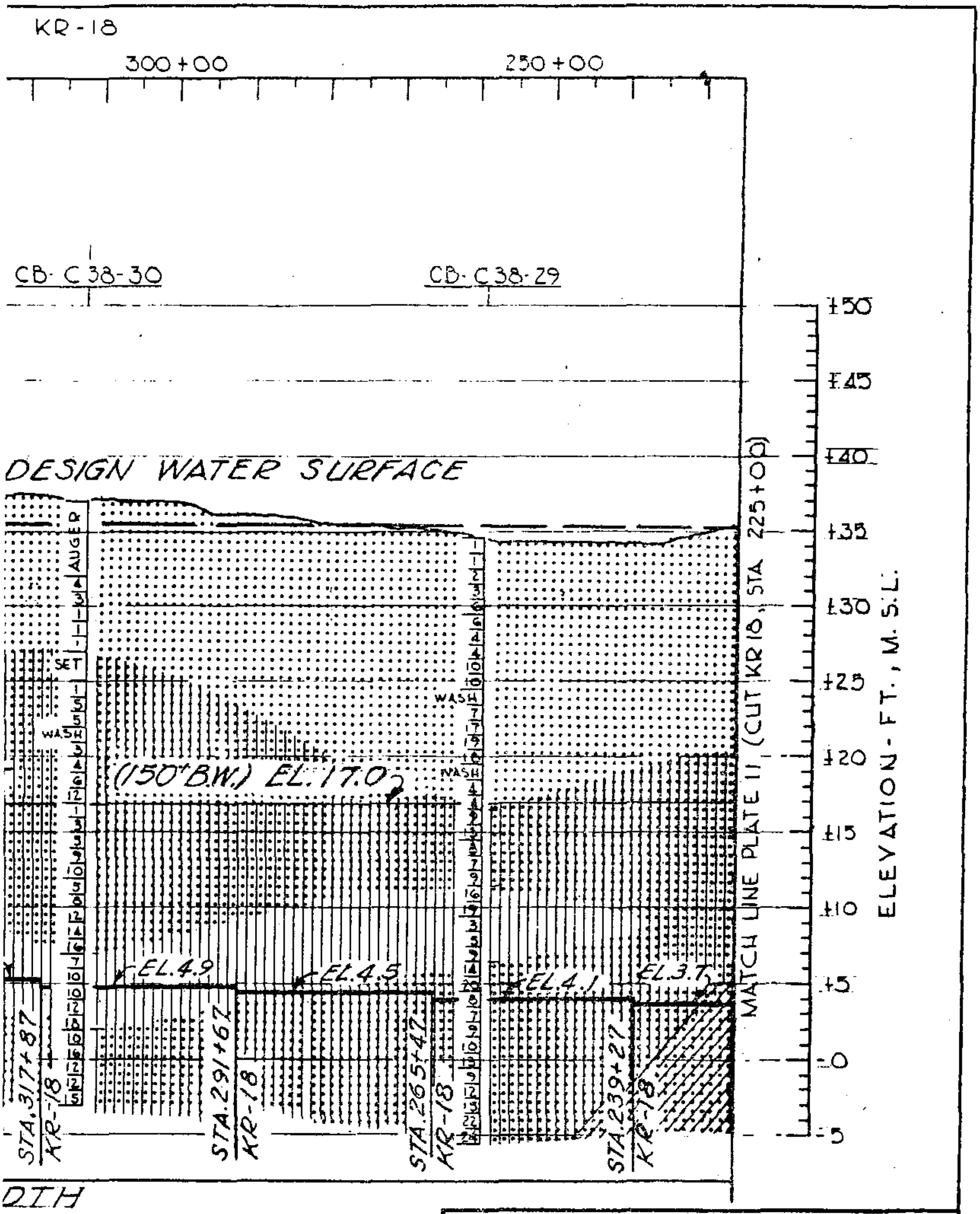
CENTRAL AND SOUTHERN FLORIDA
CANAL 38
SECTIONS 4,5 AND 6
(KISSIMMEE RIVER)
GEOLOGIC SECTION
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA
TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP. 15, DATED: FEB., 1963

FILE NO. 400-27,997

EXHIBIT C

PLATE 13

U.S. ARMY



) LEGEND SEE PLATE 11.

CENTRAL AND SOUTHERN FLORIDA

CANAL 38
SECTIONS 4,5 AND 6
(KISSIMMEE RIVER)
GEOLOGIC SECTION
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

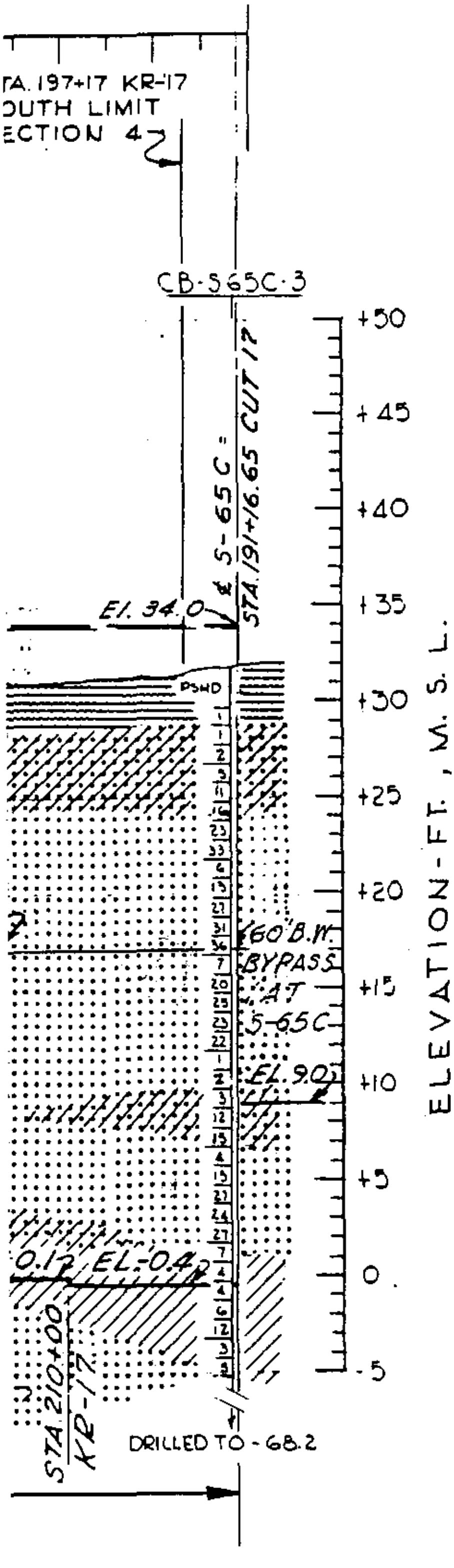
TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP. 15, DATED: FEB., 1963

FILE NO. 400-27,997

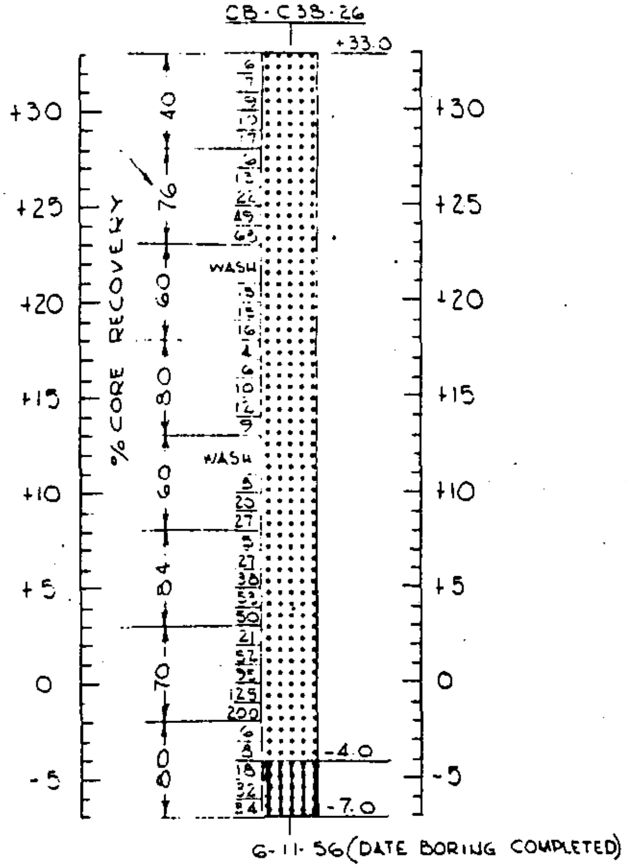
EXHIBIT D

PLATE 12

CUT KR-17



TYPICAL CONTRACT PLAN BORING LOG



LEGEND

▤ PEAT OR MUCK

▦ SAND

▧ SHELL

▨ CLAYEY SAND

▥ SILT, LOW PLASTICITY

▩ SILTY SAND

▧ CLAY, LOW PLASTICITY

3 / 7 / 8 NUMBER OF HAMMER BLOWS (450 FT. LBS. ENERGY) REQUIRED TO ADVANCE A 2-INCH I.D. SAMPLE SPOON ONE FOOT

PSHD PUSHED SPOON DOWN BY HAND

WASH WASHED AHEAD OF CASING

SET SPOON SETTLED UNDER WEIGHT OF HAMMER OR RODS

AUGER USED HAND AUGER FOR OBTAINING SAMPLE

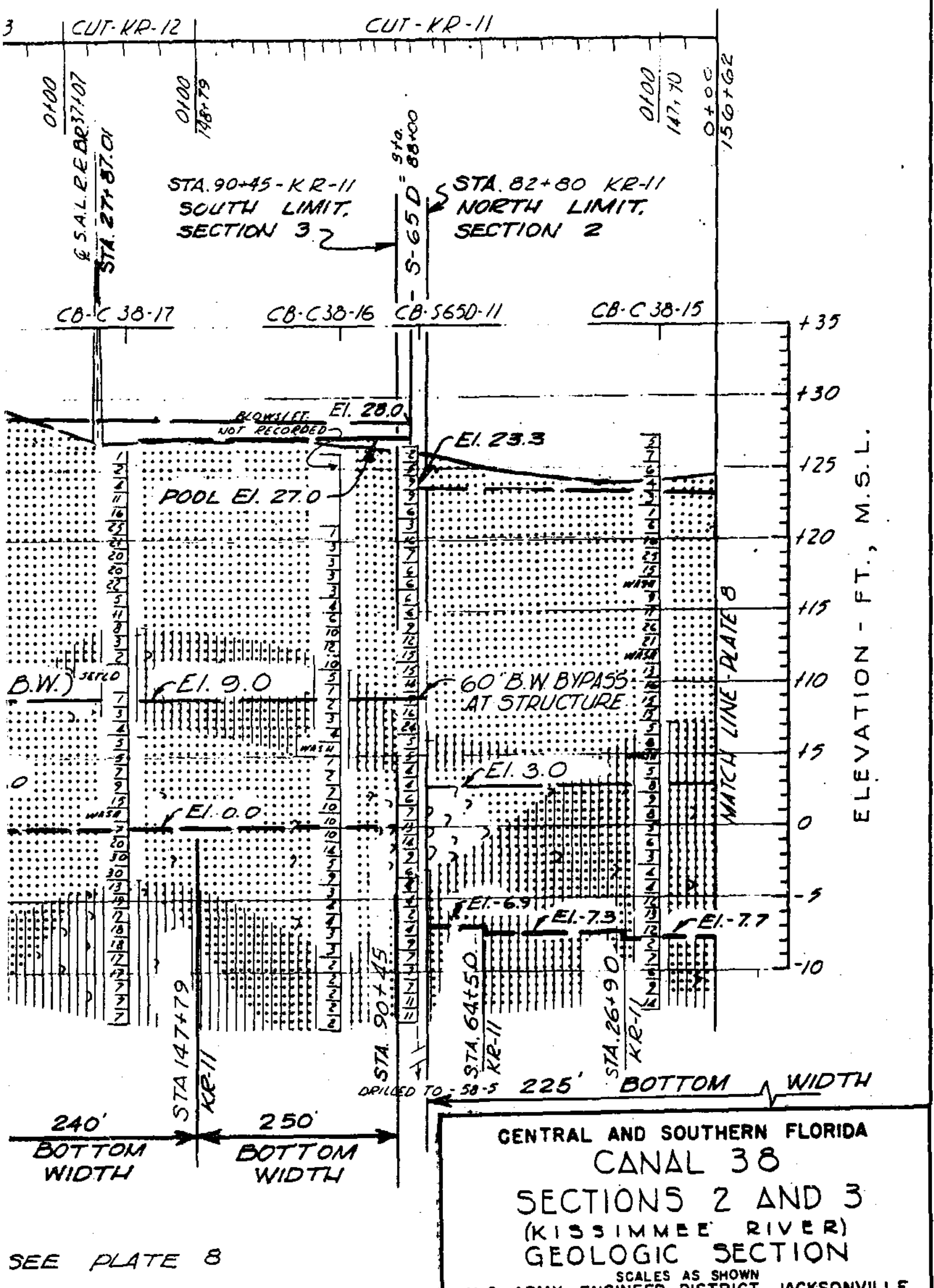
SLOPES ARE I VERTICAL ON 2
ITAL.

CENTRAL AND SOUTHERN FLORIDA
CANAL 38
SECTIONS 4,5 AND 6
(KISSIMMEE RIVER)
GEOLOGIC SECTION
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA
TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP. 15, DATED: FEB 1963

FILE NO. 400-27,997

EXHIBIT E

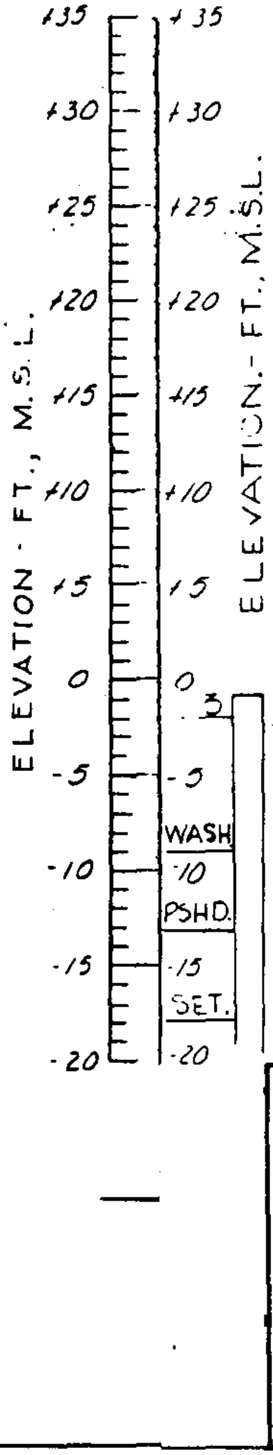
PLATE 11



CENTRAL AND SOUTHERN FLORIDA
CANAL 38
SECTIONS 2 AND 3
(KISSIMMEE RIVER)
GEOLOGIC SECTION
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP. 12, DATED: AUG., 1962

FILE NO. 400-27, 671



LEGEND

▤ PEAT

▨ SHELL

▨ SAND

▨ CLAYEY SAND

▨ SILTY SAND

☐ SILT, LOW PLASTICITY

I I I LIMESTONE, PENETRATED BY DRIVING SAMPLE SPOON

3 NUMBER OF HAMMER BLOWS (450 FT LBS. ENERGY) REQUIRED TO ADVANCE A 2-INCH I.D. SAMPLE SPOON ONE FOOT.

WASH WASHED AHEAD OF CASING.

PSHD. PUSHED SPOON DOWN WITHOUT AID OF HAMMER.

SET. SETTLED UNDER WEIGHT OF HAMMER OR RODS.

CENTRAL AND SOUTHERN FLORIDA

CANAL 38
SECTION 2
(KISSIMMEE RIVER)
GEOLOGIC SECTION

SCALES AS SHOWN
U.S ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

TO ACCOMPANY DETAIL DESIGN MEMO
PART II, SUPP 12, DATED AUG., 1962

FILE NO. 400-27,671

EXHIBIT G

PLATE 8

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

BORING LOGS

S-65 Core Boring Logs
- CB-S65K-1
  - -2
  - -3
  - -4
  - -5

Hand Auger Borings
- CB-S65K-HA1
  - -HA2
  - -HA3
  - -HA4
  - -HA5
  - -HA6
  - -HA7
  - -HA8
  - -HA9
  - -HA10
  - -HA11
  - -HA12
  - -HA13
  - -HA14
  - -HA15
  - -HA16
  - -HA17
  - -HA18
  - -HA19
  - -HA20

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 46.44 FEET	Hole No. CB-S65K-3
PROJECT KISSIMMEE RIVER: S-65 BYPASS BORINGS	INSTALLATION Jacksonville District	SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
-1.56			Continued from page 2.			WOR= WEIGHT OF ROD -1.56	
	48.25 49.50		Fine Gray Silty SAND, Trace Shell Fragments (SM)	20	33	-3.06	4 5 6
	50.75			90	34	-4.56	7 12 22
	52.00			90	35	-6.06	WOR 3 4
	53.25			70	36	-7.56	6 9 13
	54.50			95	37	-9.06	7 10 14
	55.75			90	38	-10.56	8 10 11
	57.00			70	39	-12.06	4 8 13
-13.56	58.25 59.50			75	40	-13.56	10 13 23

*Sample lab tested.

Sample No.	LL	PL	PI
12	113	32	81

NOTE: 140 LB. HAMMER
WITH A 30" DROP
USED ON 2.0 FT.
SPLITSPOON SAMPLER
(1 3/8" ID X 2" OD)

Soils are visually classified in the field in accordance with the Unified Soils Classification System.

Hole No.CB-S65K-4

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 2 SHEETS

1. PROJECT: KISSIMMEE RIVER: S-65 BYPASS BORINGS
2. LOCATION (Coordinates or Station): scaled X= 439,585 Y= 1,260,665
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-4
5. NAME OF DRILLER: CHARLIE WESTON
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 40.5 FEET
10. SIZE AND TYPE OF BIT: 1 3/8"ID X 2"OD SPLITSPOON
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MEAN SEA LEVEL
12. MANUFACTURER'S DESIGNATION OF DRILL: SIMCO SK-2400
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 27 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: 1
15. ELEVATION GROUND WATER: 46.01 (CAVED)
16. DATE HOLE: STARTED 5-7-91 COMPLETED 5-7-91
17. ELEVATION TOP OF HOLE: 54.51
18. TOTAL CORE RECOVERY FOR BORING: 63.7%
19. SIGNATURE OF INSPECTOR: Charlie W

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
54.51	0.00					54.51	BLOWS/.5 FOOT
53.01	1.25		Fine Tan SAND, Some Organics (SP-SM)	80	1	53.01	3 3 4
51.51	2.50		Fine Tan SAND (SP-SM)	70	2	51.51	5 7 16
	3.75		Fine Tan and Gray SAND (SP-SM)	70	3	50.01	16 15 15
	5.00			60	4	48.51	8 9 12
47.01	6.25 7.50			70	5	47.01	7 7 8
	8.75		Fine Tan SAND (SP)	70	6	45.51	7 6 6
	10.00			50	7	44.01	3 4 4
	11.25			60	8	42.51	3 6 12
	12.50			60	9	41.01	7 15 26
39.51	13.75 15.00			60	10	39.51	15 17 16
38.01	16.25		Fine Brown Silty SAND (SM)	65	11 *	38.01	7 7 7
	17.50		Fine Brown SAND (SP-SM)	70	12	36.51	7 8 14
35.01	18.75			70	13	35.01	17 26 48
33.51	20.00		Fine Gray SAND (SP-SM)	70	14	33.51	20 43 50 FOR 3"
			Borings continued on page 2.				

ENG FORM 1836

PROJECT KISSIMMEE RIVER S65 BYPASS BORINGS | HOLE NO. CB-S65K-4

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: 54.51 FEET

Hole No. CB-S65K-4

1. PROJECT: KISSIMMEE RIVER S-65 BYPASS BORINGS

INSTALLATION: Jacksonville District

SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	BLOWS/0.5 FOOT
33.51			Continued from page 1.			33.51	
	21.25 22.50	∴	Fine Tan SAND (SP)	70	15	32.01	28 43 46
	23.75			70	16	30.51	19 25 23
29.01	25.00			70	17	29.01	13 13 8
28.51		◤	Gray CLAY (CH)	85	18		
	26.25	▨	Gray Sandy CLAY, Some Shell Fragments (CL)			27.51	4 5 7
	27.50			80	19	26.01	4 6 6
24.51	28.75 30.00			80	20	24.51	3 5 6
	31.25	▨	Gray Silty Sandy CLAY, Trace Shell Fragments (CL)	70	21	23.01	7 11 22
21.51	32.50			50	22	21.51	4 10 15
20.01	33.75	▨	Gray Silty Sandy CLAY, Some Shell Fragments (CL)	50	23	20.01	4 8 11
18.51	35.00	∴	Fine Gray SAND, Trace Shell Fragments (SP-SM)	60	24	18.51	5 5 18
	36.25 37.50	∴	Fine to Medium Gray SAND, Trace Shell and Black Limestone (SP)	70	25	17.01	11 17 20
15.51	38.75			70	26	15.51	10 11 14
14.01	40.00	∴	Fine Gray Silty SAND, Some Shell Fragments (SM)	70	27	14.01	7 7 7
			NOTE: 140 LB HAMMER WITH A 30" DROP USED ON 2.0 FT. SPLITSPOON SAMPLER (1 3/8" ID X 2" OD)			*Sample lab tested. Soils are visually classified in the field in accordance with the Unified Soils Classification System.	

ENG FORM 1836

PROJECT: KISSIMMEE RIVER S65 BYPASS BORINGS

HOLE NO. CB-S65K-4

Hole No.CB-S65K-5

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 2 SHEETS

1. PROJECT KISSIMMEE RIVER: S-65 BYPASS BORINGS	10. SIZE AND TYPE OF BIT 1 3/8"ID X 2"OD SPLITSPOON
2. LOCATION (Coordinates or Station) scaled X= 435,645 Y= 1,260,505	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MEAN SEA LEVEL
3. DRILLING AGENCY TET, INC.	12. MANUFACTURER'S DESIGNATION OF DRILL SIMCO SK-2400
4. HOLE NO. (As shown on drawing title and file number) CB-S65K-5	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 20 — UNDISTURBED
5. NAME OF DRILLER CHARLIE VESTON	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	15. ELEVATION GROUND WATER 46.19
	16. DATE HOLE — STARTED 5-6-91 — COMPLETED 5-6-91
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE 55.39
8. DEPTH DRILLED INTO ROCK 0.0 FEET	18. TOTAL CORE RECOVERY FOR BORING 60.3%
9. TOTAL DEPTH OF HOLE 30.0 FEET	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
55.39	0.00					55.39 BLOWS/.5 FT
53.89	1.25		Fine Tan Silty SAND, Trace Organics (SP-SM)	70	1	53.89 3 4 5
52.39	2.50			50	2	52.39 6 8 15
	3.75		Fine Tan Silty SAND (SP)	60	3	50.89 10 19 23
49.39	5.00			60	4	49.39 18 22 28
	6.25		Fine Brown SAND (SP)	60	5	47.89 13 13 14
	7.50 8.75			50	6	46.39 7 6 7
44.89	10.00			50	7	44.89 5 7 11
	11.25		Fine Tan SAND (SP)	30	8	43.39 6 13 9
42.39	12.50			60	9	41.89 7 6 13
40.39	13.75 15.00		Fine Brown SAND (SP)	70	10 *	40.39 10 14 21
	16.25		Fine Tan SAND (SP)	60	11	38.89 10 16 20
	17.50			60	12	37.39 16 25 31
35.89	18.75			60	13	35.89 14 22 34
34.39	20.00		Fine Tan and Brown SAND (SP)	60	14	34.39 9 13 23
			Borings continued on page 2.			

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE 55.39 FEET	Hole No.: CB-S65K-5
PROJECT: KISSIMMEE RIVER: S-65 BYPASS BORINGS	INSTALLATION: Jacksonville District	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	BLOWS/0.5 FOOT
34.39			Continued from page 1.			34.39	
	21.25 22.50		Fine Brown SAND (SP-SM)	60	15	32.89	11 8 8
	23.75			60	16	31.39	5 5 7
29.89	25.00			80	17	29.89	6 5 6
27.89	26.25 27.50		Fine Brown Clayey SAND (SC)	75	18	28.39	6 5 6
	28.75		Green CLAY (CH)	75	19	26.89	6 3 3
25.89 25.39	30.00		Gray Clayey SAND (SC)	75	20	25.39	2 2 3

*Sample lab tested.

NOTE 140 LB. HAMMER
WITH A 30’ DROP
USED ON 2.0 FT.
SPLITSPOON SAMPLER
(1 3/8’ ID X 2’ OD)

Soils are visually classified in the field in accordance with the Unified Soils Classification System.

Hole No.:CB-S65K-HA1

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

2. LOCATION (Coordinates or Station) scaled X= 437,800 Y= 1,254,600

3. DRILLING AGENCY: TET, INC.

4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA1

5. NAME OF DRILLER: Charles Weston

6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

7. THICKNESS OF OVERBURDEN: 0.0 FEET

8. DEPTH DRILLED INTO ROCK: 0.0 FEET

9. TOTAL DEPTH OF HOLE: 6.5 FEET

10. SIZE AND TYPE OF BIT: 4" HAND AUGER

11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A

12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED

14. TOTAL NUMBER CORE BOXES: N/A

15. ELEVATION GROUND WATER: NOT ENCOUNTERED

16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91

17. ELEVATION TOP OF HOLE:

18. TOTAL CORE RECOVERY FOR BORING:

19. SIGNATURE OF INSPECTOR: Charli

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.00					BLOWS/.5 FOOT
	1.25	●	Fine White and Gray SAND, Trace Shell and Shell Fragments (SP)			
	2.50	●			*	
	3.75	▨	Tan and Green Sandy CLAY (CL)			
	5.00	▨				
	6.25	▨			*	
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

HOLE NO. CB-S65K-HA1

Hole No.: CB-S65K-HA2

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

2. LOCATION (Coordinates or Station) scaled X= 441,600 Y= 1,245,600

3. DRILLING AGENCY TET, INC.

4. HOLE NO. (As shown on drawing title and file number) CB-S65K-HA2

5. NAME OF DRILLER Charles Weston

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

7. THICKNESS OF OVERBURDEN 0.0 FEET

8. DEPTH DRILLED INTO ROCK 0.0 FEET

9. TOTAL DEPTH OF HOLE 6.5 FEET

10. SIZE AND TYPE OF BIT: 4" HAND AUGER

11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A

12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED 1 | UNDISTURBED

14. TOTAL NUMBER CORE BOXES N/A

15. ELEVATION GROUND WATER NOT ENCOUNTERED

16. DATE HOLE | STARTED 5-5-91 | COMPLETED 5-5-91

17. ELEVATION TOP OF HOLE

18. TOTAL CORE RECOVERY FOR BORING

19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
	1.25	●	Fine White and Gray SAND, Trace Shell and Shell Fragments (SP)			
	2.50	●			*	
	3.75	▨	Tan and Green Sandy CLAY (CL)			
	5.00	▨			*	
	6.25	▨				
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA2

Hole No.: CB-S65K- HA3

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station): scaled X= 445,500 Y= 1,236,500
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K- HA3
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE OF BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/.5 FOOT
	1.25 2.50	●	Fine White and Gray SAND, Trace Shell and Shell Fragments (SP)		*	
	3.75 5.00 6.25	▨	Tan and Green Sandy CLAY (CL)		*	
	7.50 8.75 10.00 11.25 12.50 13.75 15.00 16.25 17.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			*Composite sample lab tested.

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS

HOLE NO. CB-S65K- HA3

Hole No.: CB-S65K-HA4

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station) scaled X= 448,300 Y= 1,229,500
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA4
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE OF BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
						BLOWS/.5 FOOT
	0.00	●	Fine White and Gray SAND, Trace Shell and Shell Fragments (SP)			
	1.25	●				
	2.50	●			*	
	3.75	▨	Tan and Green Sandy CLAY (CL)			
	5.00	▨			*	
	6.25	▨				
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

Hole No.: CB-S65K-HA5

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station): scaled X= 450,300 Y= 1,224,400
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA5
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/.5 FOOT
	1.25	●	Fine White and Gray SAND, Trace Shell and Shell Fragments (SP)			
	2.50	●			*	
	3.75	▨	Tan and Green Sandy CLAY (CL)			
	5.00	▨				
	6.25	▨			*	
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA5

Hole No.: CB-S65K-HA6

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station): scaled X= 452,000 Y= 1,218,700
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA6
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/5 FOOT
	1.25 2.50	●	Fine White and Gray SAND, Trace Shell and Shell Fragments (SP)		*	
	3.75 5.00 6.25	▨	Tan and Green Sandy CLAY (CL)		*	
	7.50 8.75 10.00 11.25 12.50 13.75 15.00 16.25 17.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			*Composite sample lab tested.

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS

HOLE NO. CB-S65K-HA6

Hole No.: CB-S65K-HA7

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station): scaled X= 456,100 Y= 1,205,200
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA7
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE OF BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
		● ● ●	Fine White SAND (SP)		*	
	1.25	● ● ●	Fine Gray SAND, Some Shell (SP)			
	2.50	● ● ●			*	
	3.75	┊ ┊ ┊	Dark Gray Silty SAND, Some Shell (SM)			
	5.00	┊ ┊ ┊			*	
	6.25	┊ ┊ ┊				
	7.50					*Composite sample lab tested.
	6.75					
	10.00					
	11.25		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA7

Hole No.: CB-S65K-HA8

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station): scaled X= 434,900 Y= 1,158,900
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA8
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 5.0 FEET
10. SIZE AND TYPE OF BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.00					BLOWS/.5 FOOT
			Fine Gray Silty SAND (SM)		*	
	1.25		Gray Sandy CLAY, Some Shell (CL)			
	2.50					
					*	
	3.75					
	5.00					*Composite sample lab tested.
	6.25					
	7.50					
	8.75					
	10.00					
	11.25		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS

HOLE NO. CB-S65K-HA8

Hole No. CB-S65K-HA9

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

2. LOCATION (Coordinates or Station): scaled X= 435,700 Y= 1,155,700

3. DRILLING AGENCY: TET, INC.

4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA9

5. NAME OF DRILLER: Charles Weston

6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

7. THICKNESS OF OVERBURDEN: 0.0 FEET

8. DEPTH DRILLED INTO ROCK: 0.0 FEET

9. TOTAL DEPTH OF HOLE: 6.0 FEET

10. SIZE AND TYPE BIT: 4" HAND AUGER

11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A

12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED

14. TOTAL NUMBER CORE BOXES: N/A

15. ELEVATION GROUND WATER: NOT ENCOUNTERED

16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91

17. ELEVATION TOP OF HOLE:

18. TOTAL CORE RECOVERY FOR BORING:

19. SIGNATURE OF INSPECTOR: Charlie W

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/.5 FOOT
	1.25	▨	Gray Sandy CLAY, Some Shell Fragments (CL)			
	2.50	▨				
	3.75	▨			*	
	5.00	▨				
	6.25					*Composite sample lab tested.
	7.50					
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

HOLE NO. CB-S65K-HA9

Hole No.: CB-S65K-HA10

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station) scaled X= 435,600 Y= 1,153,000
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA10
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE BIT: 4' HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00	● ●	Fine White SAND (SP)		*	BLOWS/5 FOOT
	1.25 2.50 3.75	● ●	Fine Gray SAND, Trace Shell (SP)		*	
	5.00 6.25	▨	Gray Sandy CLAY (CL)		*	
	7.50 8.75 10.00 11.25 12.50 13.75 15.00 16.25 17.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			*Composite sample lab tested.

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA10

Hole No.: CB-S65K-HA11

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station) scaled X= 438,200 Y= 1,147,100
3. DRILLING AGENCY TET, INC.
4. HOLE NO. (As shown on drawing title and file number) CB-S65K-HA11
5. NAME OF DRILLER Charles Weston
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.0 FEET
10. SIZE AND TYPE BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER NOT ENCOUNTERED
16. DATE HOLE STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
		● ●	Fine Gray SAND, Trace Limestone Shell (SP)			
	1.25	● ●				
	2.50	● ●				
	3.75	● ●				
	5.00	● ●			*	
	6.25					
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA11

Hole No.: CB-S65K-HA12

DRILLING LOG

DIVISION South Atlantic

INSTALLATION Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station) X= 445,050 scaled Y= 1,138,600
3. DRILLING AGENCY TET, INC.
4. HOLE NO. (As shown on drawing title and file number) CB-S65K-HA12
5. NAME OF DRILLER Charles Weston
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN 0.0 FEET
8. DEPTH DRILLED INTO ROCK 0.0 FEET
9. TOTAL DEPTH OF HOLE 6.5 FEET
10. SIZE AND TYPE BIT: 4' HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED 1 | UNDISTURBED
14. TOTAL NUMBER CORE BOXES N/A
15. ELEVATION GROUND WATER NOT ENCOUNTERED
16. DATE HOLE | STARTED 5-5-91 | COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/.5 FOOT
		▨	Tan and Gray Sandy CLAY, Trace Organics (CL)		*	
	1.25 2.50	●	Fine White SAND (SP)		*	
	3.75 5.00 6.25	●	Fine Gray Silty SAND, Some Shell (SM)		*	
	7.50 8.75 10.00 11.25 12.50 13.75 15.00 16.25 17.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			*Composite sample lab tested.

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA12

Hole No.: CB-S65K-HA13

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station) scaled X= 436,500 Y= 1,149,800
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA13
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 6.5 FEET
10. SIZE AND TYPE OF BIT: 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-5-91 COMPLETED 5-5-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR: Charles W

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	0.00					BLOWS/.5 FOOT
			Fine Gray Silty SAND (SM)		*	
	1.25		Fine Tan Silty SAND (SM)		*	
	2.50		Fine Tan SAND, Trace Shell (SP)			
	3.75					
	5.00				*	
	6.25					
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA13

Hole No.: CB-S65K-HA14

DRILLING LOG

DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station): scaled X= 439,200 Y= 1,145,600
3. DRILLING AGENCY: TET, INC.
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA14
5. NAME OF DRILLER: Charles Weston
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: 0.0 FEET
8. DEPTH DRILLED INTO ROCK: 0.0 FEET
9. TOTAL DEPTH OF HOLE: 7.0 FEET
10. SIZE AND TYPE OF BIT: 4' HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES: N/A
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 5-6-91 COMPLETED 5-6-91
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING:
19. SIGNATURE OF INSPECTOR: Charles W

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/.5 FOOT
	1.25		Fine Gray Silty SAND, Trace Shell (SM)			
	2.50					
	3.75					
	5.00				*	
	6.25					
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA14

Hole No.: CB-S65K-HA15

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

2. LOCATION (Coordinates or Station): X=443,300 scaled Y= 1,141,100

3. DRILLING AGENCY: TET, INC.

4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA15

5. NAME OF DRILLER: Charles Weston

6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

7. THICKNESS OF OVERBURDEN: 0.0 FEET

8. DEPTH DRILLED INTO ROCK: 0.0 FEET

9. TOTAL DEPTH OF HOLE: 6.3 FEET

10. SIZE AND TYPE OF BIT: 4" HAND AUGER

11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A

12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED

14. TOTAL NUMBER CORE BOXES: N/A

15. ELEVATION GROUND WATER: NOT ENCOUNTERED

16. DATE HOLE: STARTED 5-6-91 COMPLETED 5-6-91

17. ELEVATION TOP OF HOLE:

18. TOTAL CORE RECOVERY FOR BORING:

19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
		●	Fine Tan SAND, Trace Shell (SP)			
	1.25	●				
	2.50	●				
		●			*	
	3.75	●				
	5.00	●				
	6.25	●				
						*Composite sample lab tested.
	7.50					
	8.75					
	10.00					
	11.25		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA15

Hole No.: CB-S65K-HA16

DRILLING LOG
DIVISION South Atlantic
INSTALLATION Jacksonville District
SHEET 1 OF 1 SHEETS

1. PROJECT KISSIMMEE RIVER: D/A HAND AUGER BORINGS
2. LOCATION (Coordinates or Station) scaled X= 450,200 Y= 1,131,250
3. DRILLING AGENCY TET, INC.
4. HOLE NO. (As shown on drawing title and file number) CB-S65K-HA16
5. NAME OF DRILLER Charles Weston
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN 0.0 FEET
8. DEPTH DRILLED INTO ROCK 0.0 FEET
9. TOTAL DEPTH OF HOLE 6.5 FEET
10. SIZE AND TYPE BIT 4" HAND AUGER
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES N/A
15. ELEVATION GROUND WATER
16. DATE HOLE STARTED 5-6-91 COMPLETED 5-6-91
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant)
	0.00					BLOWS/.5 FOOT
		●	Fine Tan SAND, Some Shell (SP)			
	1.25	●				
	2.50	●				
	3.75	●			*	
	5.00	●				
	6.25	●				
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS
HOLE NO. CB-S65K-HA16

Hole No.: CB-S65K-HA17

DRILLING LOG

DIVISION: South Atlantic

INSTALLATION: Jacksonville District

SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

2. LOCATION (Coordinates or Station): X= 452,000 scaled Y= 1,128,800

3. DRILLING AGENCY: TET, INC.

4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA17

5. NAME OF DRILLER: Charles Weston

6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

7. THICKNESS OF OVERBURDEN: 0.0 FEET

8. DEPTH DRILLED INTO ROCK: 0.0 FEET

9. TOTAL DEPTH OF HOLE: 6.5 FEET

10. SIZE AND TYPE OF BIT: 4' HAND AUGER

11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A

12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 UNDISTURBED

14. TOTAL NUMBER CORE BOXES: N/A

15. ELEVATION GROUND WATER: NOT ENCOUNTERED

16. DATE HOLE: STARTED 5-6-91 COMPLETED 5-6-91

17. ELEVATION TOP OF HOLE:

18. TOTAL CORE RECOVERY FOR BORING:

19. SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
		●	Fine Tan SAND, Some Shell (SP)			
	1.25	●				
	2.50	●				
	3.75	●			*	
	5.00	●				
	6.25	●				
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER D/A HAND AUGER BORINGS

HOLE NO. CB-S65K-HA17

Hole No.: CB-S65K-HA18

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

2. LOCATION (Coordinates or Station) scaled X= 452,900 Y= 1,127,400

3. DRILLING AGENCY TET, INC.

4. HOLE NO. (As shown on drawing title and file number) CB-S65K-HA18

5. NAME OF DRILLER Charles Weston

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

7. THICKNESS OF OVERBURDEN 0.0 FEET

8. DEPTH DRILLED INTO ROCK 0.0 FEET

9. TOTAL DEPTH OF HOLE 6.5 FEET

10. SIZE AND TYPE BIT: 4" HAND AUGER

11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A

12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 1 UNDISTURBED

14. TOTAL NUMBER CORE BOXES N/A

15. ELEVATION GROUND WATER NOT ENCOUNTERED

16. DATE HOLE STARTED 5-6-91 COMPLETED 5-6-91

17. ELEVATION TOP OF HOLE

18. TOTAL CORE RECOVERY FOR BORING

19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
		●	Fine Tan SAND, Some Shell (SP)			
	1.25	●				
	2.50	●				
	3.75	●			*	
	5.00	●				
	6.25	●				
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25		NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.			
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA18

Hole No.: CB-S65K-HA19

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS	10. SIZE AND TYPE BIT: 4" HAND AUGER
2. LOCATION (Coordinates or Station) scaled X= 455,600 Y= 1,123,100	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): N/A
3. DRILLING AGENCY: TET, INC.	12. MANUFACTURER'S DESIGNATION OF DRILL: HAND AUGER
4. HOLE NO. (As shown on drawing title and file number): CB-S65K-HA19	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED
5. NAME OF DRILLER: Charles Weston	14. TOTAL NUMBER CORE BOXES: N/A
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _______ DEGREES FROM VERTICAL	15. ELEVATION GROUND WATER: NOT ENCOUNTERED
7. THICKNESS OF OVERBURDEN: 0.0 FEET	16. DATE HOLE: STARTED 5-6-91; COMPLETED 5-6-91
8. DEPTH DRILLED INTO ROCK: 0.0 FEET	17. ELEVATION TOP OF HOLE:
9. TOTAL DEPTH OF HOLE: 6.5 FEET	18. TOTAL CORE RECOVERY FOR BORING:
	19. SIGNATURE OF INSPECTOR: Charles W

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc., If Significant)
	0.00					BLOWS/.5 FOOT
	0.00–6.5	●	Fine Tan SAND, Some Shell (SP)		*	
	7.50					
	8.75					*Composite sample lab tested.
	10.00					
	11.25					
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

NOTE: HAND AUGER BORINGS WERE TAKEN ALONG THE C-38 CANAL FROM GIVEN DREDGE DISPOSAL SITES. BORINGS WERE PERFORMED USING LAYOUT DRAWINGS AND WERE MARKED WITH WOODEN STAKES.

ENG FORM 1836

PROJECT:	HOLE NO.
KISSIMMEE RIVER D/A HAND AUGER BORINGS	CB-S65K-HA19

Hole No.: CB-S65K-HA20

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS

10. SIZE AND TYPE BIT: 4" HAND AUGER

2. LOCATION (Coordinates or Station) scaled X= 459,100 Y= 1,117,900

11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A

3. DRILLING AGENCY TET, INC.

12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER

4. HOLE NO. (As shown on drawing title and file number) CB-S65K-HA20

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 1 UNDISTURBED

5. NAME OF DRILLER Charles Weston

14. TOTAL NUMBER CORE BOXES N/A

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEGREES FROM VERTICAL

15. ELEVATION GROUND WATER NOT ENCOUNTERED

16. DATE HOLE STARTED 5-6-91 COMPLETED 5-6-91

7. THICKNESS OF OVERBURDEN 0.0 FEET

17. ELEVATION TOP OF HOLE

8. DEPTH DRILLED INTO ROCK 0.0 FEET

18. TOTAL CORE RECOVERY FOR BORING

9. TOTAL DEPTH OF HOLE 6.5 FEET

19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE #	REMARKS (Drilling time, Water Loss, Depth of Weathering, Etc. If Significant) BLOWS/5 FOOT
	0.00					
		●	Fine Tan SAND, Some Shell (SP)			
	1.25	●				
	2.50	●				
	3.75	●			*	
	5.00	●				
	6.25	●				
	7.50					*Composite sample lab tested.
	8.75					
	10.00					
	11.25					
	12.50					
	13.75					
	15.00					
	16.25					
	17.50					

NOTE: HAND AUGER BORINGS
WERE TAKEN ALONG THE C-38
CANAL FROM GIVEN DREDGE
DISPOSAL SITES. BORINGS
WERE PERFORMED USING LAYOUT
DRAWINGS AND WERE MARKED
WITH WOODEN STAKES.

ENG FORM 1836

PROJECT: KISSIMMEE RIVER: D/A HAND AUGER BORINGS | HOLE NO. CB-S65K-HA20

APPENDIX C

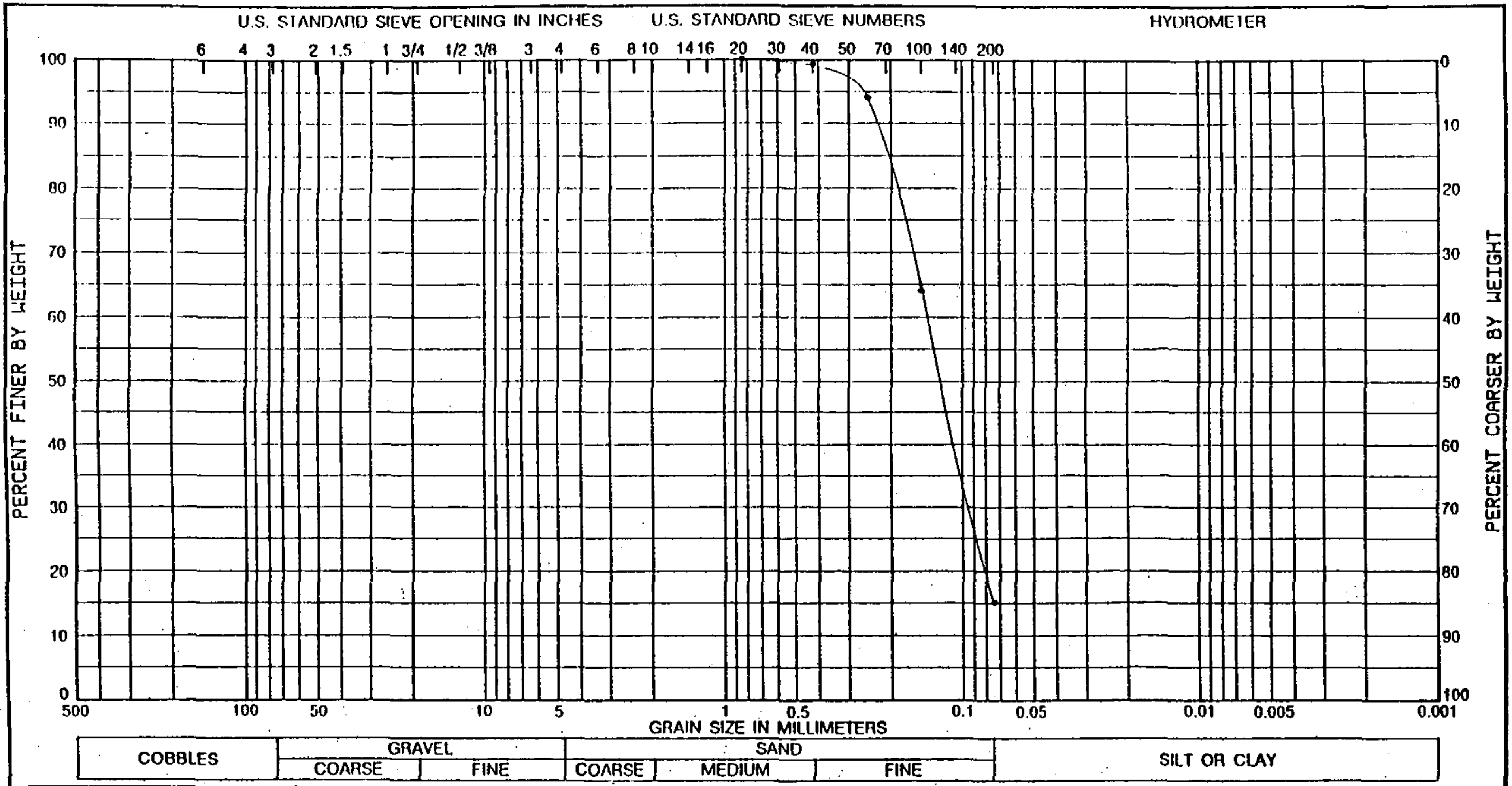
GEOTECHNICAL INVESTIGATIONS

LABORATORY TEST RESULTS

S-65 Core Borings
Hand Auger Borings

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER: 6436
REQUISITION: RM_CW_91_0129



Sample No.	Depth/Elev	Classification	Nat w%	LL	PL	PI
13	—	Classification was not requested.	–	–	–	–

Project KISSIMMEE RIVER

S-65 BYPASS

Lab No. 4/3114

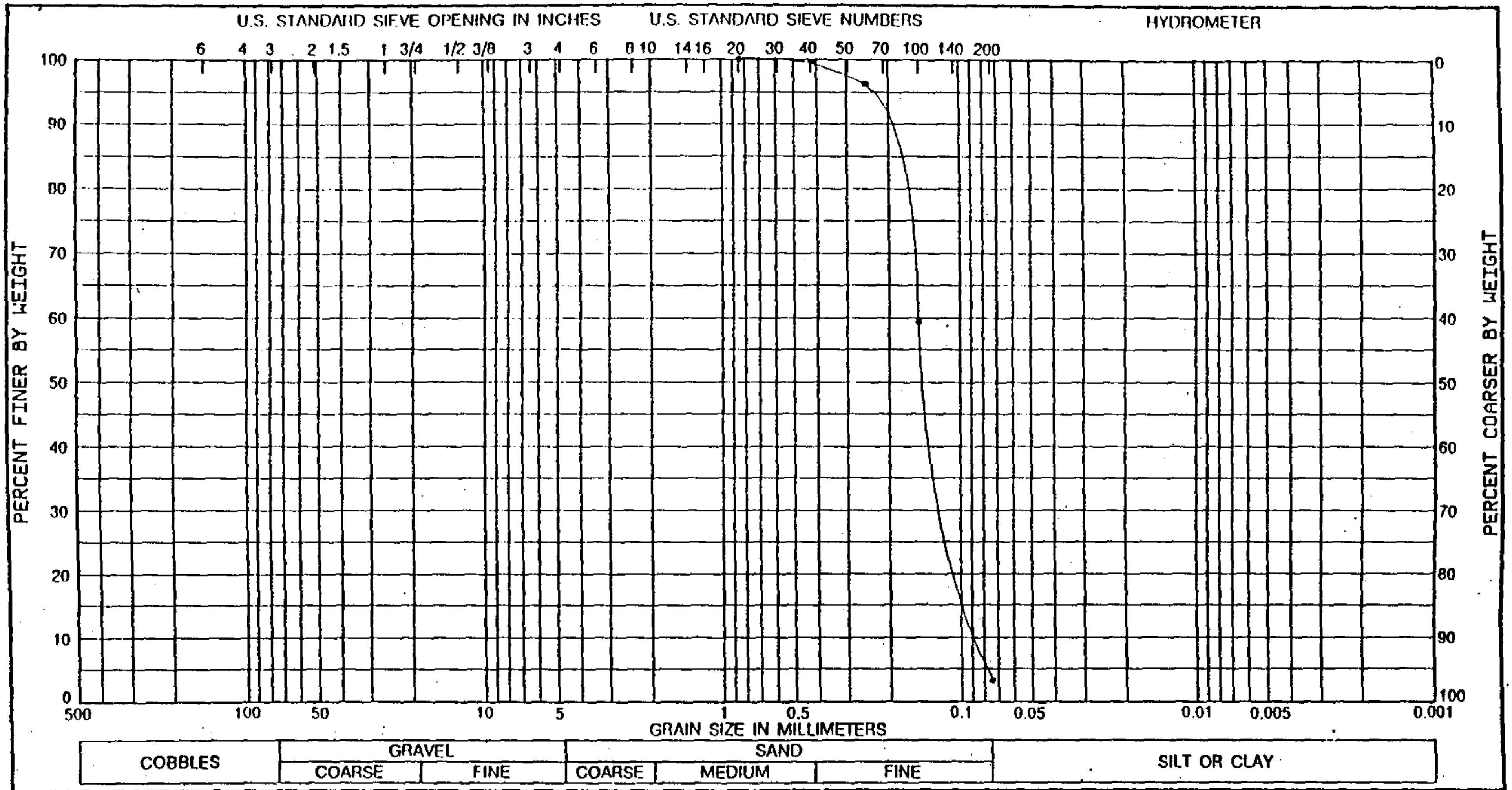
Boring No. CB-S65-1

Date 07/19/91

GRADATION CURVES

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER: 6436
REQUISITION: RM_CW_91_0129



Sample No.	Depth/Elev	Classification	Nat w%	LL	PL	PI
4	---	Classification was not requested.	–	–	–	–

Project KISSIMMEE RIVER
S-65 BYPASS

Lab No. 4/3115

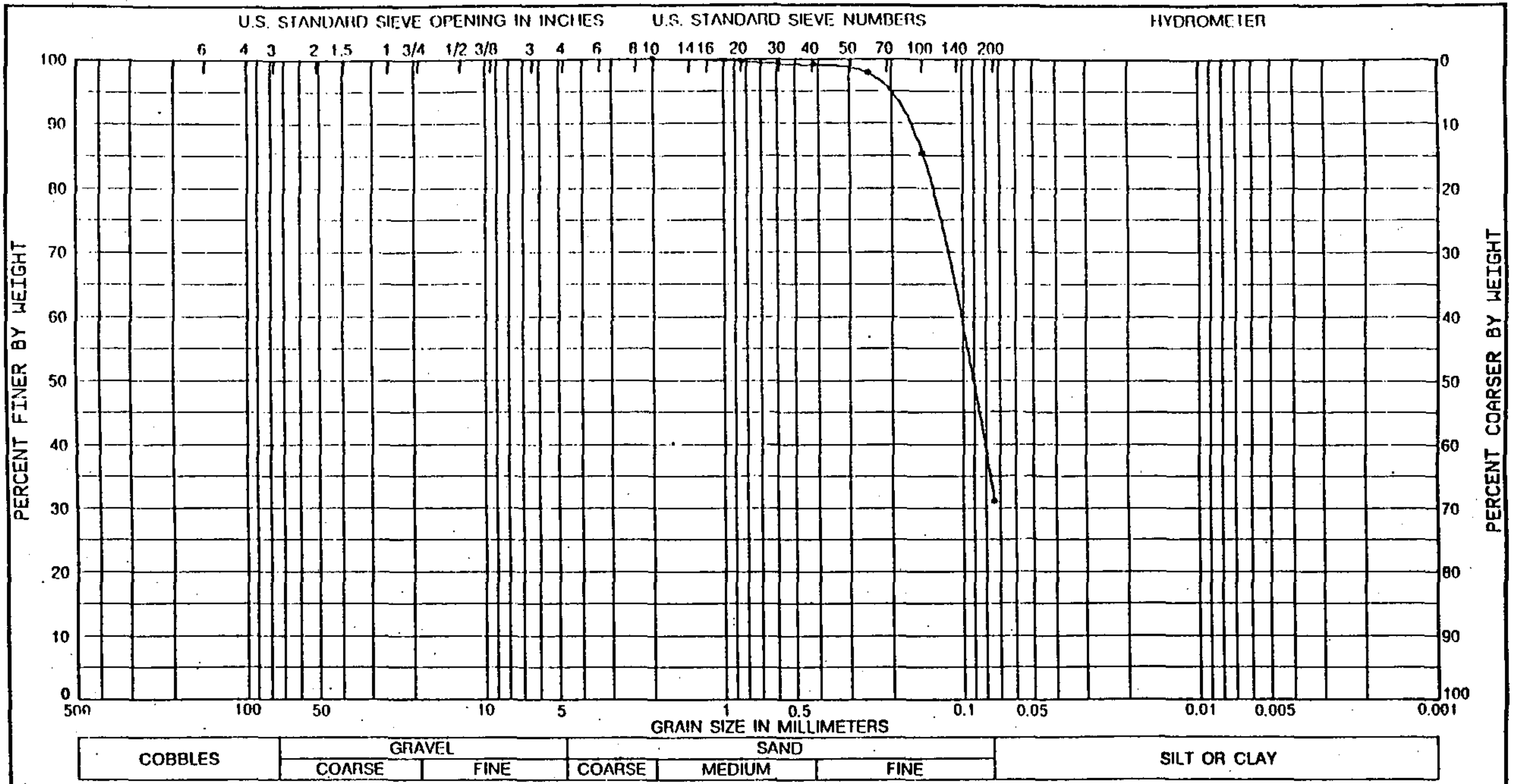
Boring No. CB-S65-2

Date 07/19/91

GRADATION CURVES

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER: 6436
REQUISITION: RM_CW_91_0129



Sample No.	Depth/Elev	Classification	Nat w%	LL	PL	PI
2	---	Classification was not requested.	--	--	--	-

Project KISSIMMEE RIVER
S-65 BYPASS

Lab No. 4/3116

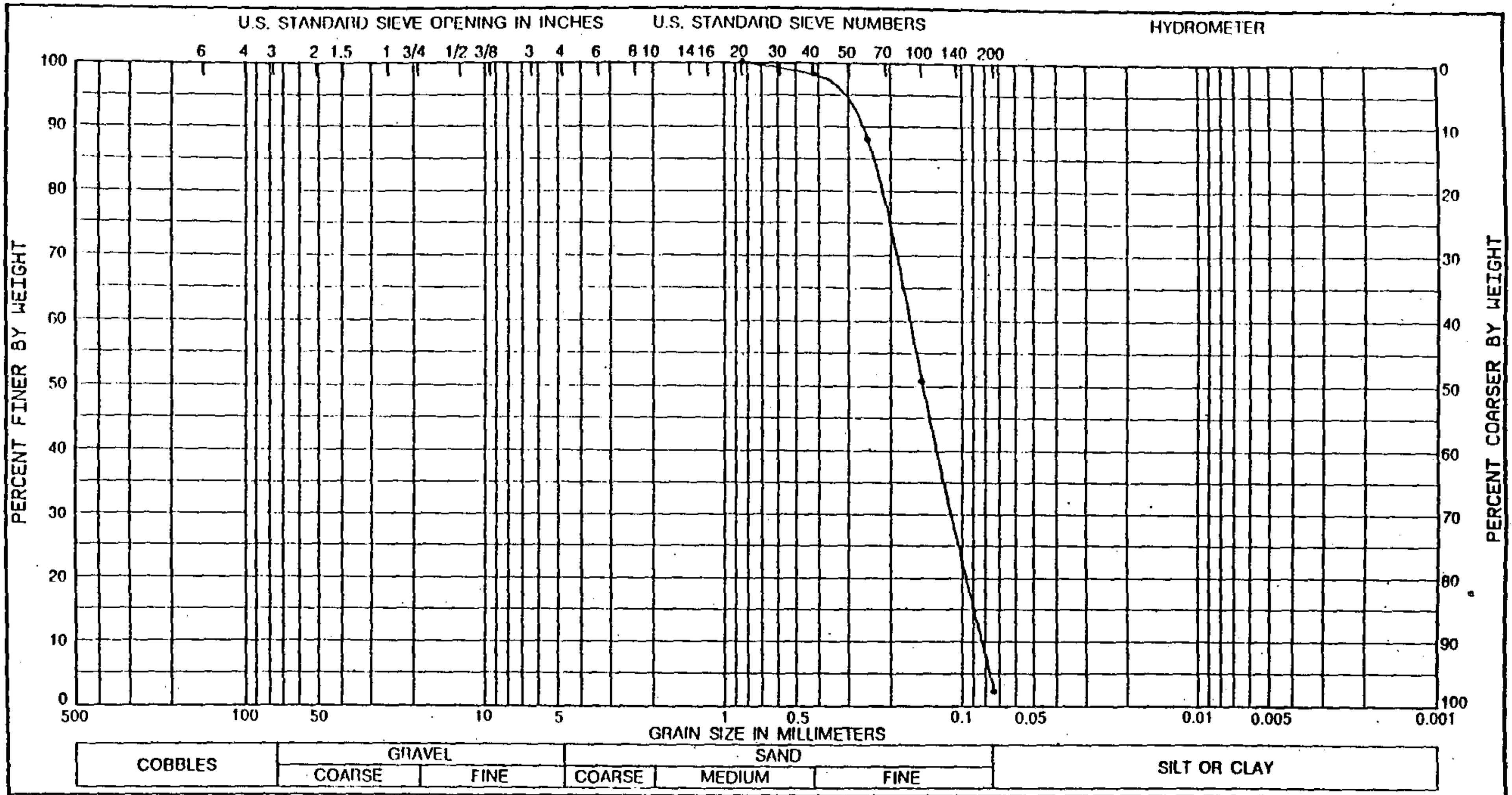
Boring No. CB-S65-3

Date 07/19/91

GRADATION CURVES

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER: 6436
REQUISITION: RM_CW_91_0129



Sample No.	Depth/Elev	Classification	Nat w%	LL	PL	PI
6	--	Classification was not requested.	-	-	--	-

Project KISSIMMEE RIVER
S-65 BYPASS

Lab No. 4/3117

Boring No. CB-S65-3

Date 07/19/91

GRADATION CURVES

U.S. ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION LABORATORY
MARIETTA, GEORGIA

PROJECT: S-65 BYPASS
DISTRICT: JACKSONVILLE
WORK ORDER NO:6436
DATE RECEIVED:07/11/91

REQUISITION NO: RM-CW-91-0129
DATE REPORTED: 07/19/91

LOCATION: KISSIMMEE RIVER PROJECT
DESCRIPTION: JAR SAMPLES OF DISTURBED SOIL.

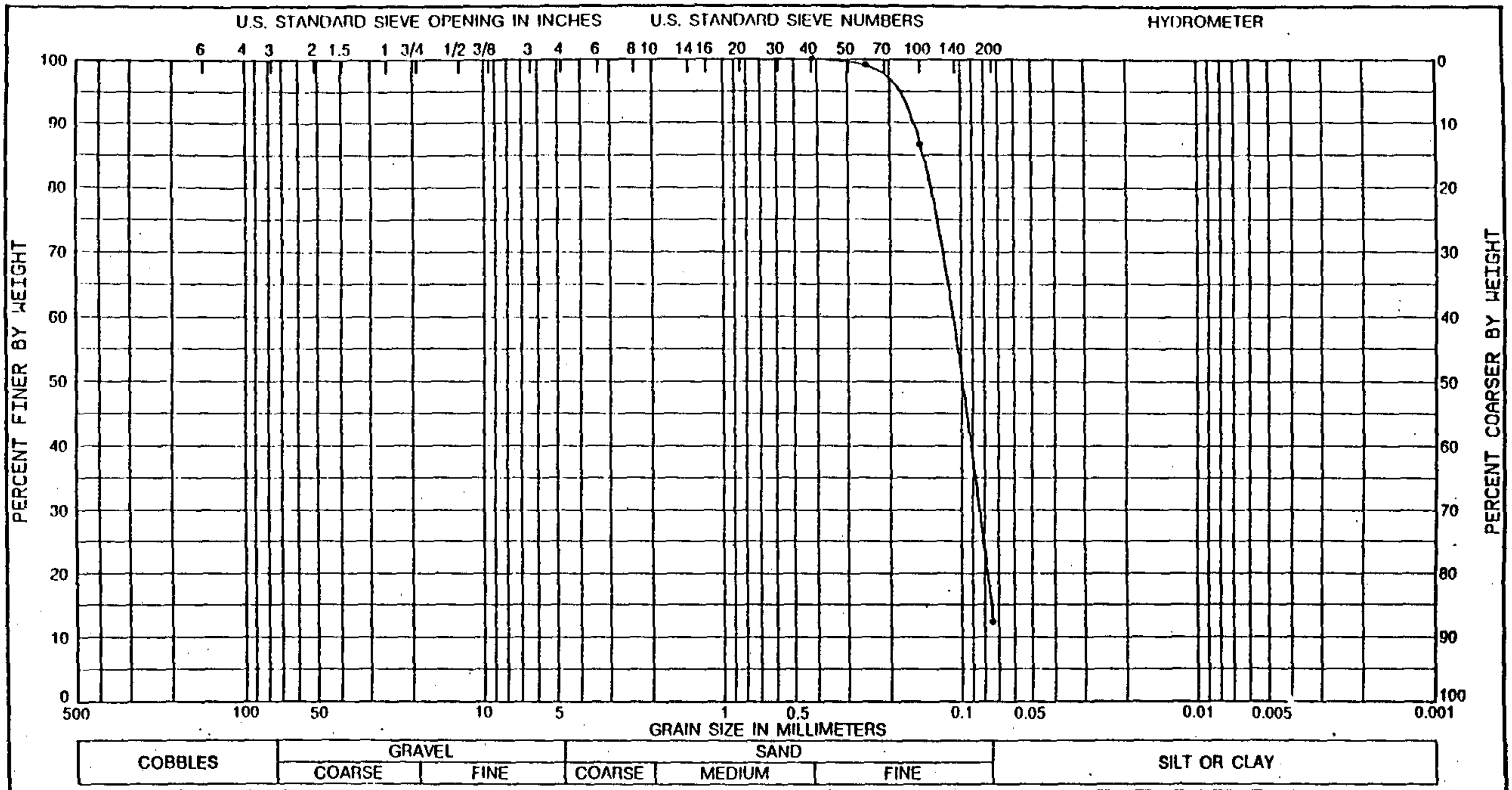
LAB NO.	HOLE NO.	SAMPLE NO.	DEPTH (FT)	MOIST (%)	VISUAL CLASSIFICATION AND/OR REMARKS
4/3118	CA-S65-3	12	---	---	LL= 113 PL= 32 PI= 81
					NOTE: SEE TEST DATA FOR ALL OTHER SAMPLES FROM THE "S-65 BYPASS PROJECT" ON THE ENCLOSED GRADATION CURVES.

TESTED BY: WB

CHECKED BY :

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER: 6436
REQUISITION: RM_CW_91_0129



Sample No.	Depth/Elev	Classification	Nat w%	LL	PL	PI
11	---	Classification was not requested.	–	–	–	–

Project KISSIMMEE RIVER
S-65 BYPASS

Lab No. 4/3119

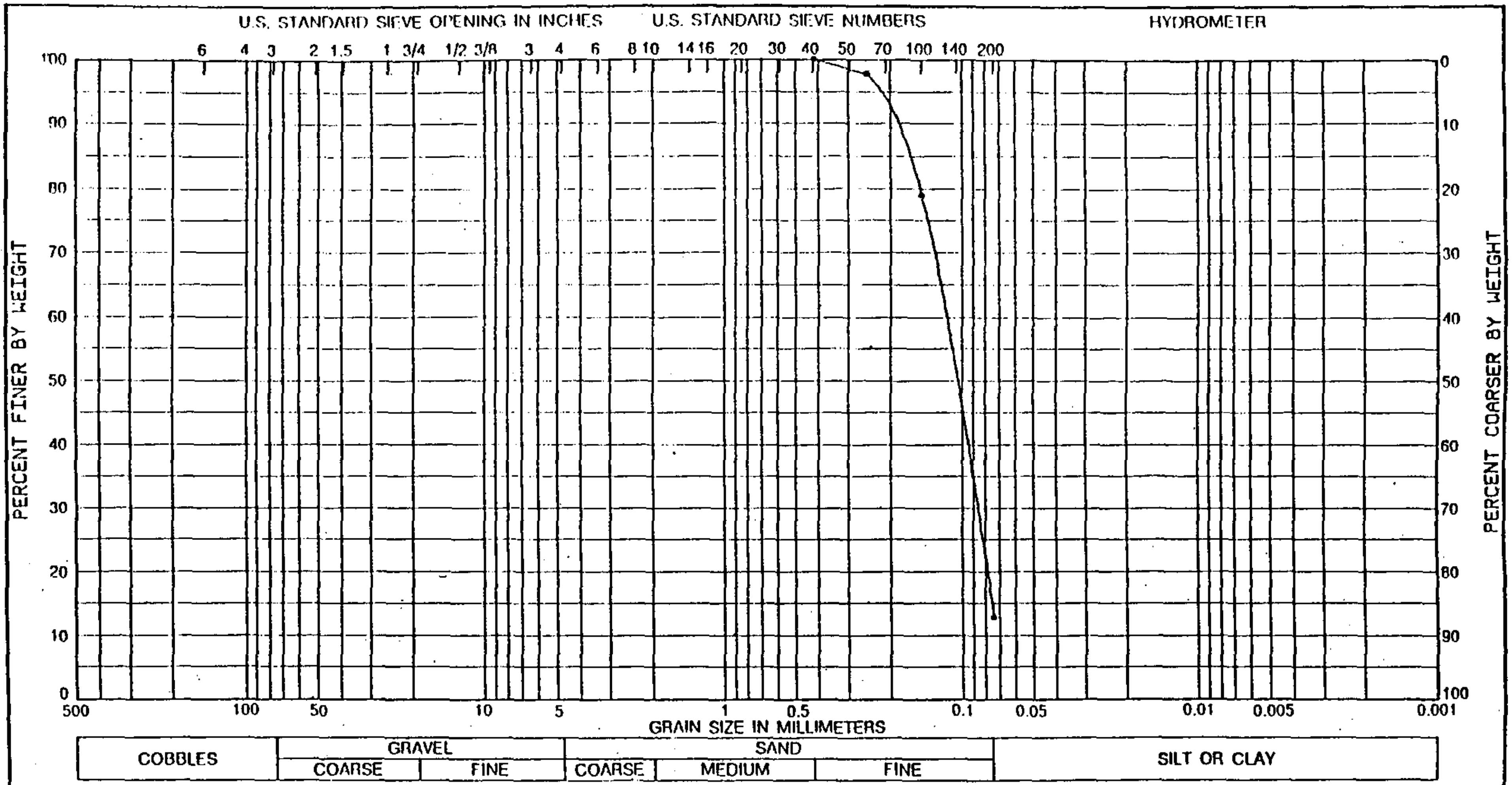
Boring No. CB-S65-4

Date 07/19/91

GRADATION CURVES

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER: 6436
REQUISITION: RM_CW_91_0129



Sample No.	Depth/Elev	Classification	Nat w%	LL	PL	PI
10	---	Classification was not requested.	--	–	–	–

GRADATION CURVES

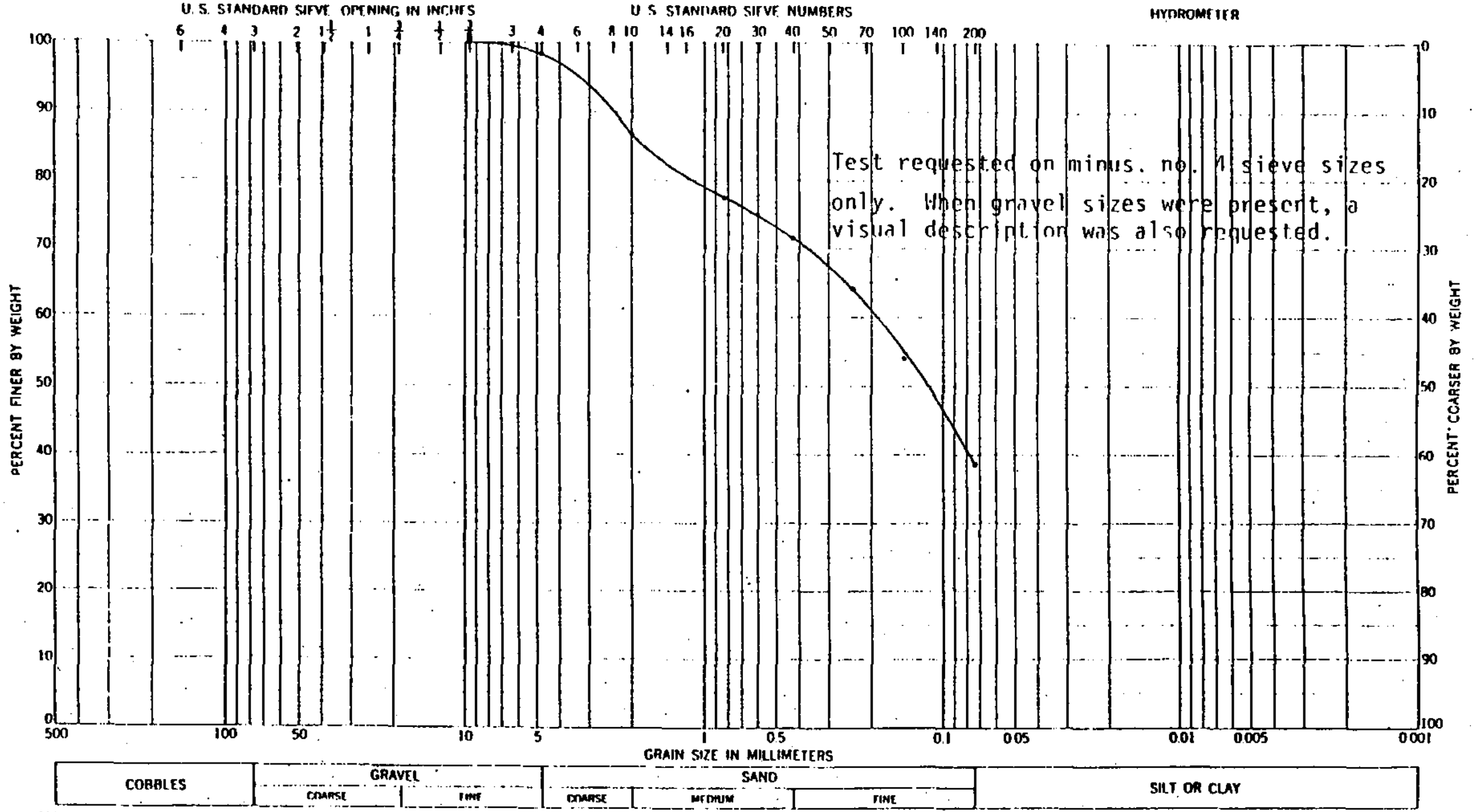
Project KISSIMMEE RIVER
S-65 BYPASS

Lab No. 4/3120

Boring No. CB-S65-5

Date 07/19/91

W.O. NO. 6436
REQ. NO. RM-CN-91-0129



Test requested on minus. no. 4 sieve sizes only. When gravel sizes were present, a visual description was also requested.

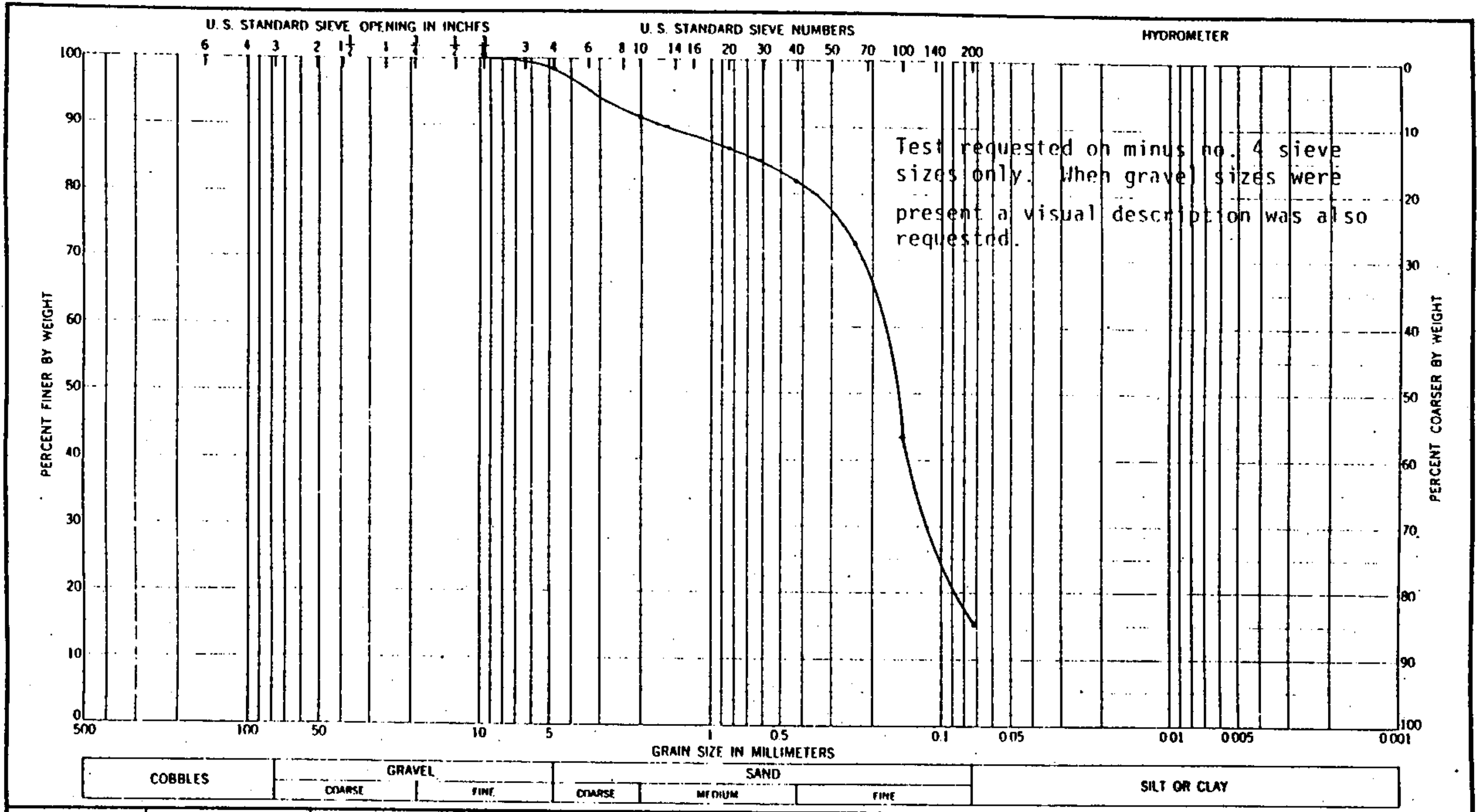
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-1	-	Lt. gray, clayey sand (SC-H) high liquid limit, w/ some gravel size shell fragments	-	60	17	43

Project Kissimmee River
Lab. No. 4/3086*
Area River Restoration Project
Boring No. CBS 65K, Sample No. HA-1
Date 15 July 1991

GRADATION CURVES

*Classification only

W.O. NO. 6436
REQ. NO. RM-CW-91-0129



Test requested on minus no. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-2	-	Lt. gray silty sand (SM), w/ a little gravel size shell fragments.	-	Not Requested		

Project Kissimmee River
Lab. No. 4/3087*

Area River Restoration Project

Boring No. CBS-65K, Sample No. HA-2

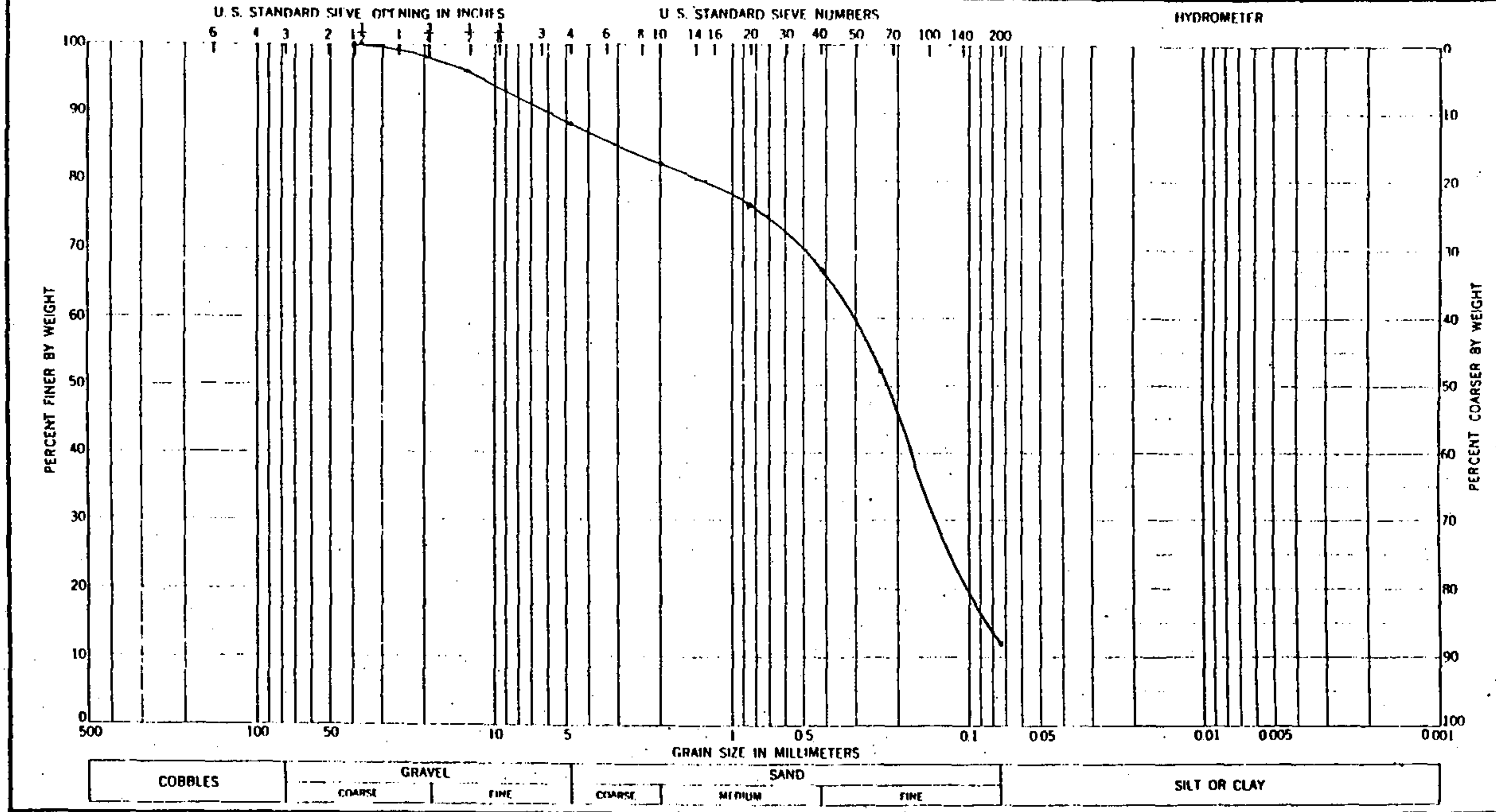
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

*Classification only

W.O. NO. 6436
REQ. NO. RM-CW-91-0129



Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-3	-	Lt. gray, poorly graded silty sand (SP-SM), w/ a little gravel size shell fragments.	-	Not Requested		

Project Kissimmee River
Lab. NO. 4/3088*

Area River Restoration Project

Boring No. CBS 65K, Sample No. HA-3

Date 15 July 1991

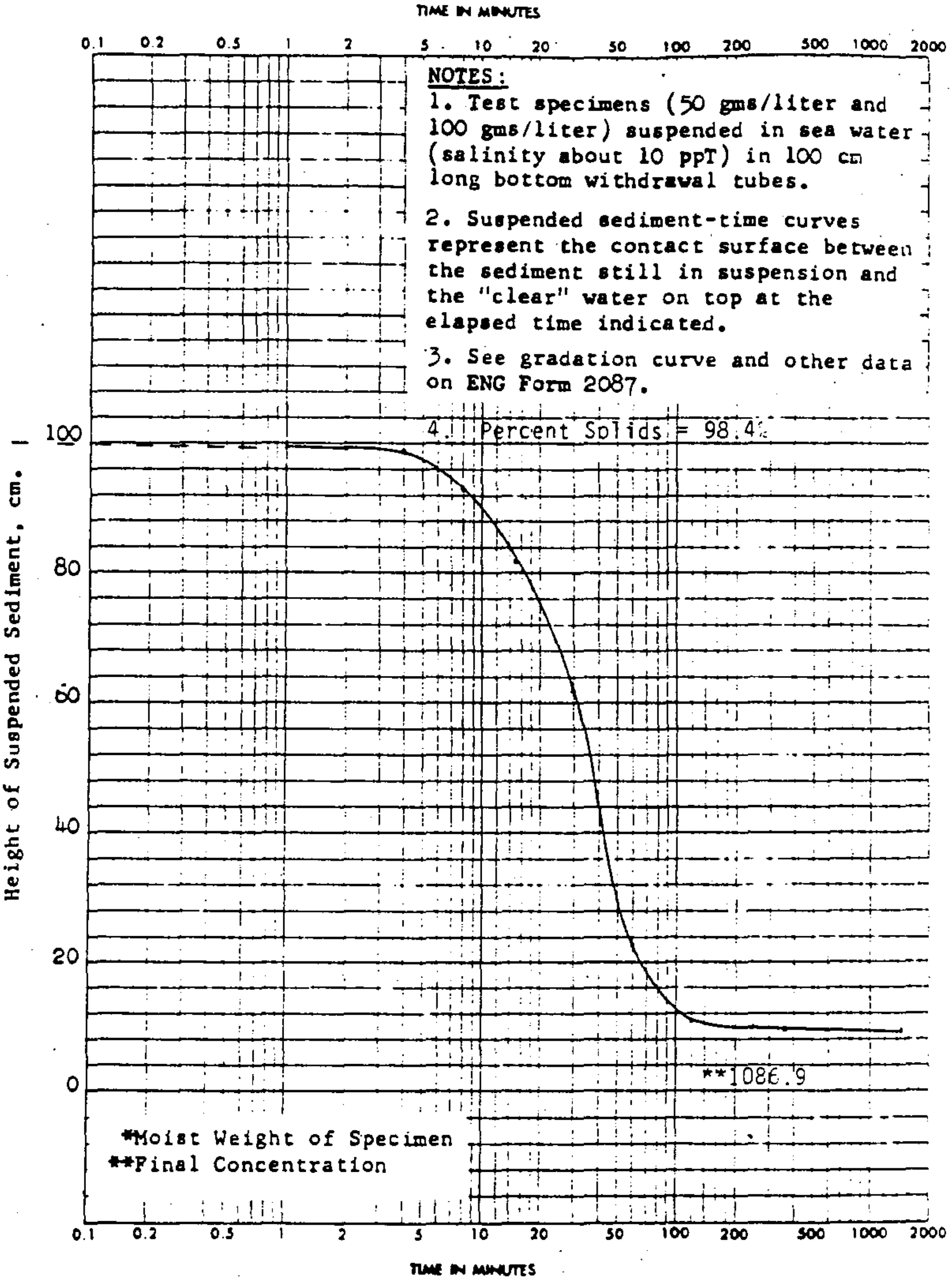
GRADATION CURVES

ENG FORM 2087

*Sedimentation Test

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-91-0129
Work Order No. 6436



NOTES:

1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.
2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.
3. See gradation curve and other data on ENG Form 2087.
4. Percent Solids = 98.4%

**1086.9

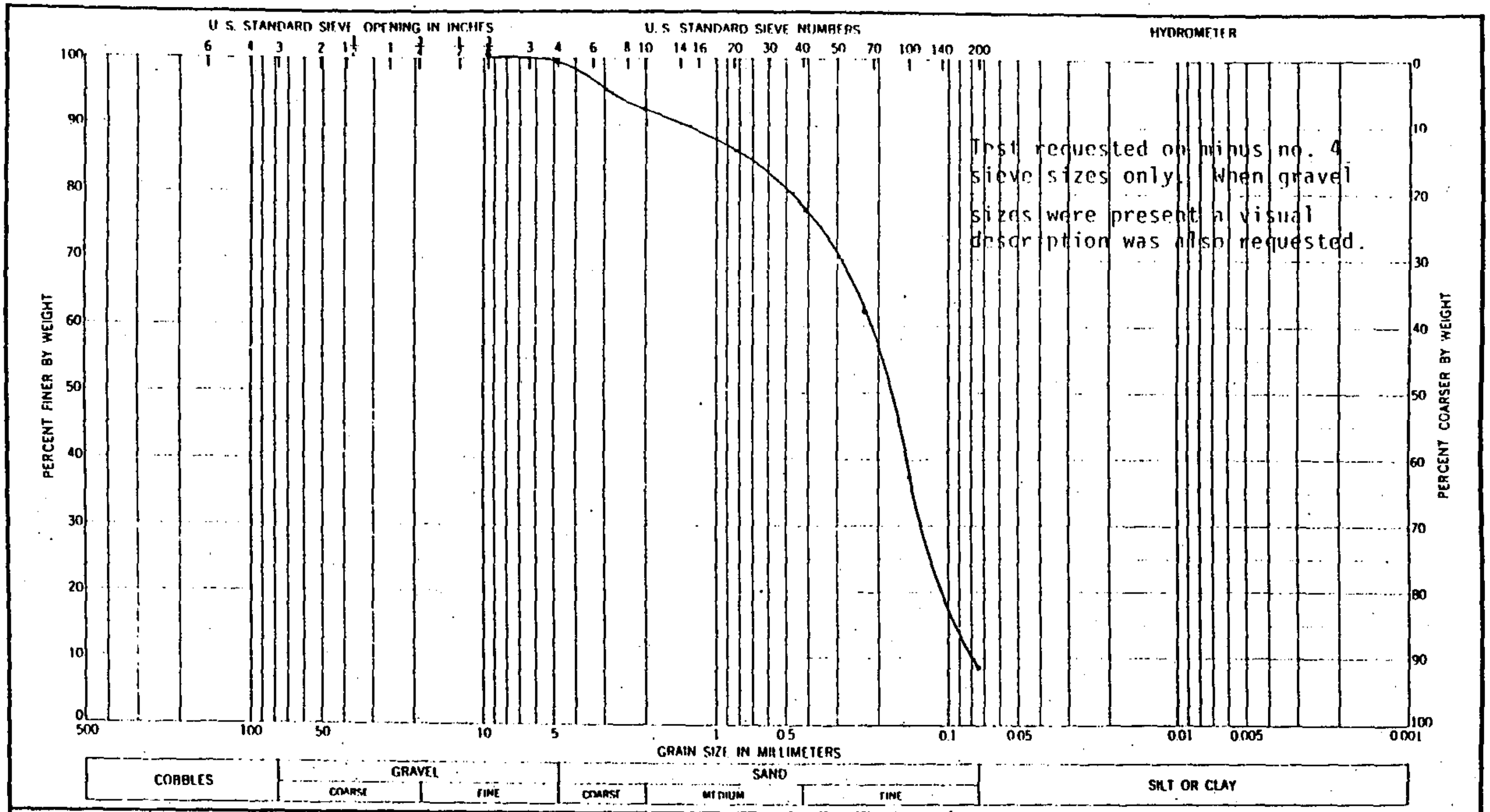
*Moist Weight of Specimen
**Final Concentration

PROJECT Kissimmee River			
AREA River Restoration Project	Lab. No. 4/3088		
BORING NO. CBS-65K	SAMPLE NO. HA-3	DEPTH EL --	DATE 15 July 1991

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

W.O. NO. 6436
REQ. NO. RM-CW-91-0129



Test requested on minus no. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

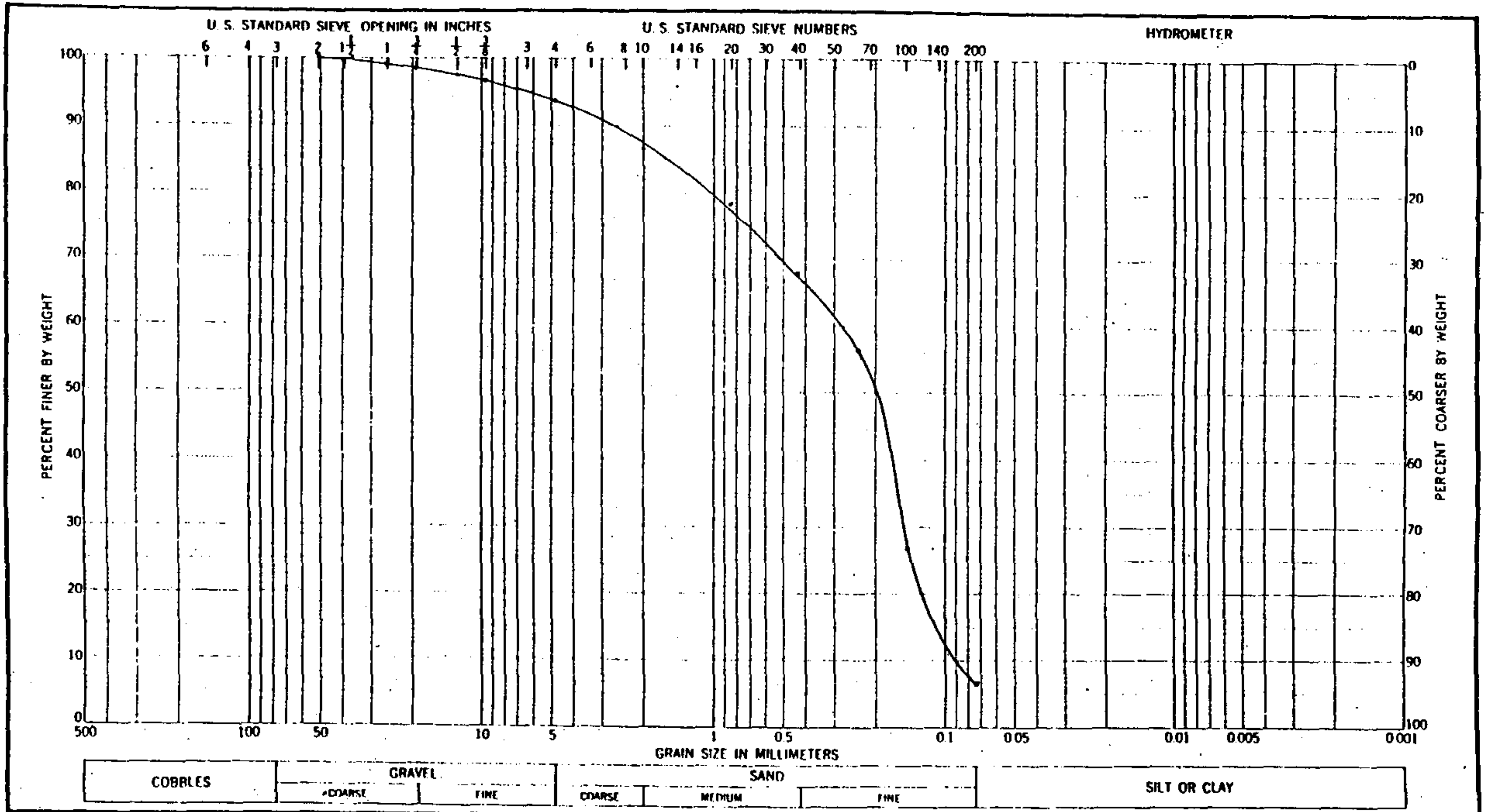
Sample No	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-4	-	Lt. gray, gravelly poorly graded silty sand (SP-SM) gravel size shell fragments	-	Not Requested		

Project Kissimmee River
Lab. No. 4/3089*
Area River Restoration Project
Boring No. CBS 65K, Sample No. HA-4
Date 15 July 1991

GRADATION CURVES

*Classification only

W.O. NO. 6436
REQ. NO. RM-CW-91-0129



Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-5	-	Lt. gray, poorly graded silty sand (SP-SM), w/ a trace of gravel size shell fragments	-	Not Requested		

Project Kissimmee River
Lab. No. 4/3090*

Area River Restoration Project

Boring No. CBS 65K, Sample No. HA-5

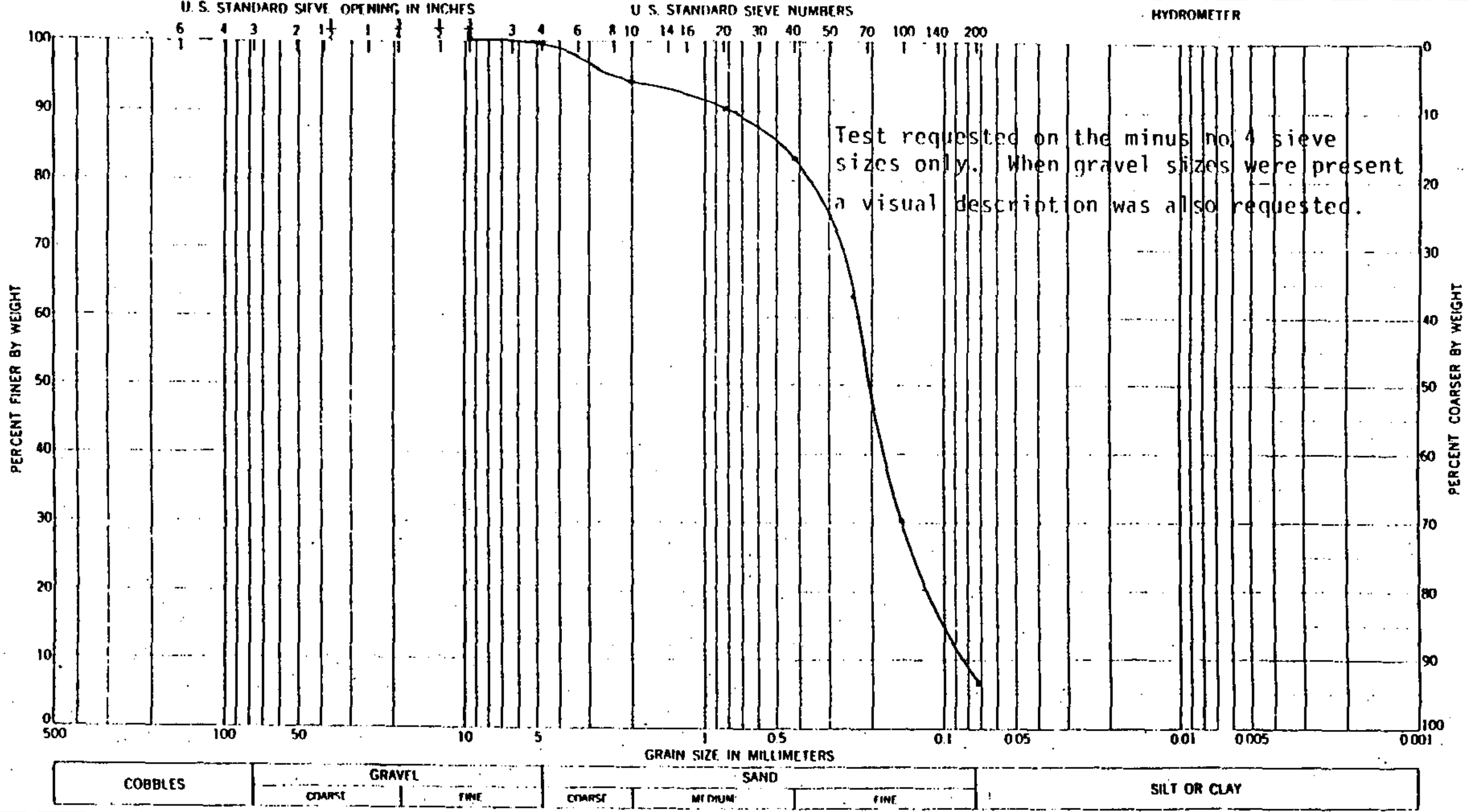
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

*Classification only

W.O. NO. 6436
REQ. NO. RM-CW-91-0129



Test requested on the minus no 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-6	-	Lt. gray, poorly graded silty sand (SP-SM), w/ a little gravel size shell fragments	-	Not Requested		

Project Kissimmee River
Lab. No. 4/3091*

Area River Restoration Project

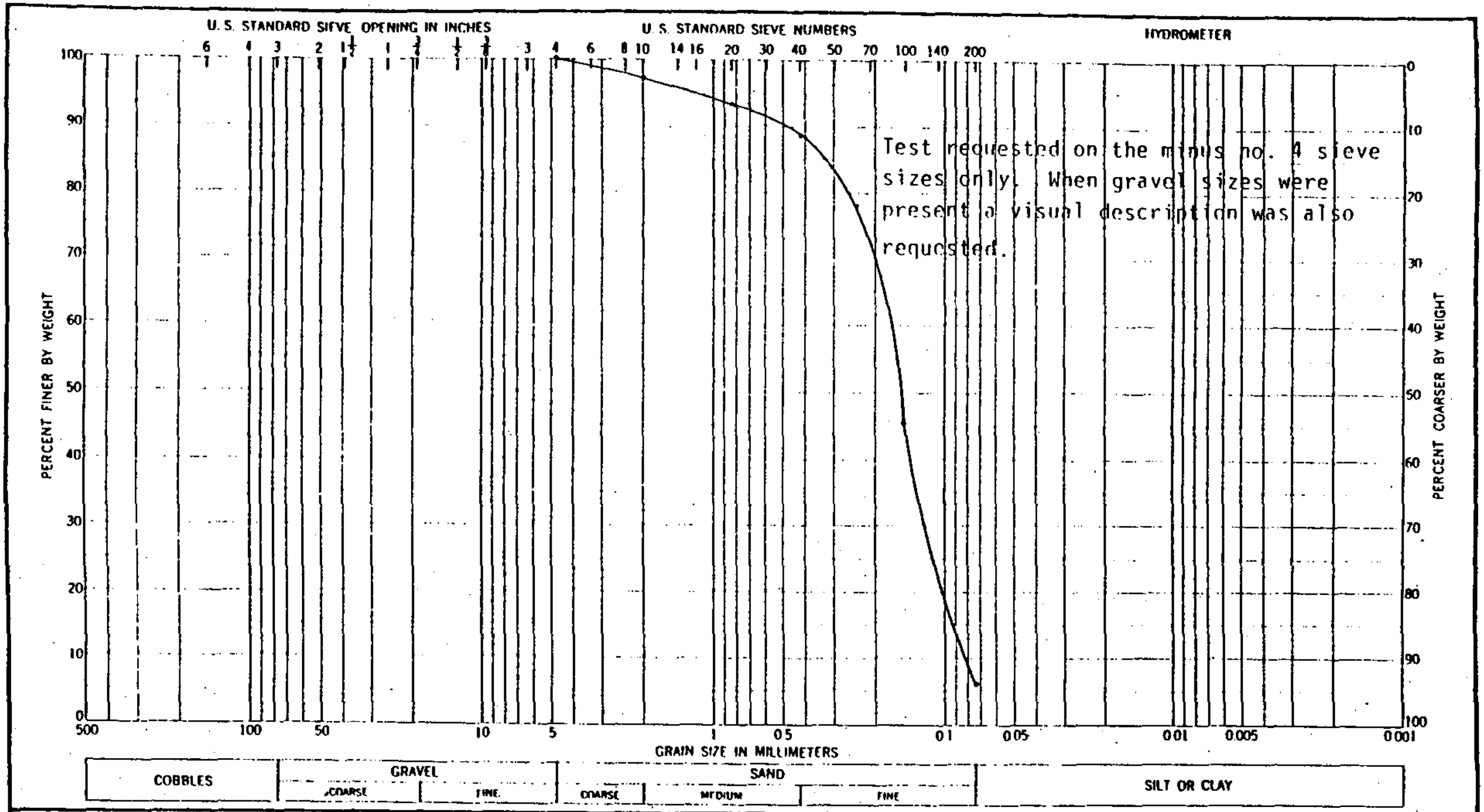
Boring No. CBS 65K, Sample No. HA-6

Date 15 July 1991

GRADATION CURVES

*Classification only

W.O. NO. 6436
REQ. NO. RM-CW-91-0129



Test requested on the minus no. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-7	-	Lt. gray, poorly graded silty sand (SP-SM) w/ a little gravel size shell fragments.	-	Not Requested		

GRADATION CURVES

Project Kissimmee River
Lab. No. 4/3092*

Area River Restoration Project

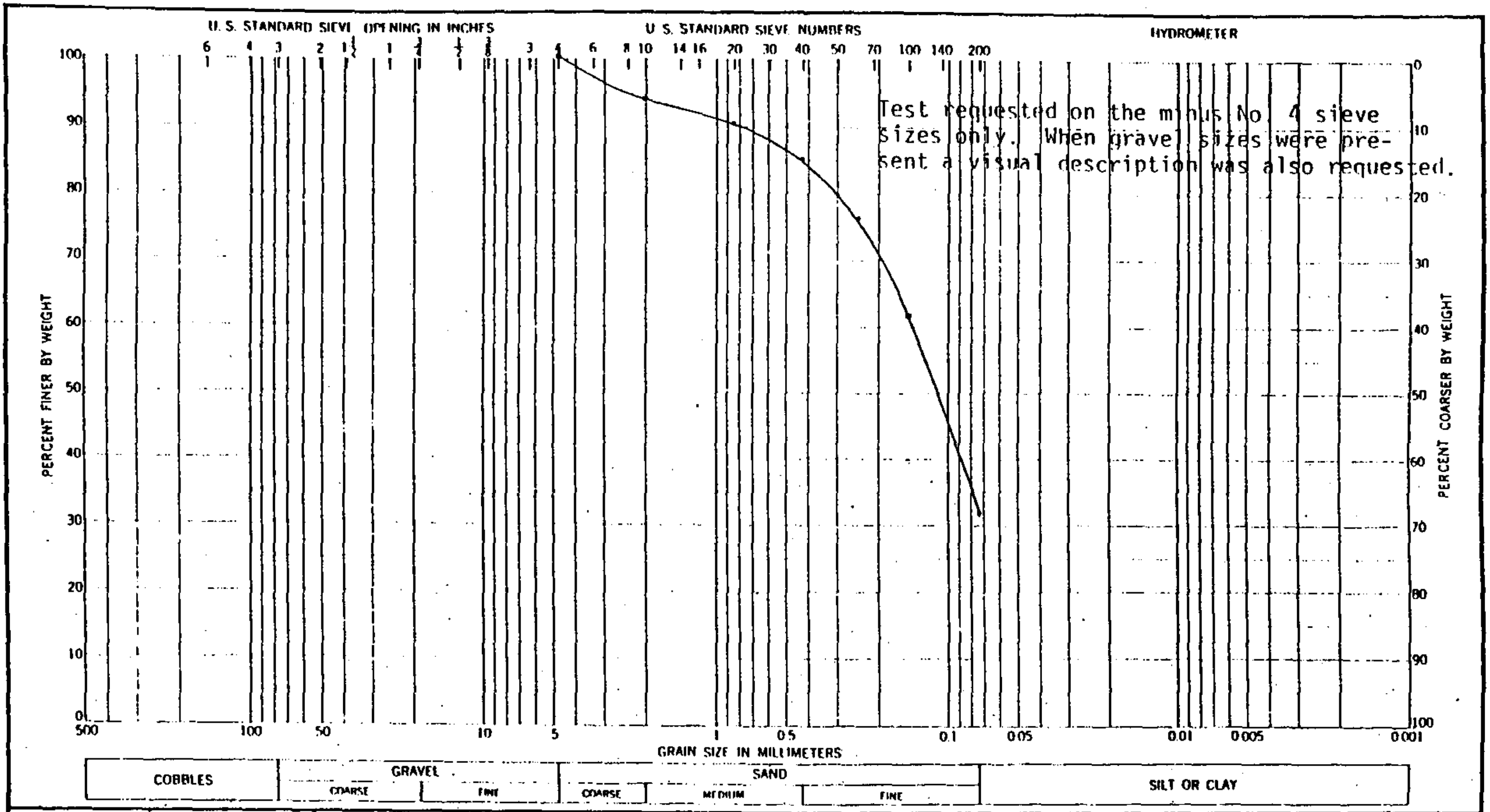
Boring No. CBS-65K, Sample No. HA-7

Date 15 July 1991

ENG FORM 1 MAY 63 2087

*Classification only

W. O. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-8	-	Gray clayey sand (SC), w/a trace of gravel size shell fragments.	-	45	16	29

Project Kissimmee River
Lab. No. 4/3093*
Area River Restoration Project
Boring No. CBS 65K, Sample No. HA-8
Date 15 July 1991

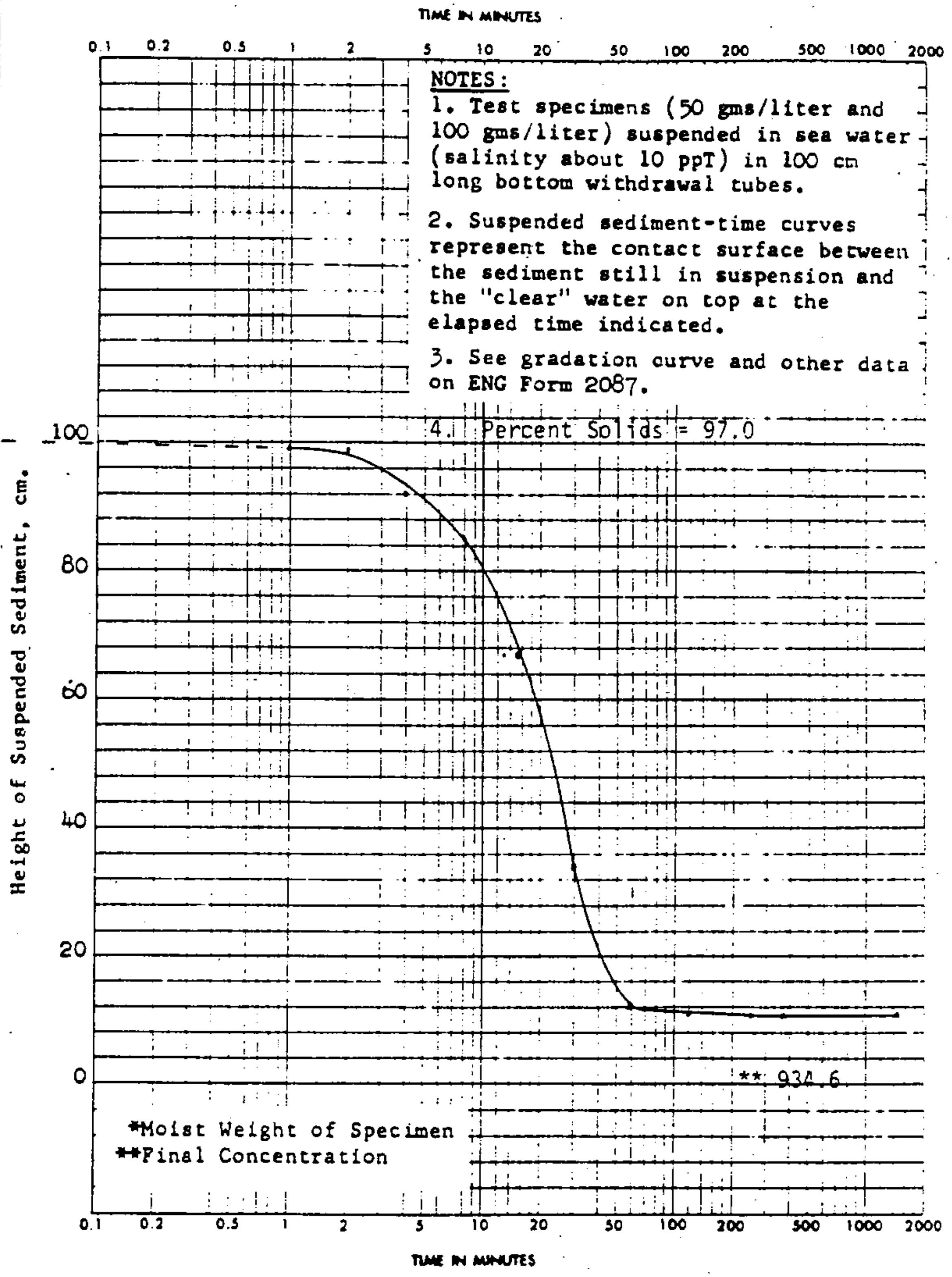
GRADATION CURVES

ENG FORM 2087

*Standard Compaction and sedimentation rate tests. Sub-aqueous density

Reqn. No. RM-CW-91-0129
Work Order No. 6436

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061



NOTES:

1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 97.0

** 934.6

*Moist Weight of Specimen
**Final Concentration

PROJECT Kissimmee River

AREA River Restoration Project Lab. No. 4/3093

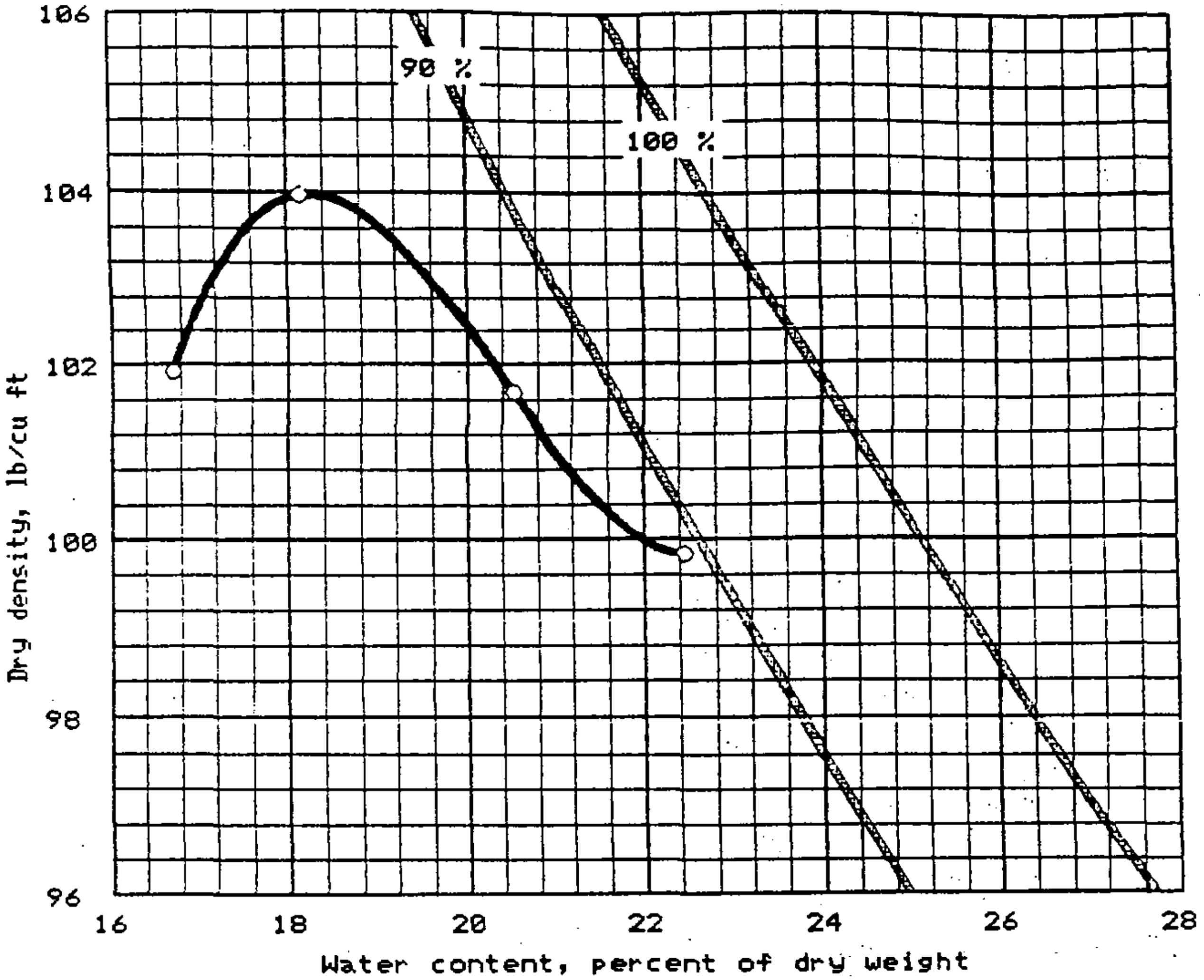
BORING NO. CBS 65K SAMPLE NO HA-8 DEPTH EL - DATE 15 July 91

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

WORK ORDER NO. 6436
Req. No. RM-CW-91-0129
Contract No.

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060



Standard compaction test ASTM D698 Method A
25 blows per each of 3 layers, with 5.50 lb. sleeve rammer
and 12.0 inch drop. 4.0 inch diameter mold

Sample No.	Elev/ Depth	Classification	G	LL	PL	% > No.4	% > 3/4 in.
HA-8		GRAY, CLAYEY SAND	2.68	45	16		
		(SC), WITH A TRACE					
		OF GRAVEL SIZE SHELL					
		FRAGMENTS.					

Sample No.	HA-8			
Water content, percent				
Optimum water content, percent	18.3			
Max dry density, lb/cu ft	104.0			

Remarks: See lab classification data on ENG FORM 2087

Project: KISSIMMEE RIVER

Lab No.: 4/3093

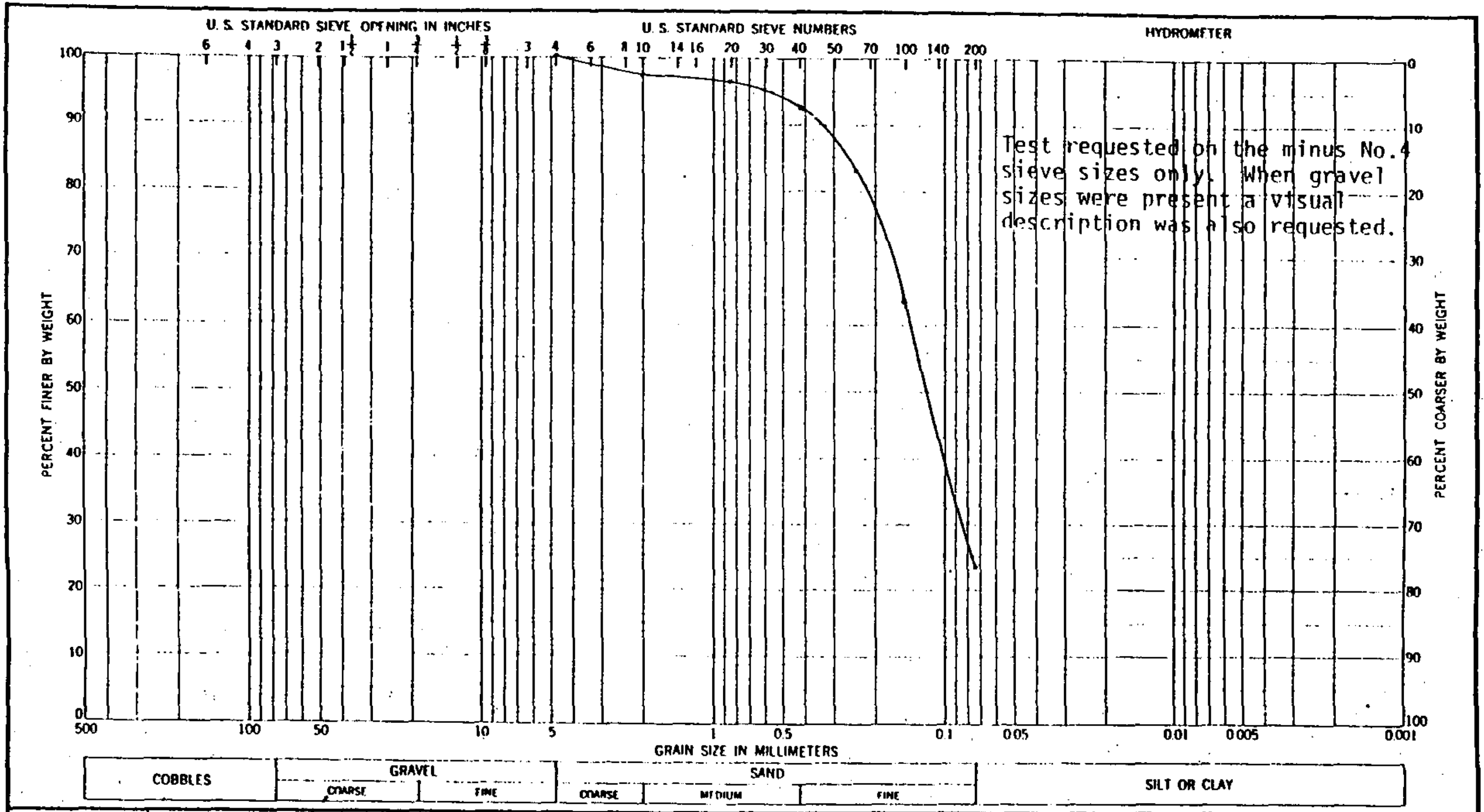
Area: RIVER RESTORATION PROJECT

Boring No.: CBS -65K

Date: 6-27-1991

COMPACTION TEST REPORT

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No.4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-9	-	Lt, Gray silty sand (SM), w/a trace of gravel size shell gragments.	-	Not Requested		

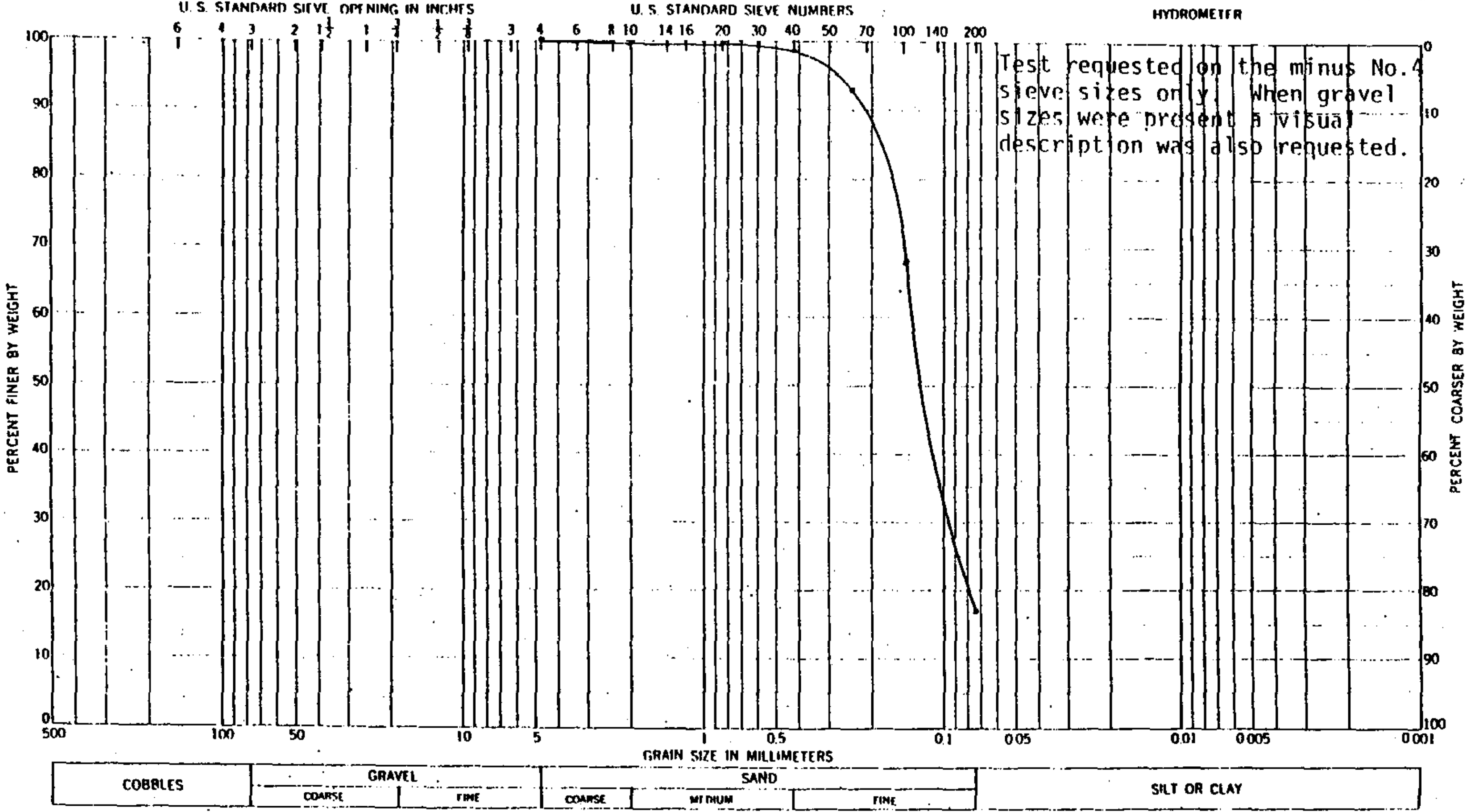
Project Kissimmee River Project
Lab. No. 4/3094*
Area River Restoration Project
Boring No. CBS 65K, Sample HA-9
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

*Classification Only

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No.4 sieve sizes only. When gravel sizes were present a visual description was also requested.

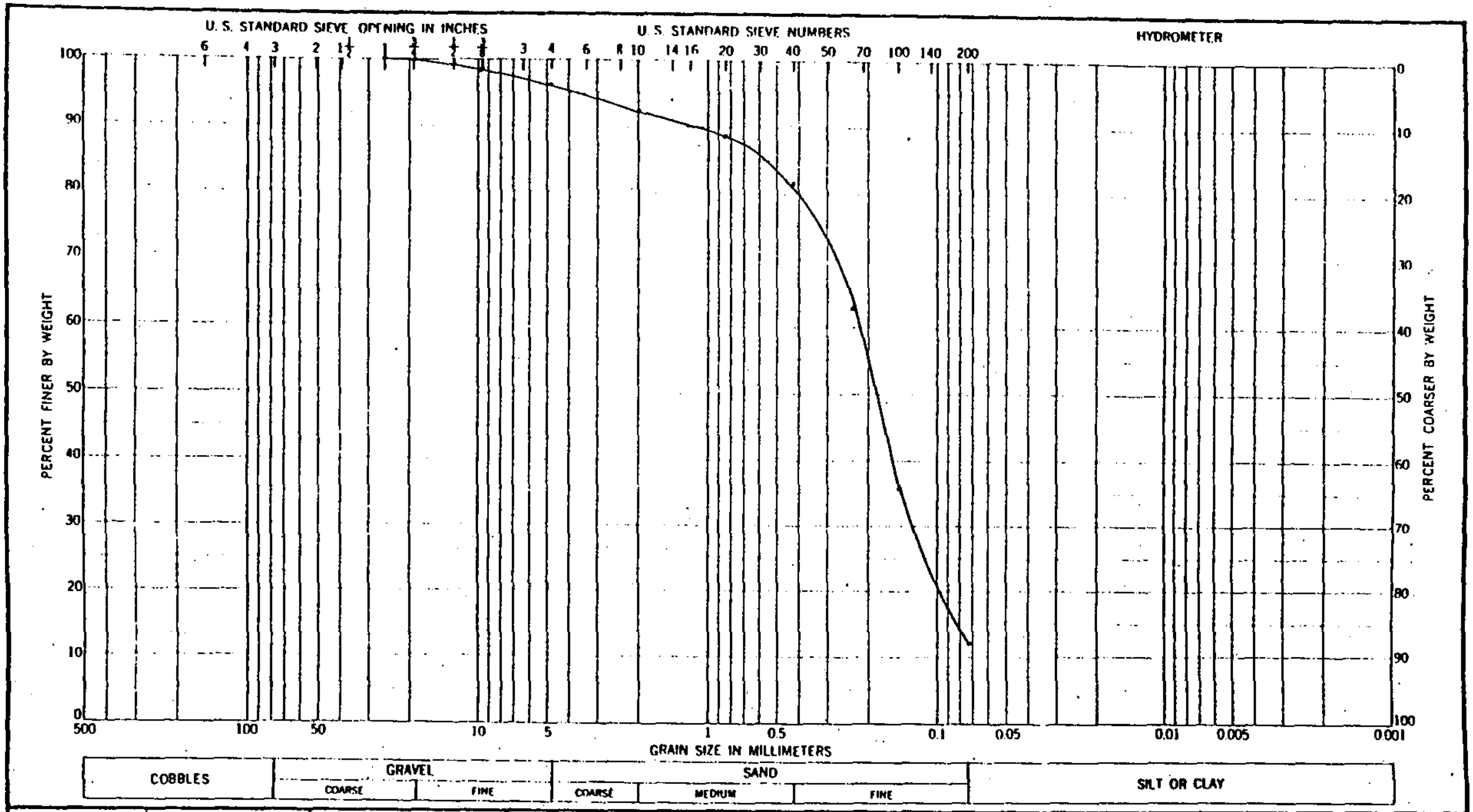
Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-10	-	Tan, silty sand (SM), w/a trace of shell fragments.	-	Not Requested		

GRADATION CURVES

Project Kissimmee River
Lab. No. 4/3095*
Area River Restoration Project
Boring No. CBS 65K, Sample No: HA-10
Date 15 July 1991

* Classification Only

W. O. No. 6436
Req. No. RM-CW-91-0129



Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-11	-	Brown & gray, poorly graded silty sand, (SP-SM), w/a trace of gravel size shell fragments.	-	Not Requested		

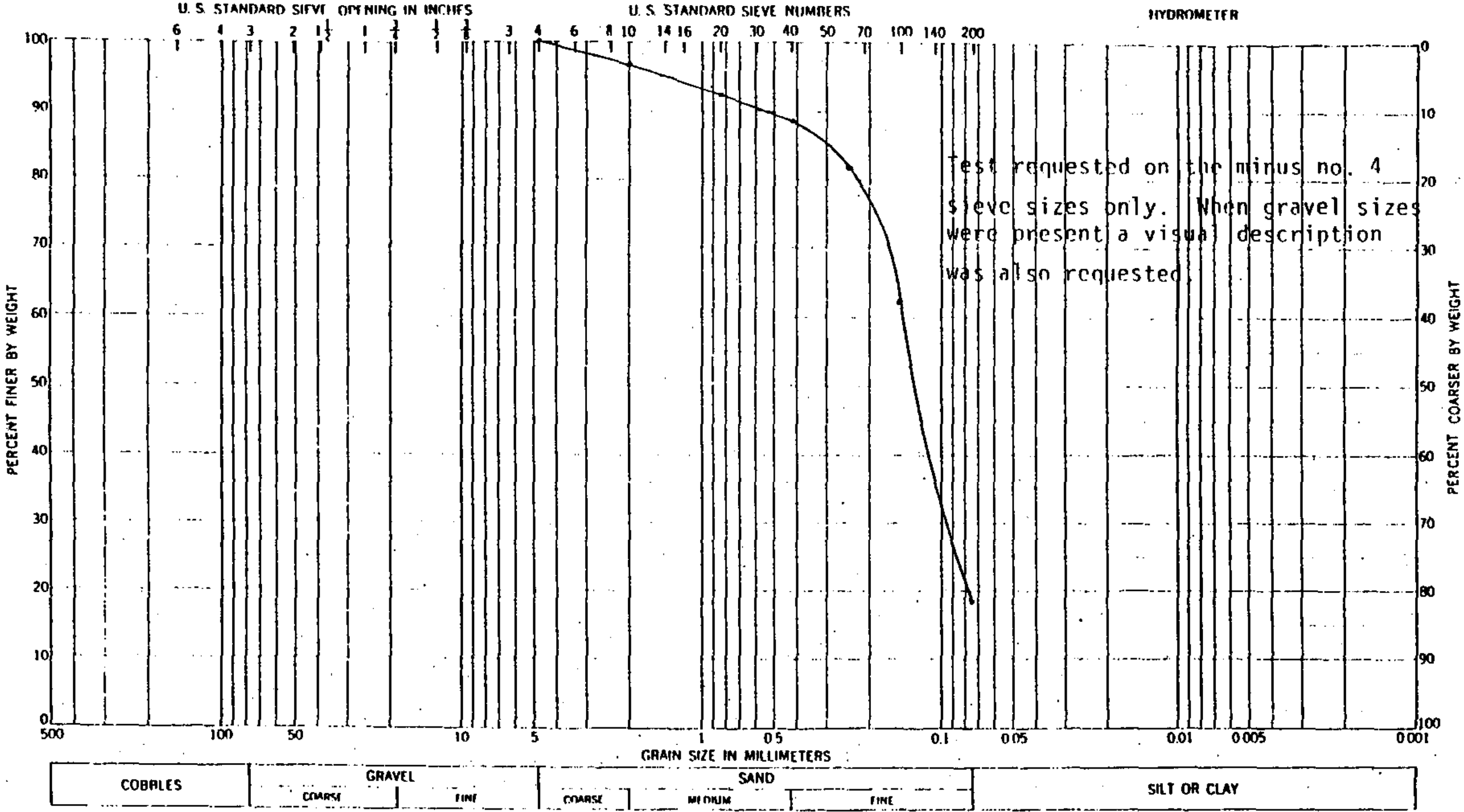
GRADATION CURVES

Project Kissimmee River
Lab. No. 4/3096*
Area River Restoration Project
Boring No. CBS-65K, Sample No. HA-11
Date 15 July 1991

ENG FORM 1 MAY 63 2087

*Classification Only

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus no. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
HA-12	-	Brown, silty sand (SM), w/ some gravel size shell fragments.	-	Not Requested		

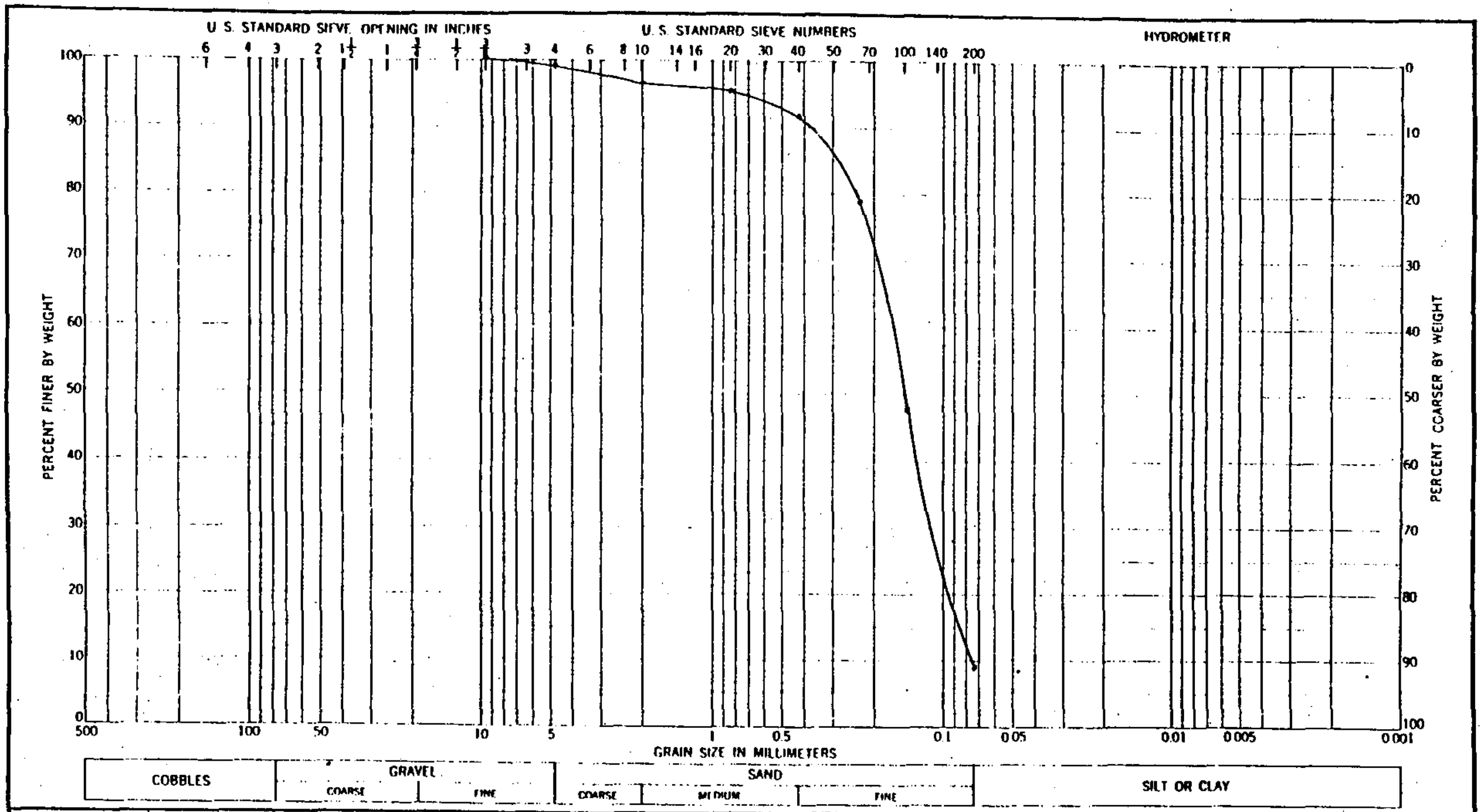
Project Kissimmee River Project
Lab. No. 4/3097*
Area River Restoration Project
Boring No. CBS 65K, Sample No. HA-12
Date 15 July 1991

GRADATION CURVES

ENG FORM 2087

* Classification Only

W. O. No. 6436
Req. No. RM-CW-91-0129



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-13	-	Gray, poorly graded silty sand (SP-SM)	-	Not	Reques	ted

Project Kissimmee River

Lab. No. 4/3098*

Area River Restoration Project

Boring No CBS-65K, Sample No. HA-13

Date 15 July 1991

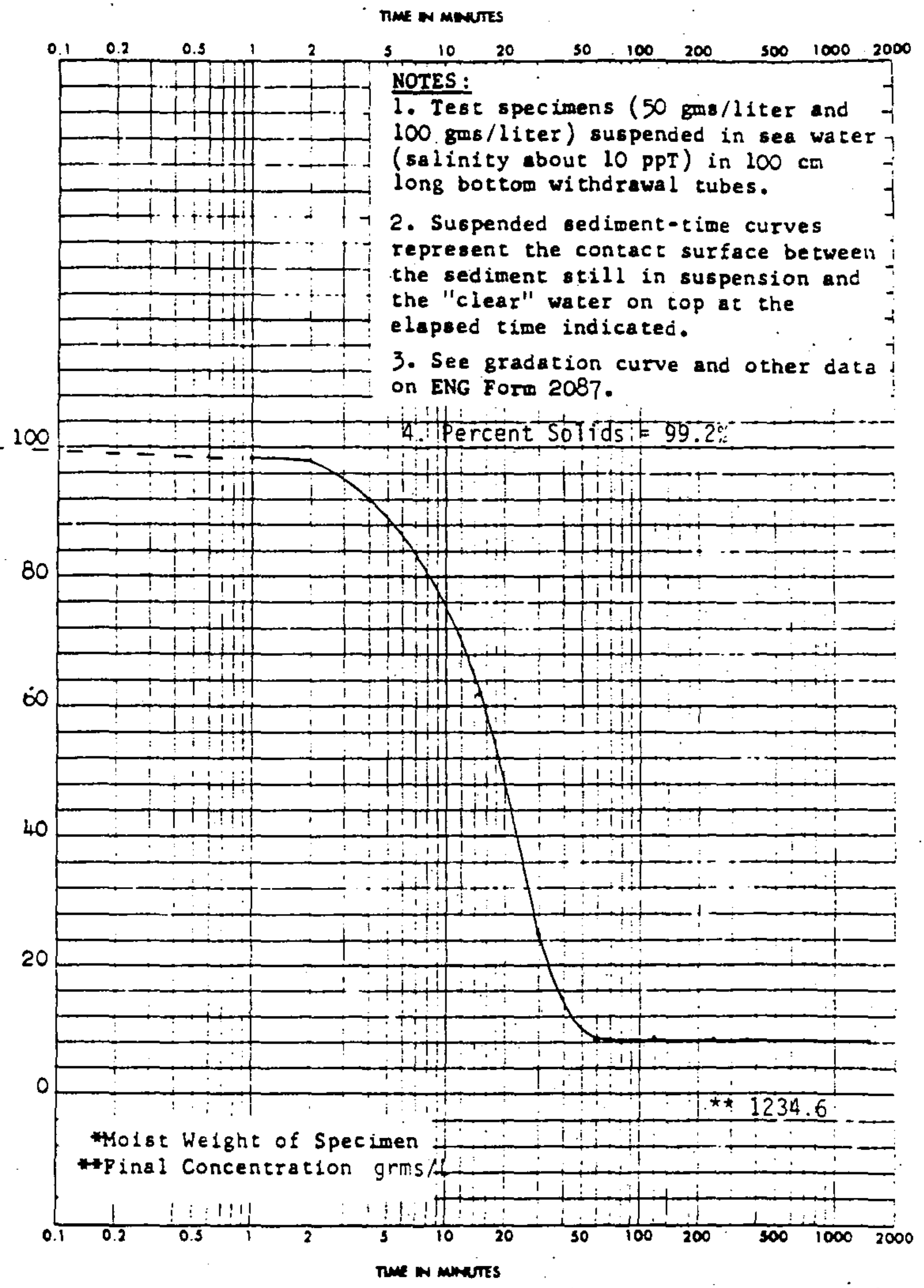
GRADATION CURVES

ENG FORM 1 MAY [illegible] 2087

*Standard Compaction, Sedimentation Rate & Sub-aqueous density tests.

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-91-0129
Work Order No. 6436



NOTES:

1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.
2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.
3. See gradation curve and other data on ENG Form 2087.
4. Percent Solids = 99.2%

*Moist Weight of Specimen
**Final Concentration grms/l ** 1234.6

PROJECT Kissimmee River

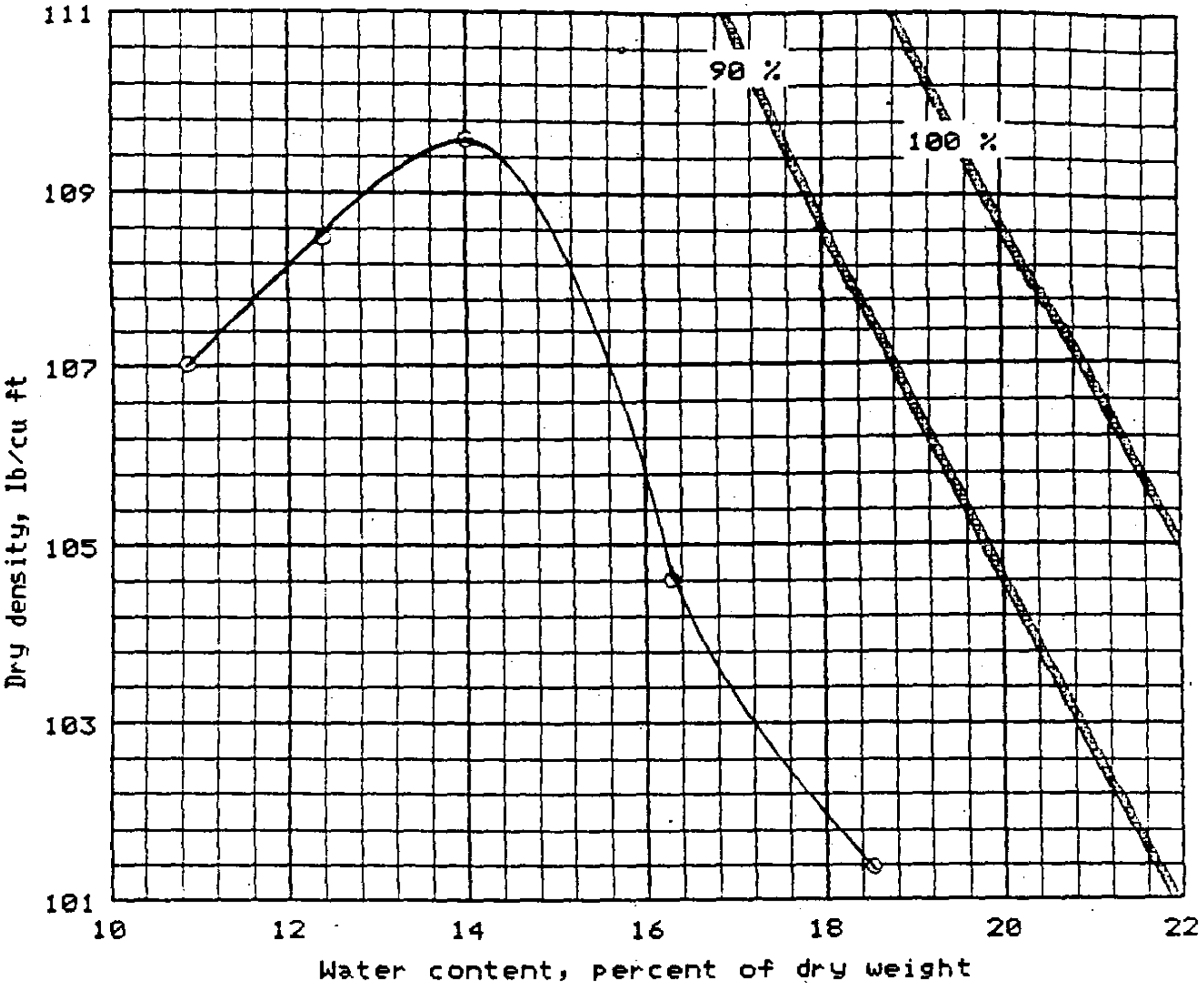
AREA River Restoration Project Lab. No. 4/3098

BORING NO. CBS-65K SAMPLE NO. HA-13 DEPTH EL - DATE 15 July 1991

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

WORK ORDER NO. 6436
Req. No. RM-CW-91-0129
Contract No.



Standard compaction test ASTM D698 Method A
25 blows per each of 3 layers, with 5.50 lb. sleeve rammer
and 12.0 inch drop.   4.0 inch diameter mold

Sample No.	Elev/ Depth	Classification	G	LL	PL	% > No.4	% > 3/4 in.
HA-13		GRAY, POORLY GRADED	2.67				
		SILTY SAND (SP-SM).					

Sample No.	HA-13			
Water content, percent				
Optimum water content, percent	14.0			
Max dry density, lb/cu ft	109.6			

Remarks: See lab
classification data
on ENG FORM 2087

Project: KISSIMMEE RIVER

Lab No.: 4/3098

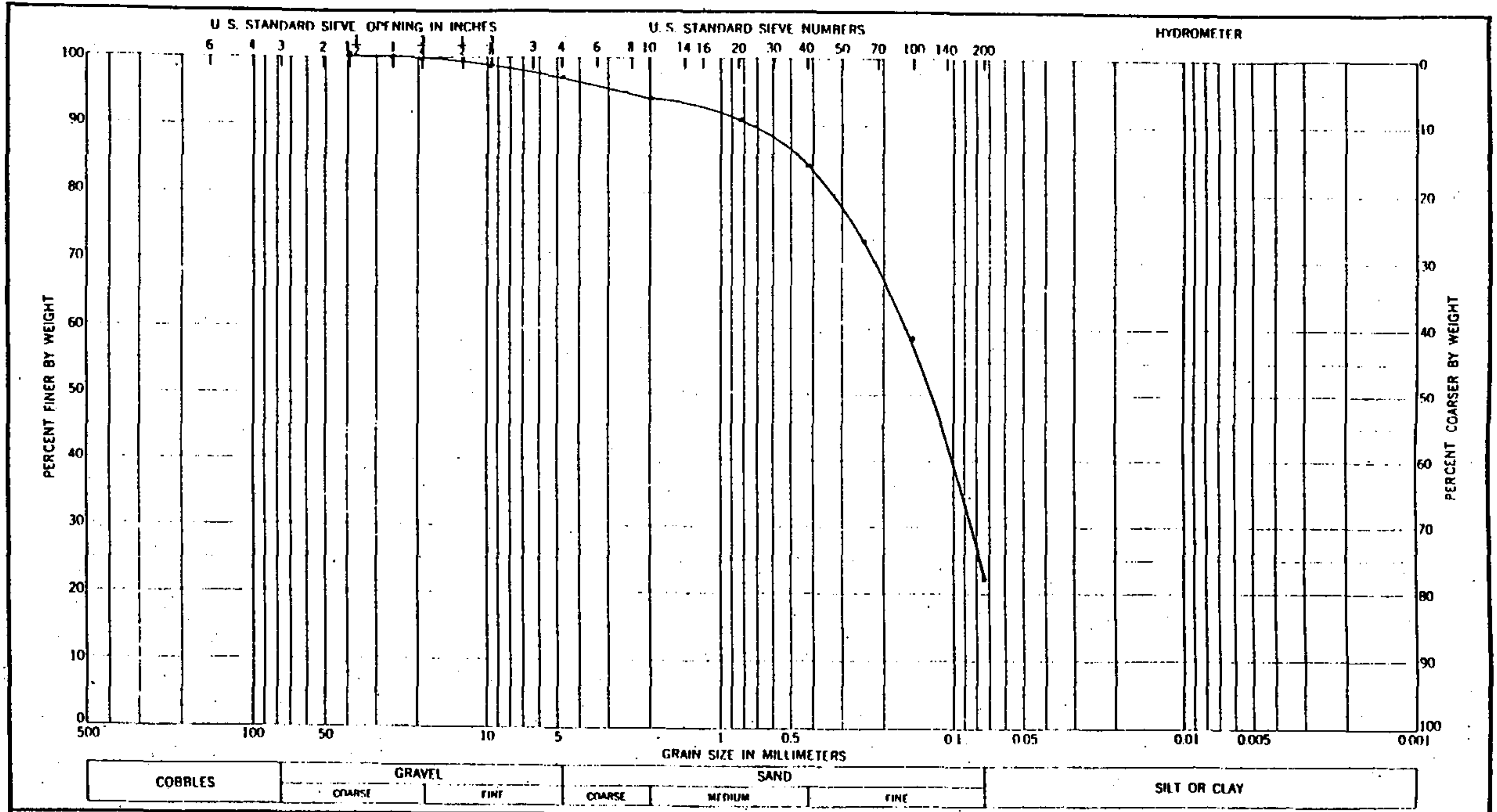
Area: RIVER RESTORATION PROJECT

Boring No.: CBS-65K
Date: 6-27-1991

COMPACTION TEST REPORT

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

W. O. No. 6436
Req. No. RM-CW-91-0129



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-14	-	Tan, silty sand (SM) w/a trace of plastic fines & gravel size shell fragments	-	NP	NP	NP

Project Kissimmee River

Lab. No. 4/3099*

Area River Restoration Project

Boring No. CBS-65K, Sample No. HA-14

Date 15 July 1991

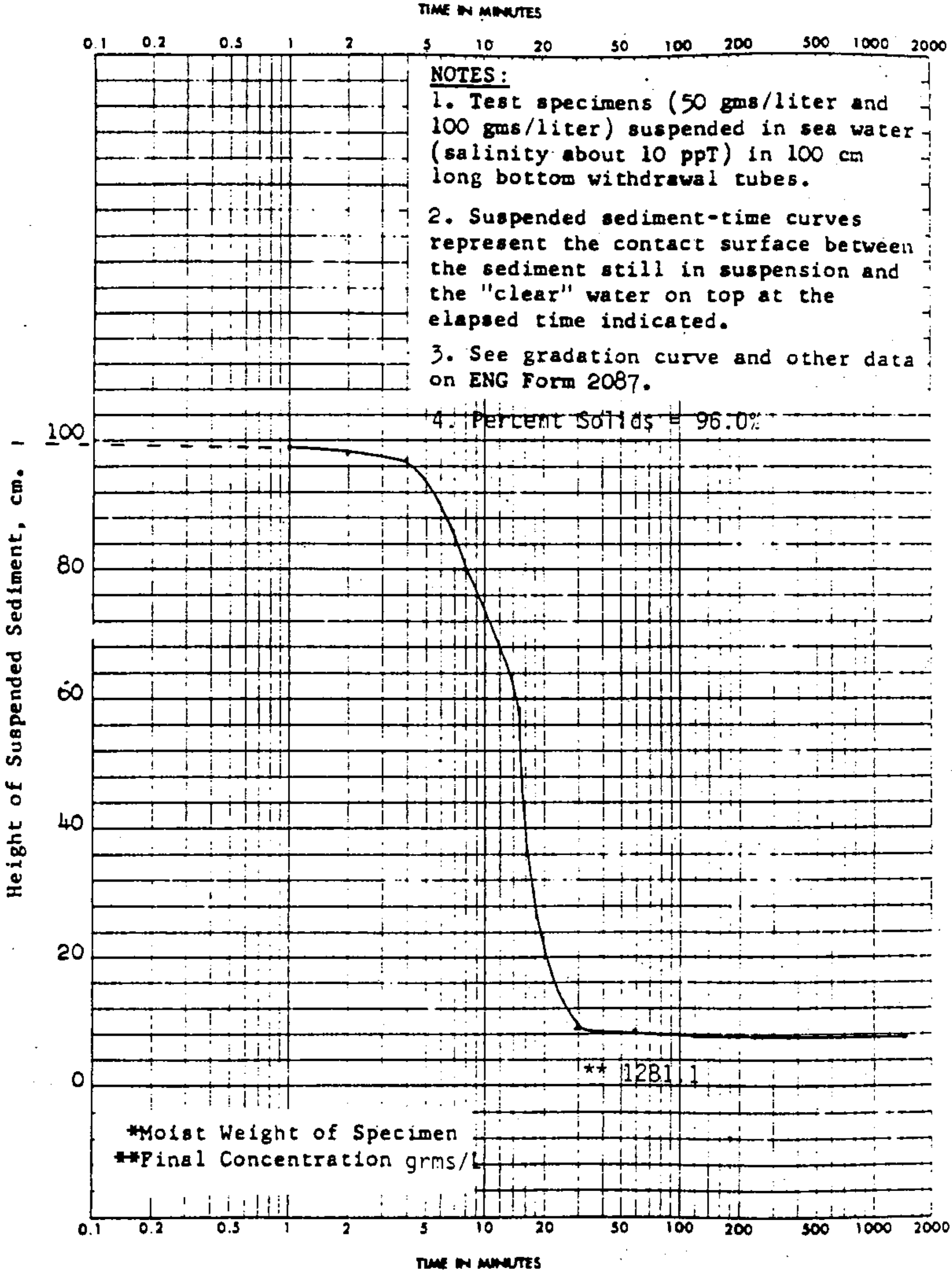
GRADATION CURVES

ENG FORM 2087

* Standard Compaction, sedimentation rate & Sub-aqueous density tests.

Reqn. No. RM-CW-91-0129
Work Order No. 6436

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061



NOTES:

1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.
2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.
3. See gradation curve and other data on ENG Form 2087.
4. Percent Solids = 96.0%

*Moist Weight of Specimen
**Final Concentration grms/L

PROJECT Kissimmee River

AREA River Restoration Project Lab. No. 4/3099

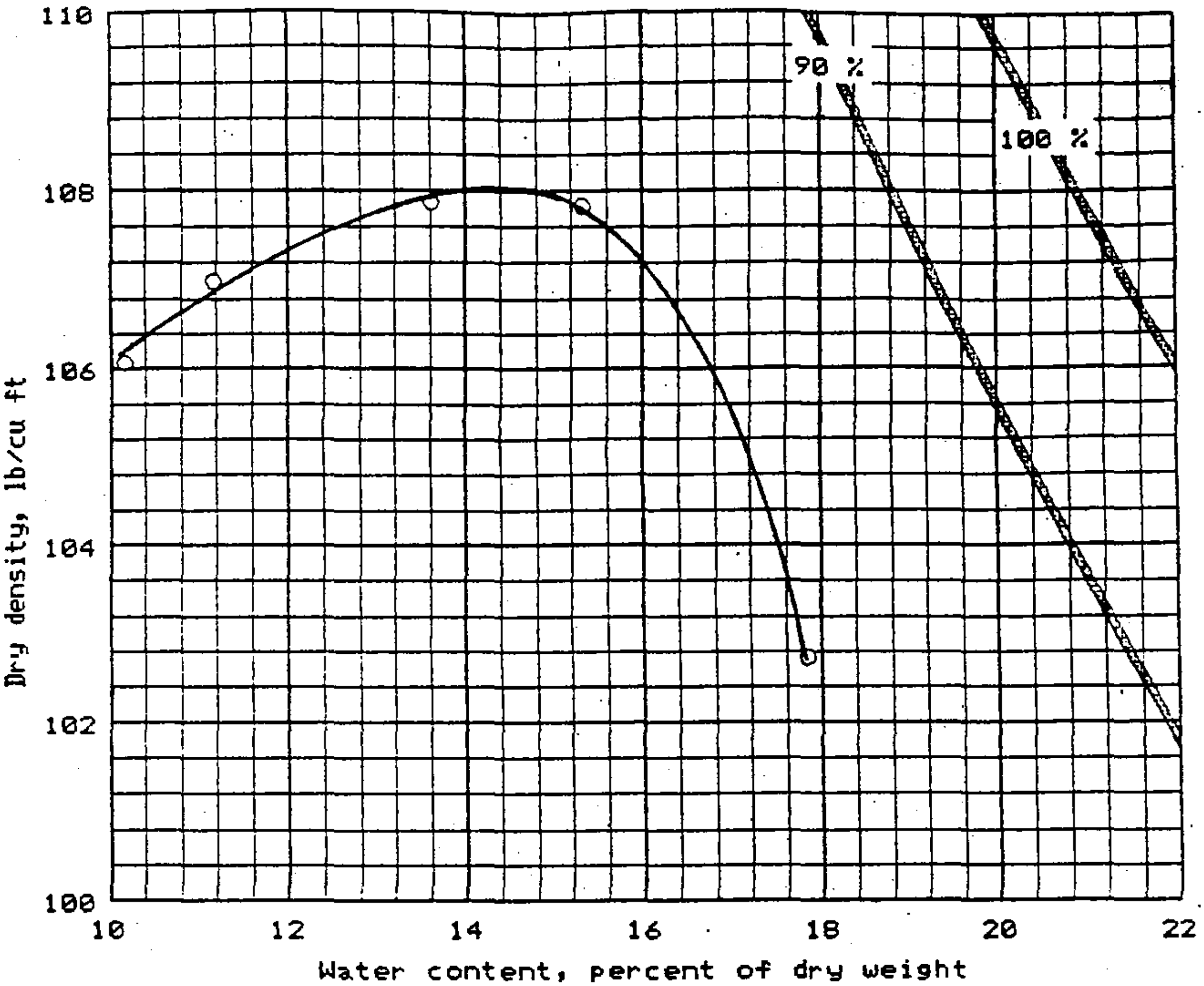
BORING NO. CBS-65K SAMPLE NO. HA-14 DEPTH EL - DATE 15 July 1991

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

WORK ORDER NO. 6436
Req. No. RM-CW-91-0129
Contract No.

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060



Standard compaction test ASTM D698 Method A
25 blows per each of 3 layers, with 5.50 lb. sleeve rammer
and 12.0 inch drop.   4.0 inch diameter mold

Sample No.	Elev/ Depth	Classification	G	LL	PL	% > No.4	% > 3/4 in.
HA-14		TAN, SILTY SAND (SM), WITH A TRACE OF PLASTIC FINES AND GRAVEL SIZE SHELL.	2.71	NP	NP		

Sample No.	HA-14			
Water content, percent	-			
Optimum water content, percent	14.4			
Max dry density, lb/cu ft	108.0			

Remarks: See lab classification data on ENG FORM 2087

Project: KISSIMMEE RIVER

Lab No.: 4/3099

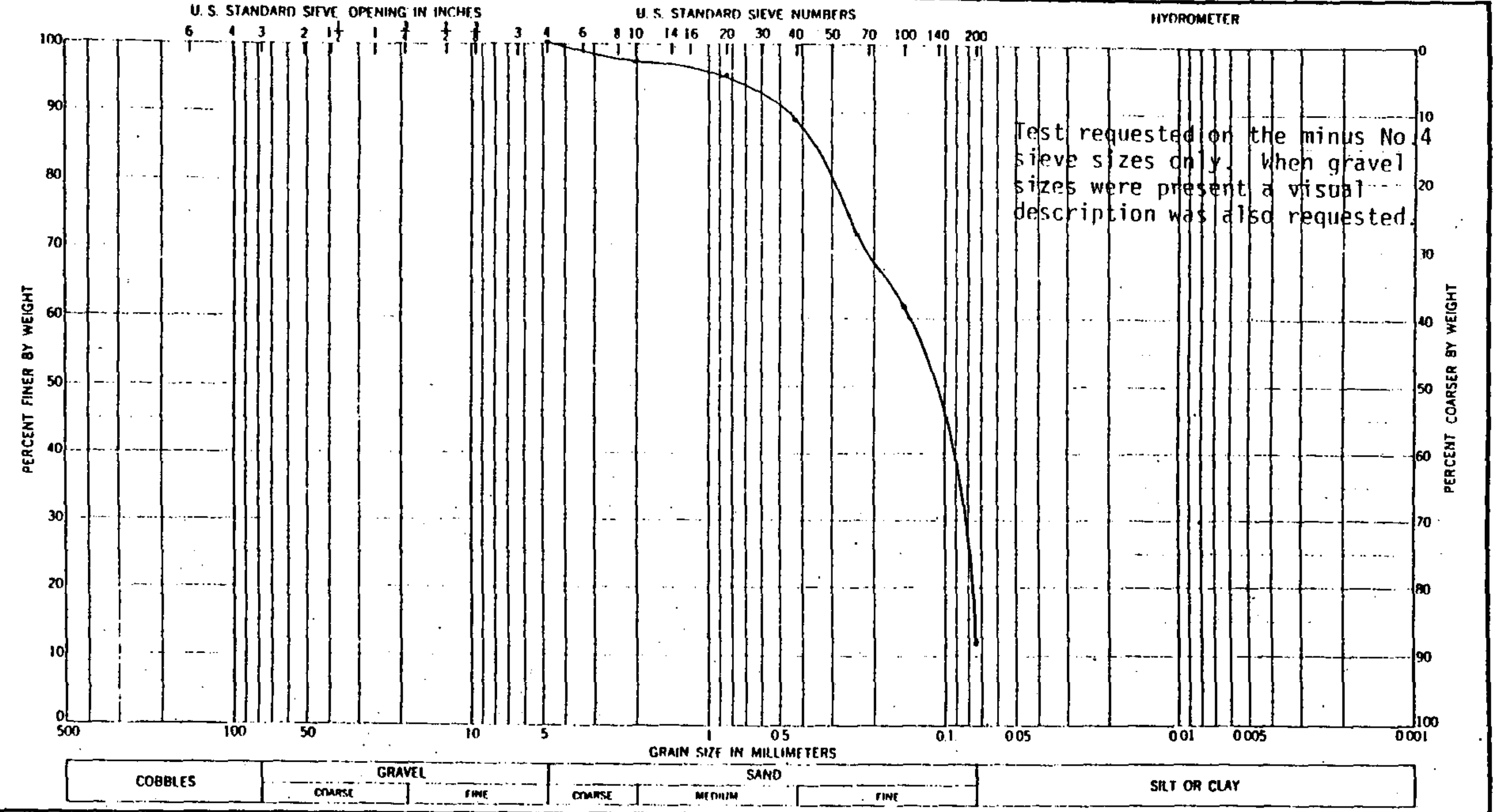
Area: RIVER RESTORATION PROJECT

Boring No.: CBS 65K

Date: 6-25-1991

COMPACTION TEST REPORT

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-15	-	Lt. Brown, poorly graded silty sand (SP-SM), w/a trace of gravel size shell fragments.	-	Not Requested		

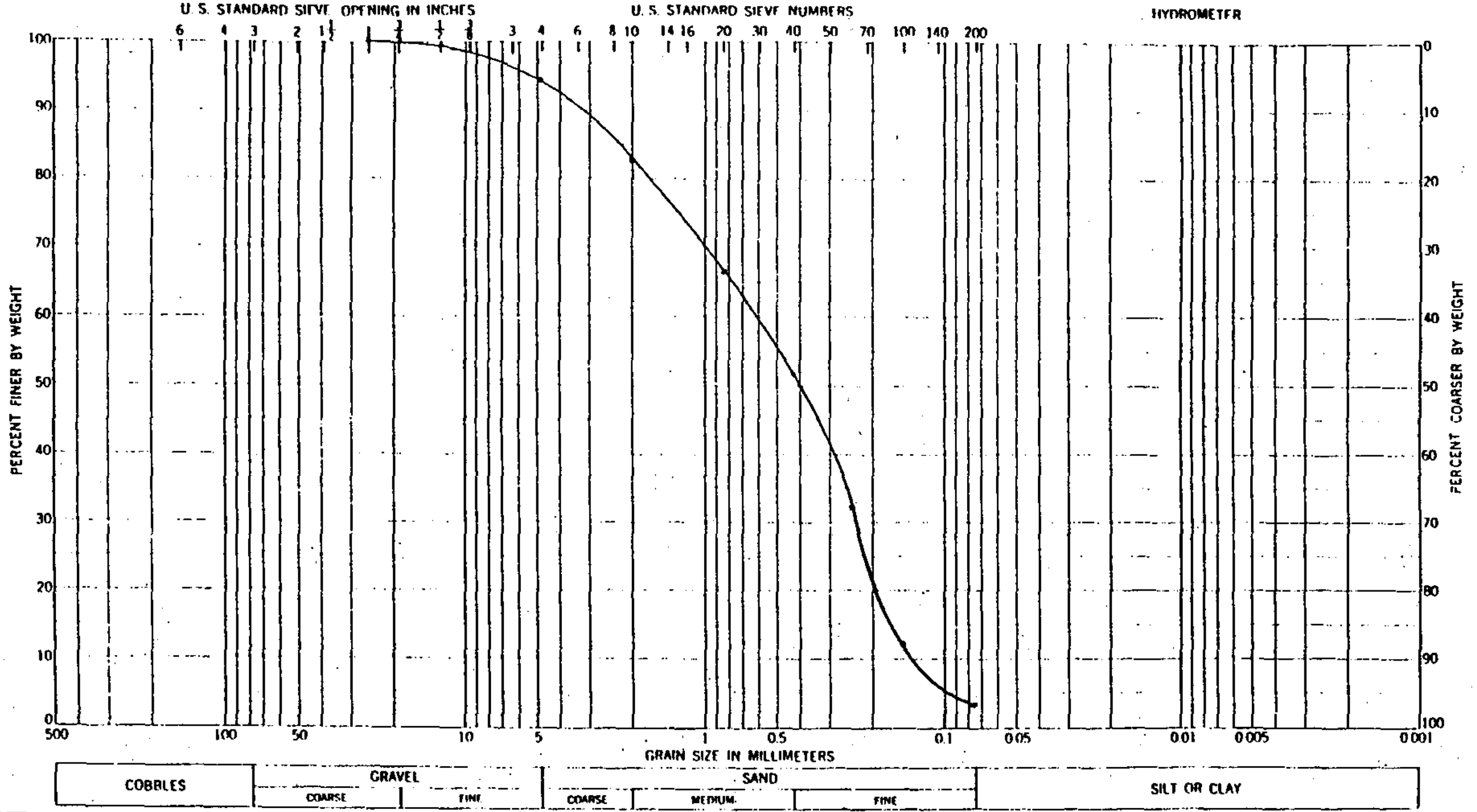
Project Kissimmee River
Lab. No. 4/3100*
Area River Restoration Project
Boring No. CBS 65K, Sample No. HA-15
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY -- 2087

* Classification only.

W. O. No. 6436
Req. No. RM-CW-91-0129



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-16	-	Lt. Gray, poorly graded sand (SP), w/a trace of gravel size shell fragments.	-	Not requested		

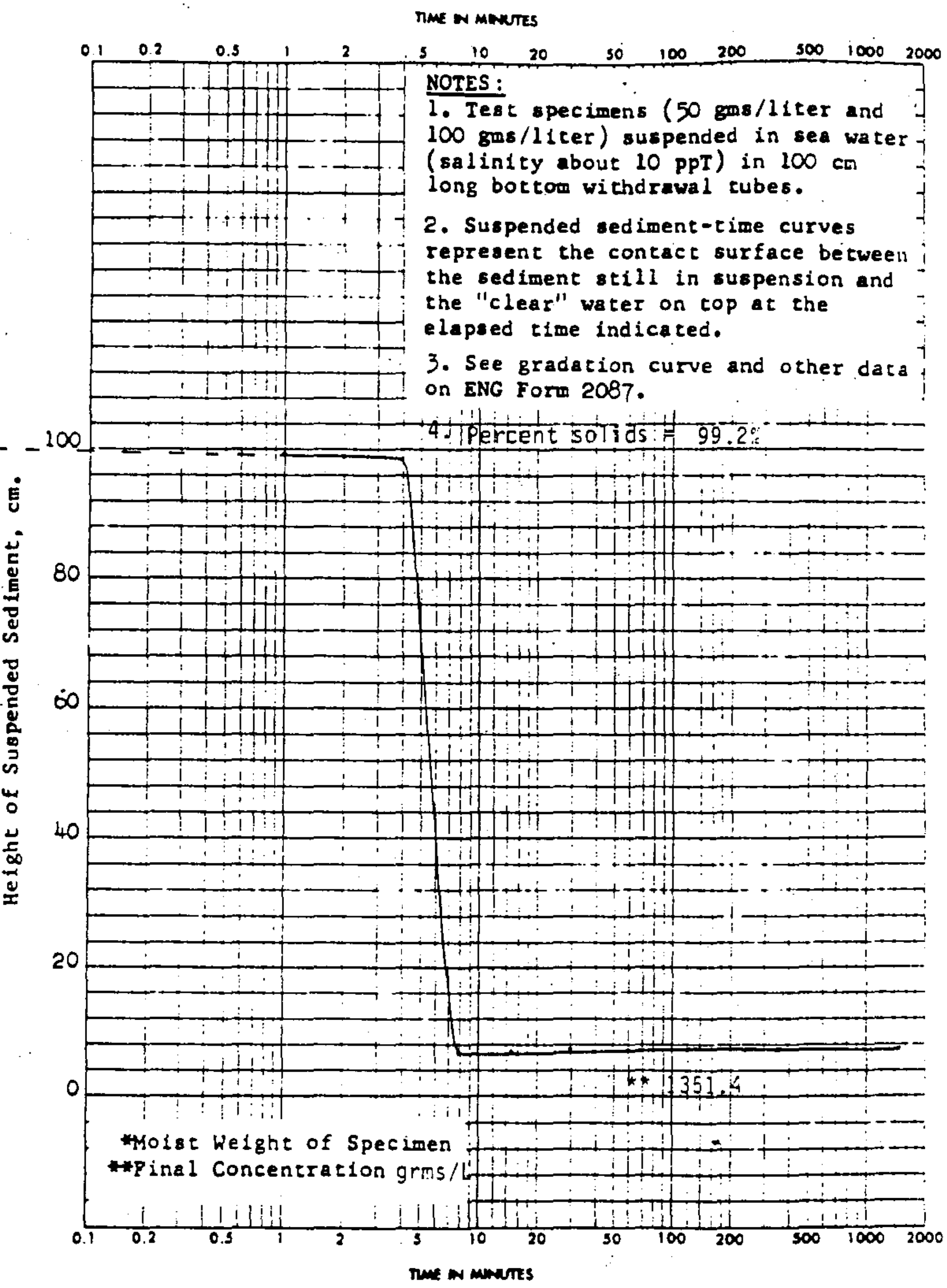
Project Kissimmee River
Lab. No. 4/3101*
Area River Restoration Project
Boring No. CBS 65K, Sample No. HA-16
Date 15 July 1991

GRADATION CURVES

* Standard Compaction and sedimentation

Reqn. No. RM-CW-91-0129
Work Order No. 6436

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061



NOTES:

1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

PROJECT Kissimmee River

AREA River Restoration Project Lab. No. 4/3101

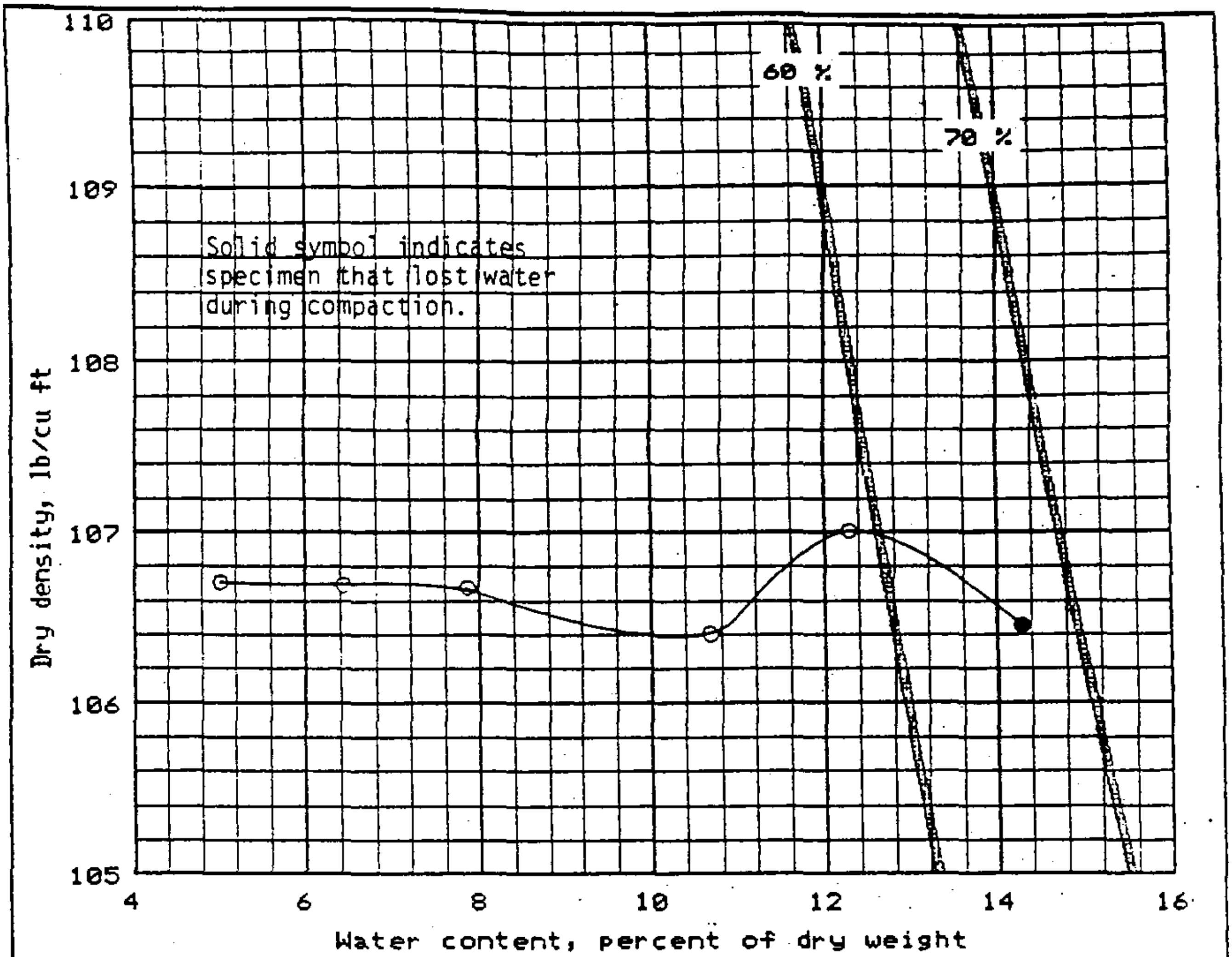
BORING NO. CBS-65K SAMPLE NO. HA-16 DEPTH EL - DATE 15 July 1991

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

WORK ORDER NO. 6436
Req. No. RM-CW-91-0129
Contract No.



Solid symbol indicates specimen that lost water during compaction.

Standard compaction test ASTM D698 Method A
25 blows per each of 3 layers, with 5.50 lb. sleeve rammer
and 12.0 inch drop.   4.0 inch diameter mold

Sample No.	Elev/ Depth	Classification	G	LL	PL	% > No.4	% > 3/4 in.
HA-16		LT. GRAY, POORLY	2.68				
		GRADED SAND (SP, W/					
		A TRACE OF GRAVEL					
		SIZE SHELL FRAGMENTS					

Sample No.	HA-16			
Water content, percent				
Optimum water content, percent	12.3			
Max dry density, lb/cu ft	107.0			

Remarks: See lab classification data on ENG FORM 2087

Project: KISSIMMEE RIVER

Lab No.: 4/3101

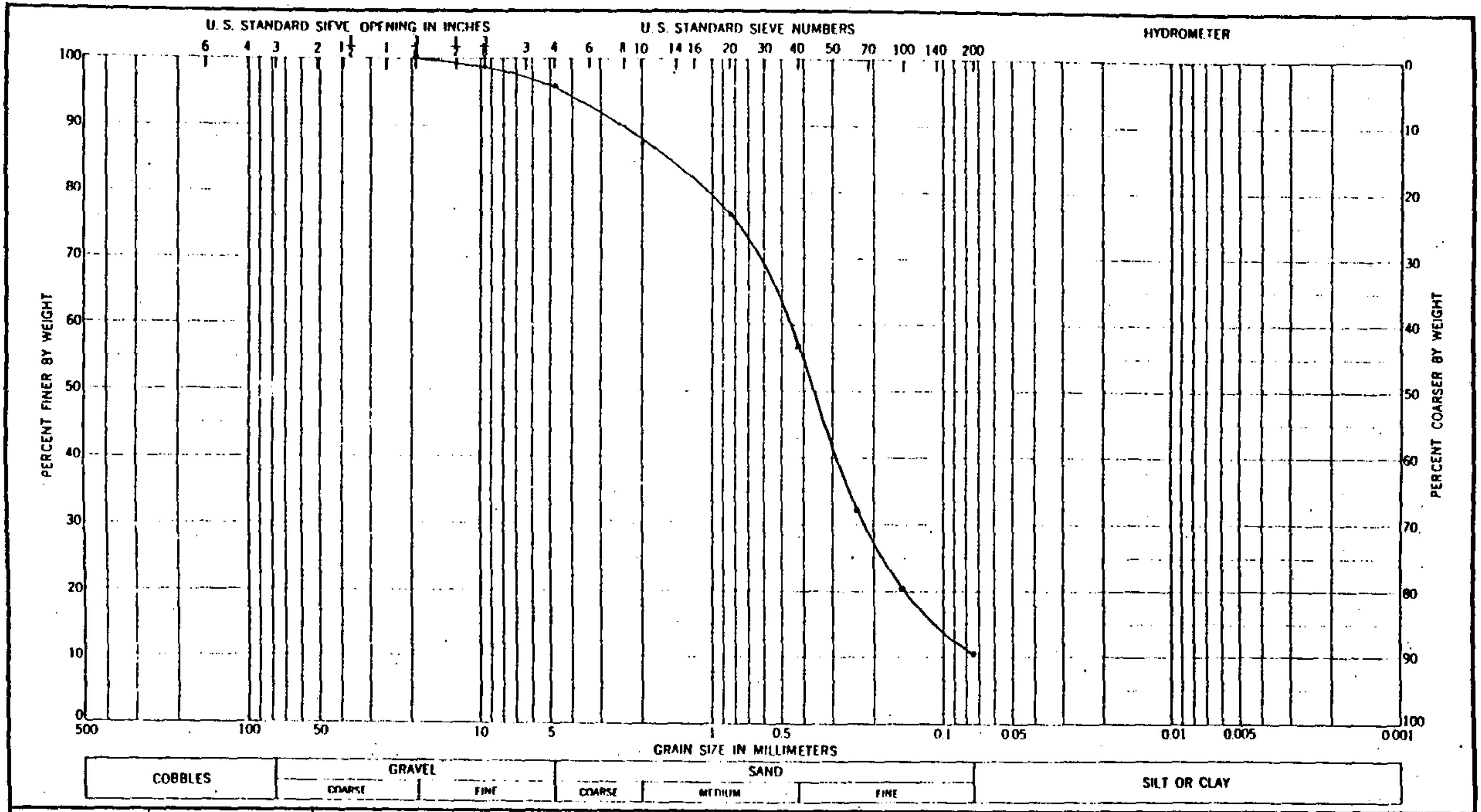
Area: RIVER RESTORATION PROJECT

Boring No.: CBS-65K

Date: 6-27-1991

COMPACTION TEST REPORT

W. O. No. 6436
Req. No. RM-CW-91-0129



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-17	-	Lt. Gray, clayey sand (SC) w/a trace of gravel size shell fragments.	-	30	16	14

GRADATION CURVES

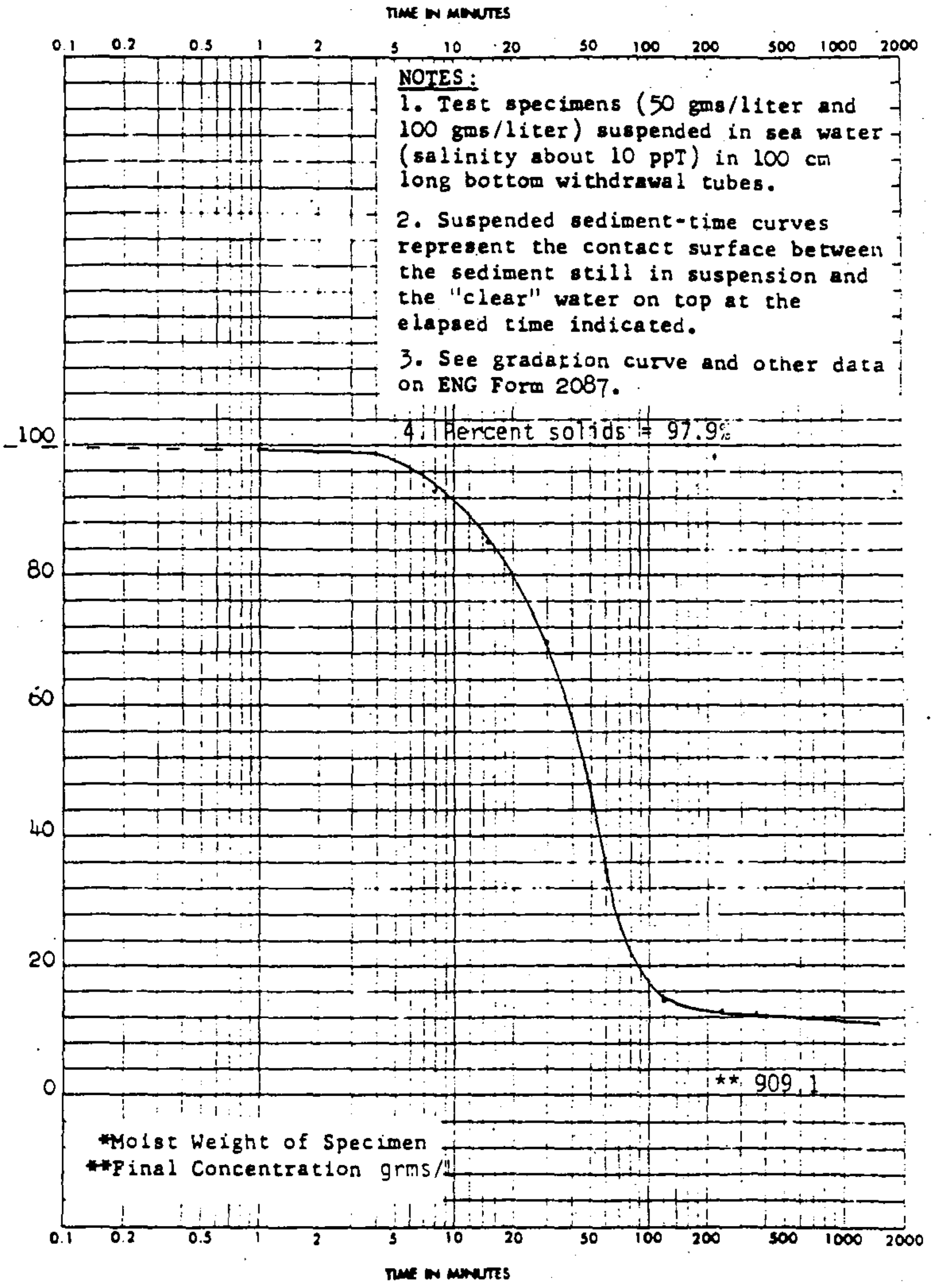
Project Kissimmee River
Lab. No. 4/3102*
Area River Restoration Project
Boring No. CBS-65K, Sample No. HA-17
Date 15 July 1991

ENG FORM 1 MAY 63 2087

*Standard compaction and sedimentation rate tests.

Reqn. No. RM-CW-91-0129
Work Order No. 6436

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061



NOTES:

1. Test specimens (50 gms/liter and 100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent solids = 97.9%

*Moist Weight of Specimen
**Final Concentration grms/l

PROJECT Kissimmee River

AREA River Restoration Project Lab. No. 4/3102

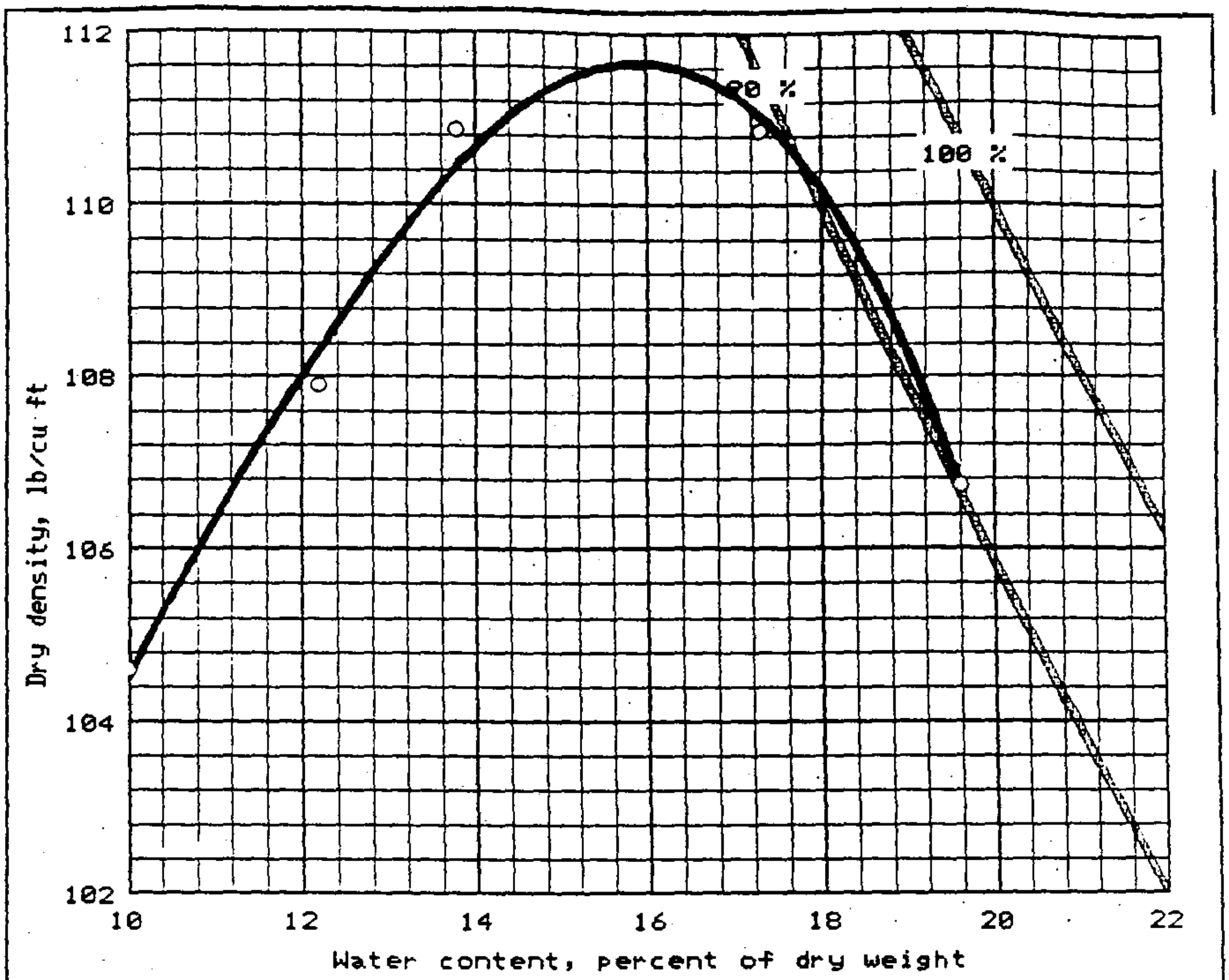
BORING NO. CBS-65K | SAMPLE NO HA-17 | DEPTH EL - | DATE 15 July 1991

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

WORK ORDER NO. 6436
Req. No.RM-CW-91-0129
Contract No.

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060



Standard compaction test ASTM D698 Method A
25 blows per each of 3 layers, with 5.50 lb. sleeve rammer
and 12.0 inch drop. 4.0 inch diameter mold

Sample No.	Elev/ Depth	Classification	G	LL	PL	% > No.4	% > 3/4 in.
HA-17		Lt. gray clayey sand (SC) w/a trace of gravel size shell fragments.	2.72	30	16		

Sample No.	HA-17			
Water content, percent				
Optimum water content, percent	15.9			
Max dry density, lb/cu ft	111.7			

Remarks: See lab classification data on ENG FORM 2087

Project: KISSIMMEE RIVER

Lab No.: 4/3102

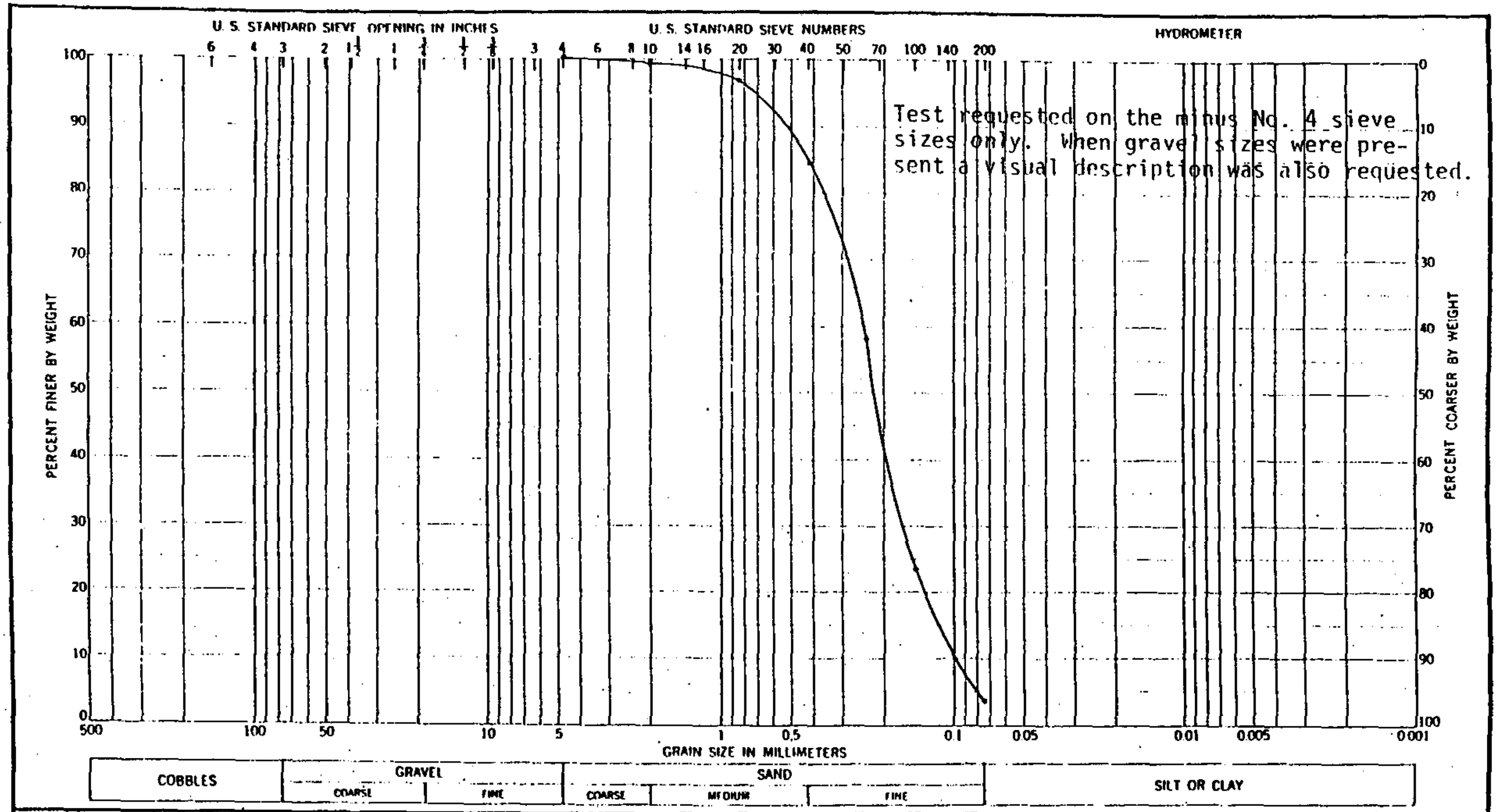
Area: RIVER RESTORATION PROJECT

Boring No.: CBS-65K

Date: 6-27-1991

COMPACTION TEST REPORT

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-18	-	Brown, poorly graded sand (SP), w/a trace of gravel size shell fragments.	-	Not Requested		

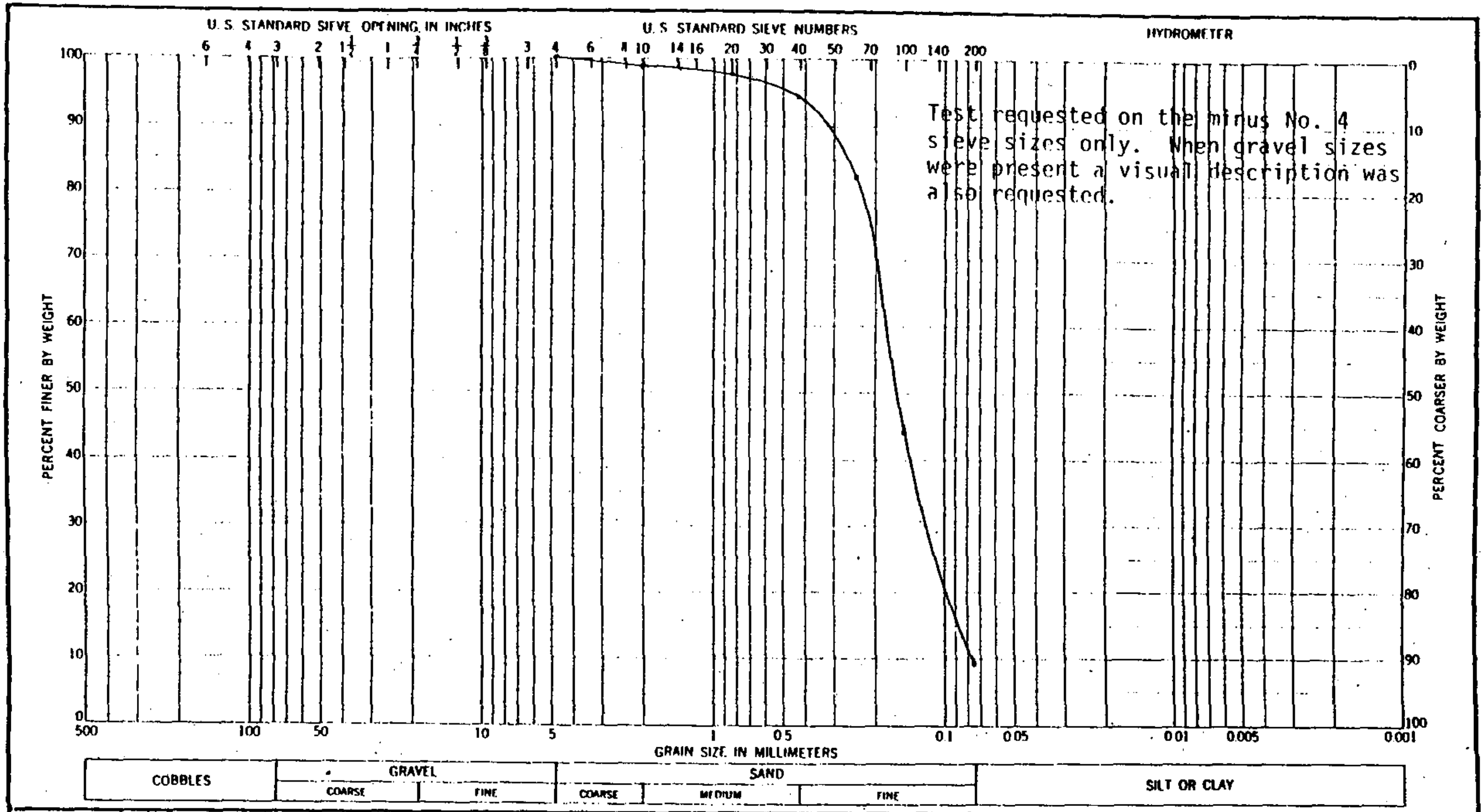
Project Kissimmee River
Lab. No. 4/3103
Area River Restoration Project
Boring No. CBS-65K, Sample No. HA-18
Date 15 July 1991

GRADATION CURVES

ENG FORM 2087

*Classification only

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No. 4 sieve sizes only. When gravel sizes were present a visual description was also requested.

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-19	-	Tan, poorly graded silty sand (SP-SM), w/a trace of gravel size shell fragments	-	Not Requested		

GRADATION CURVES

Project Kissimmee River

Lab. No. 4/3104*

Area River Restoration Project

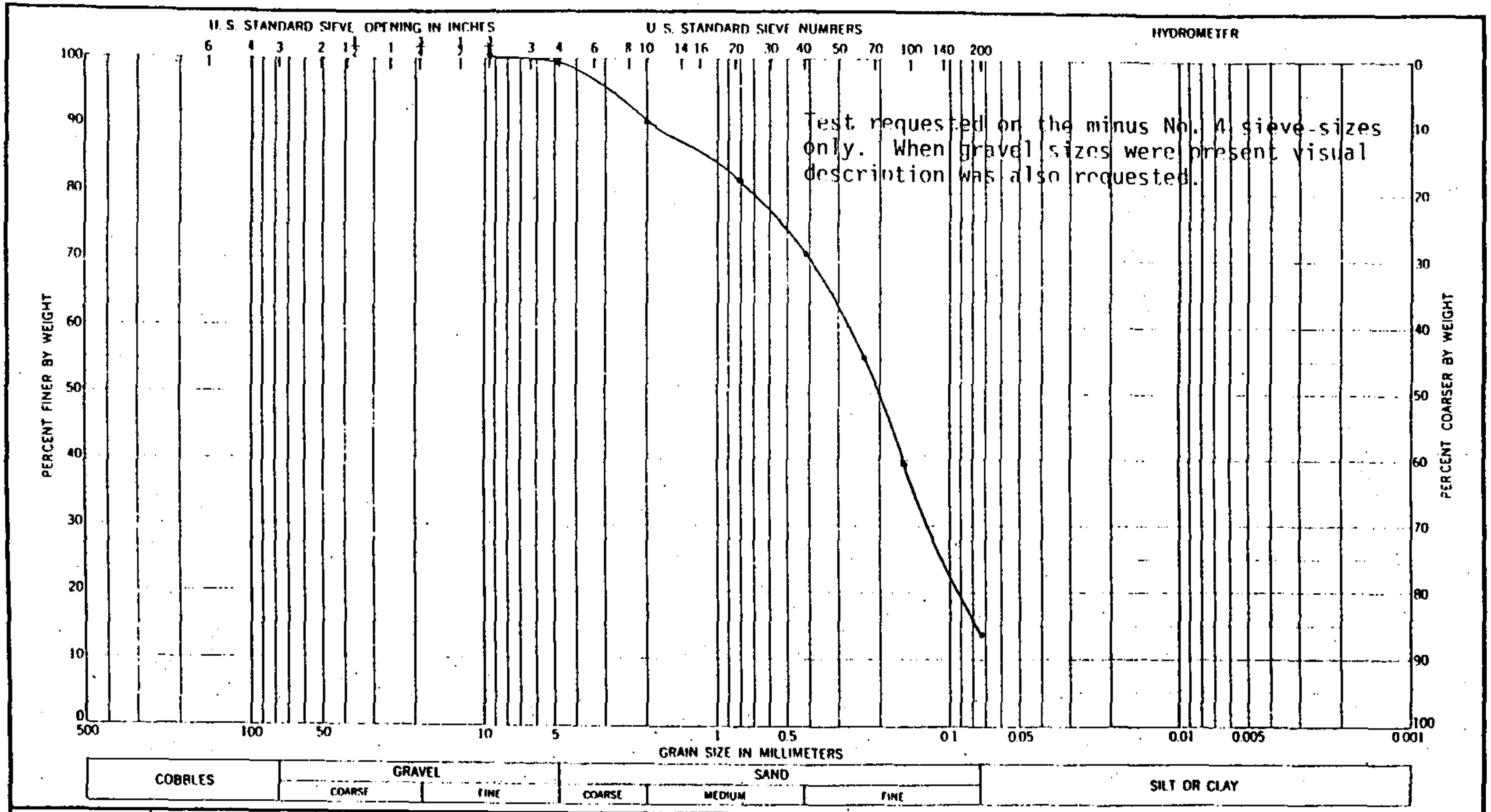
Boring No CBS-65K, Sample No. HA-19

Date 15 July 1991

ENG FORM 1 MAY 63 2087

*Classification only

W. O. No. 6436
Req. No. RM-CW-91-0129



Test requested on the minus No. 4 sieve-sizes only. When gravel sizes were present visual description was also requested.

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
HA-20	-	Tan, Silty sand (SM), w/ some gravel size shell fragments.	-	Not Requested		

GRADATION CURVES

Project Kissimmee River
Lab. No. 4/3105*
Area River Restoration Project
Boring No. CBS 65-K, Sample No. HA-20
Date 15 July 1991

ENG FORM 2087

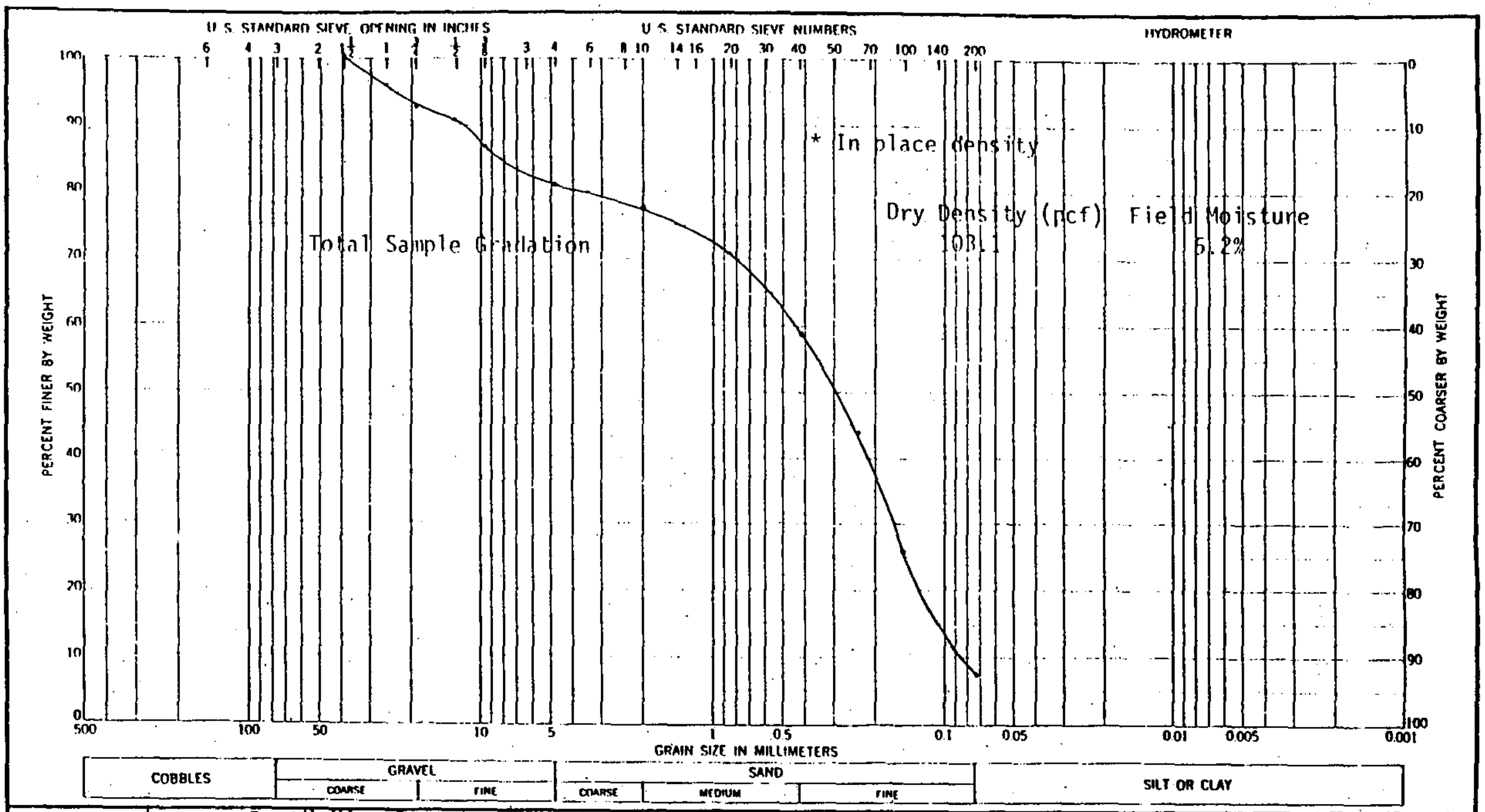
*Classification Only

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

FIELD DENSITY TEST RESULTS

W. O. No. 6436
Req. No. RM-CW-91-0129



Total Sample Gradation

* In place density

Dry Density (pcf) 108.1

Field Moisture 6.2%

Sample No.	Depth	Visual Classification	Nat w %	LL	PL	PI
7D	12 - 18"	Gray, poorly graded silty sand (SP-SM), w/a little gravel size shell fragments and a trace of organic matter & mica.	-	Not Requested		

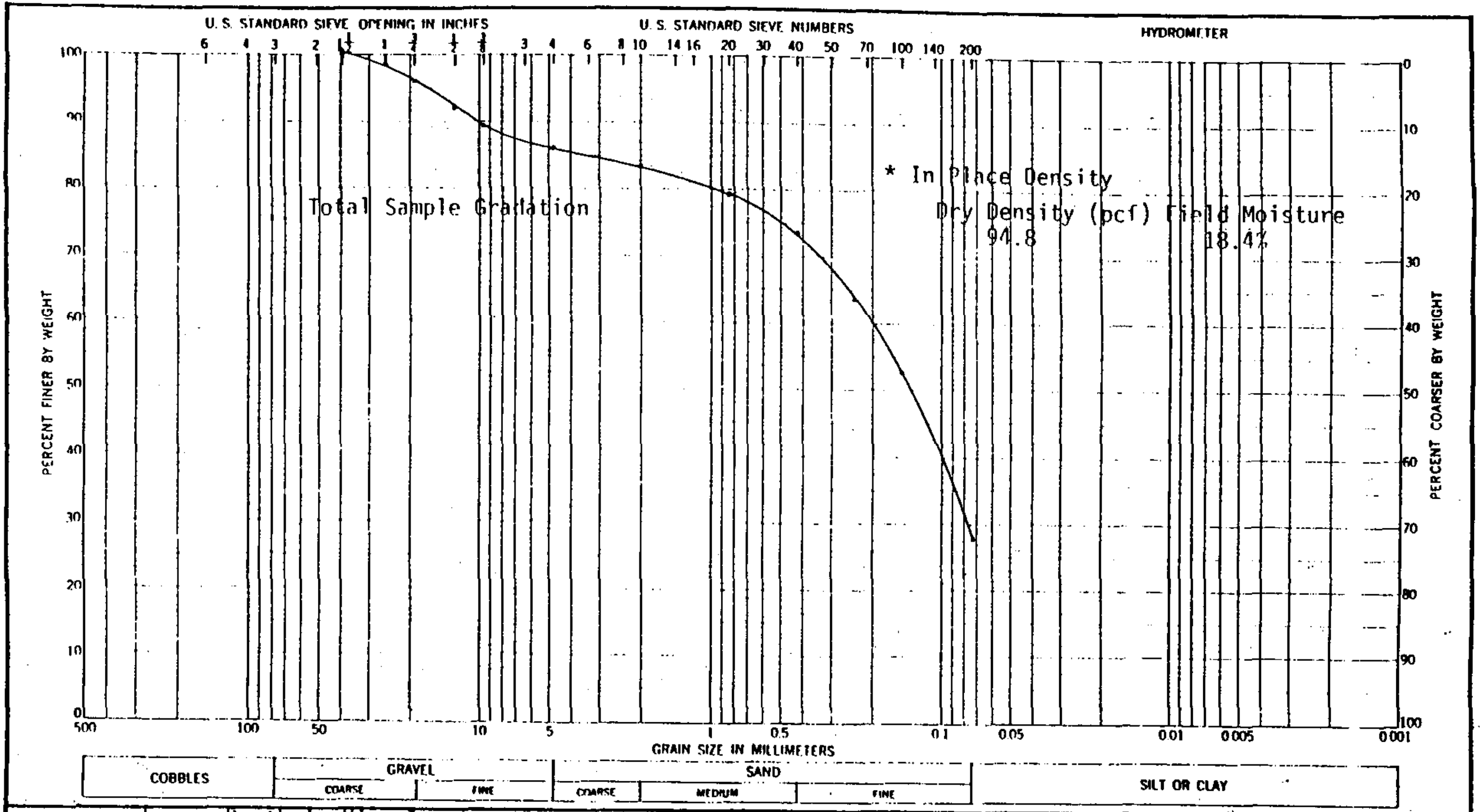
GRADATION CURVES

Project Kissimmee River
Lab. No. 4/3106*
Area Restoration Project
Boring No. HA-7, Sample No, 7D
Date 15 July 1991

ENG FORM 1 MAY 63 2087

* In place density test

Req. No. RM-CW-91-0129



Total Sample Gradation

* In Place Density

Dry Density (pcf)	Field Moisture
94.8	18.4%

Sample No.	~~XXX~~ Depth	Visual Classification	Nat w %	LL	PL	PI
8D	12-18"	Gray, Silty Sand (SM) w/a little gravel size shell fragments & a trace of organic matter & mica.	-	Not	Requested	

GRADATION CURVES

Project Kissimmee River

Lab. No. 4/3107*

Area Restoration Project

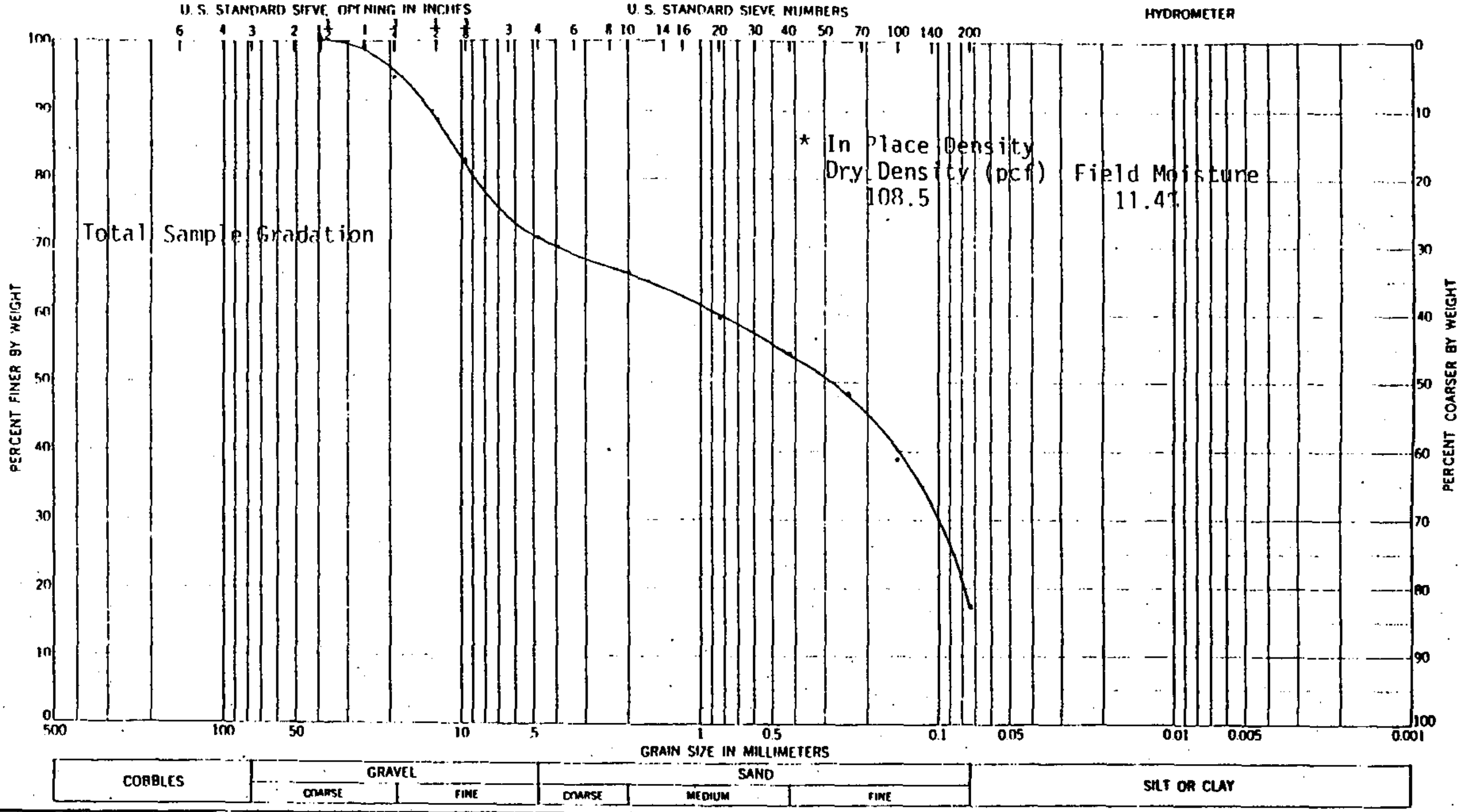
Boring No. HA-8, Sample 8D

Date 15 July 1991

ENG FORM 1 MAY 63 2087

* In place density test

W. O. No. 6436
Req. No. RM-CW-91-0129



Total Sample Gradation

* In Place Density
Dry Density (pcf) 108.5
Field Moisture 11.4%

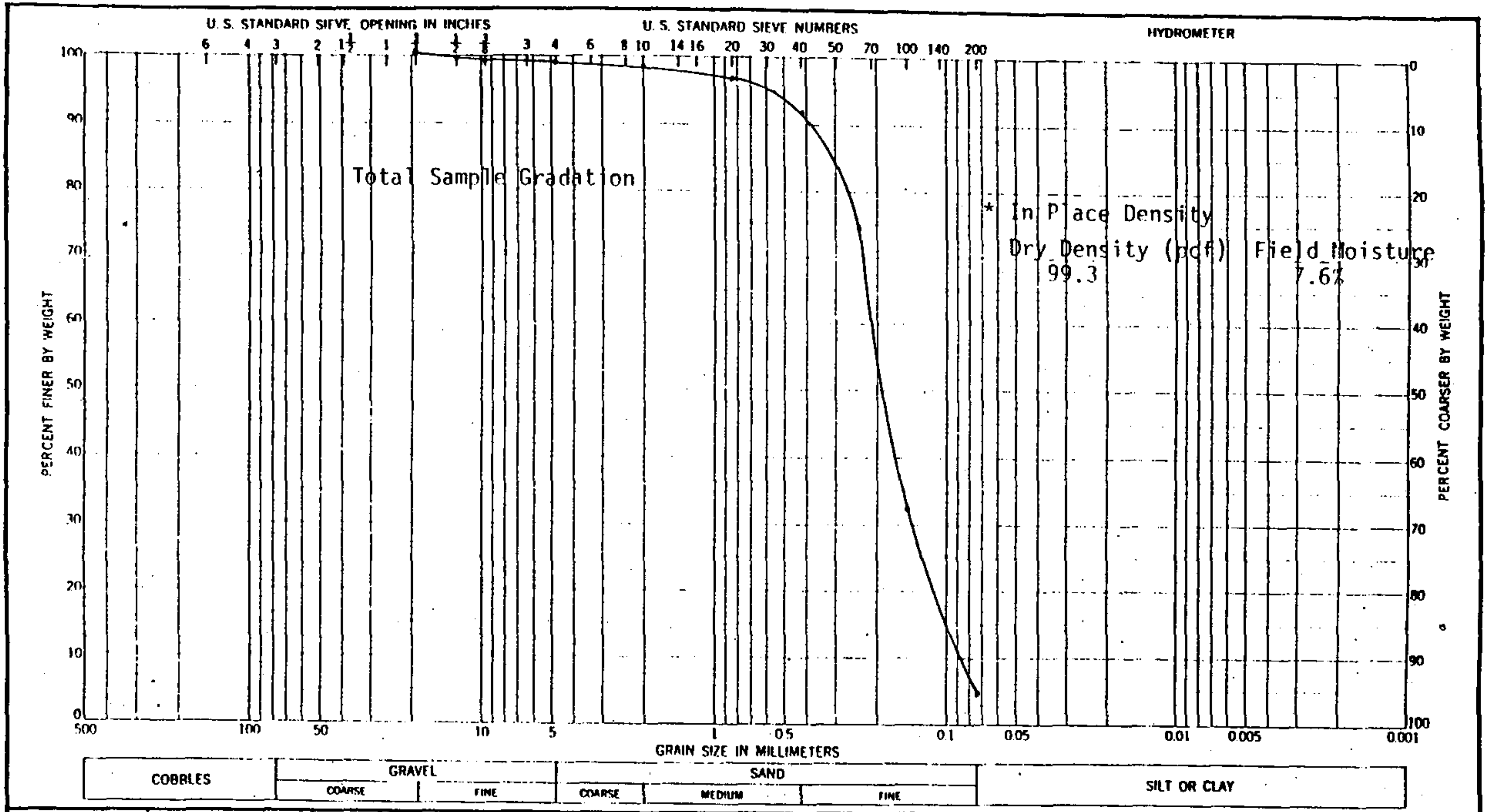
Sample No	~~No~~ Depth	Visual Classification	Nat w %	LL	PL	PI
9D	12"-18"	Gray, silty sand (SM), w/ some gravel size shell fragments & a trace of organic matter & mica.	-	Not Requested		

Project Kissimmee River
Lab. No. 4/3108*
Area Restoration Project
Boring No. HA-9, Sample No. 9D
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

* In place density test



Total Sample Gradation

* In Place Density

Dry Density (pcf)	Field Moisture
99.3	7.6%

Sample No.	Depth	Visual Classification	Nat w %	LL	PL	PI
11D	12-18"	Gray, poorly graded sand (SP), w/a trace of gravel size shell fragments & mica	-	Not Requested		

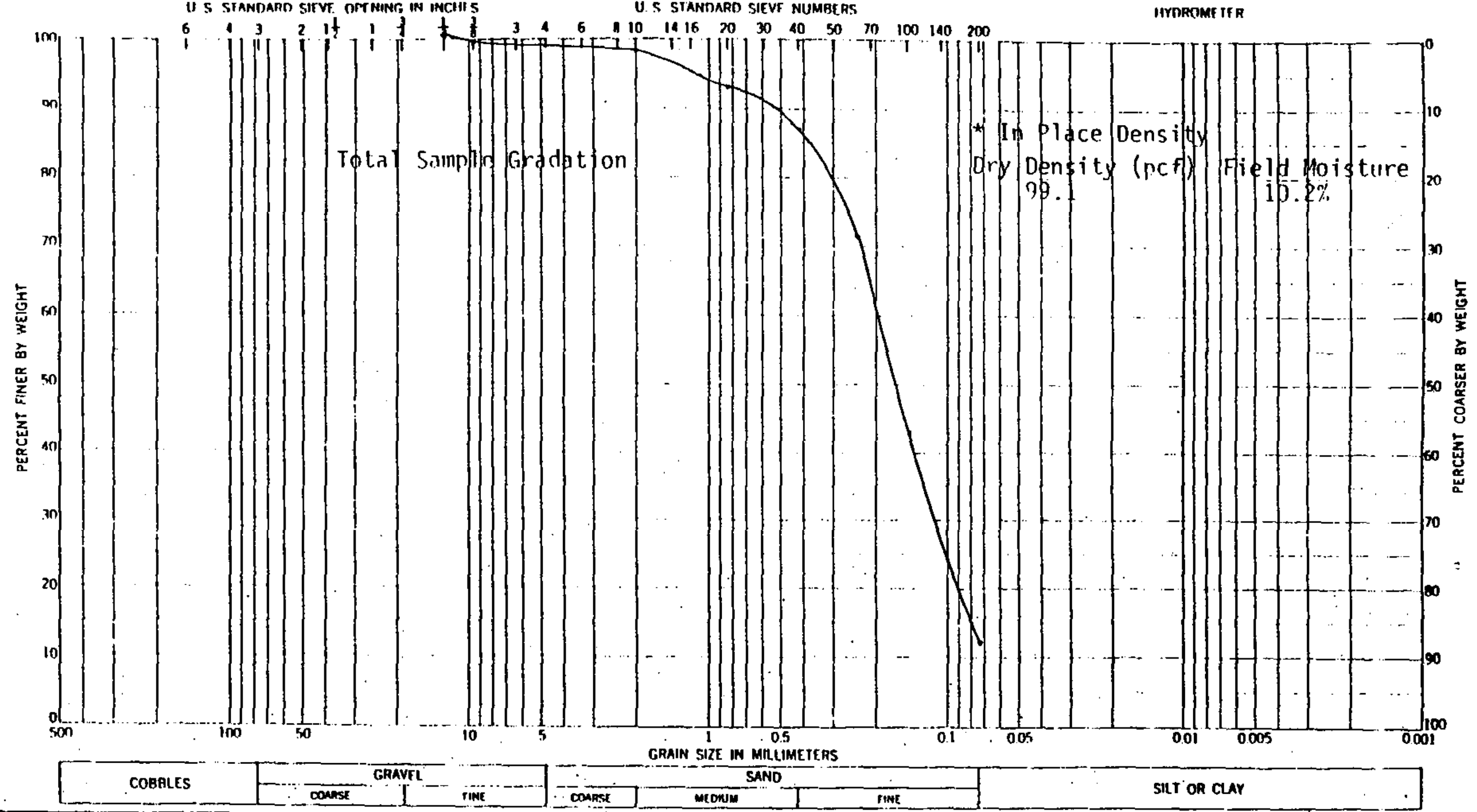
Project Kissimmee River
Lab. No. 4/3109*
Area Restoration Project
Boring No. HA-11, Sample No. 11D
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

*In place density test

W. O. No. 6436
Req. No. RM-CW-91-0129



Total Sample Gradation

* In Place Density

Dry Density (pcf)	Field Moisture
99.1	10.2%

Sample No.	Depth	Visual Classification	Nat w %	LL	PL	PI
12D	12 - 18"	Brownish gray, poorly graded silty sand (SP-SM), w/a trace of gravel size shell fragments, organic matter & mica.	-	Not Requested		

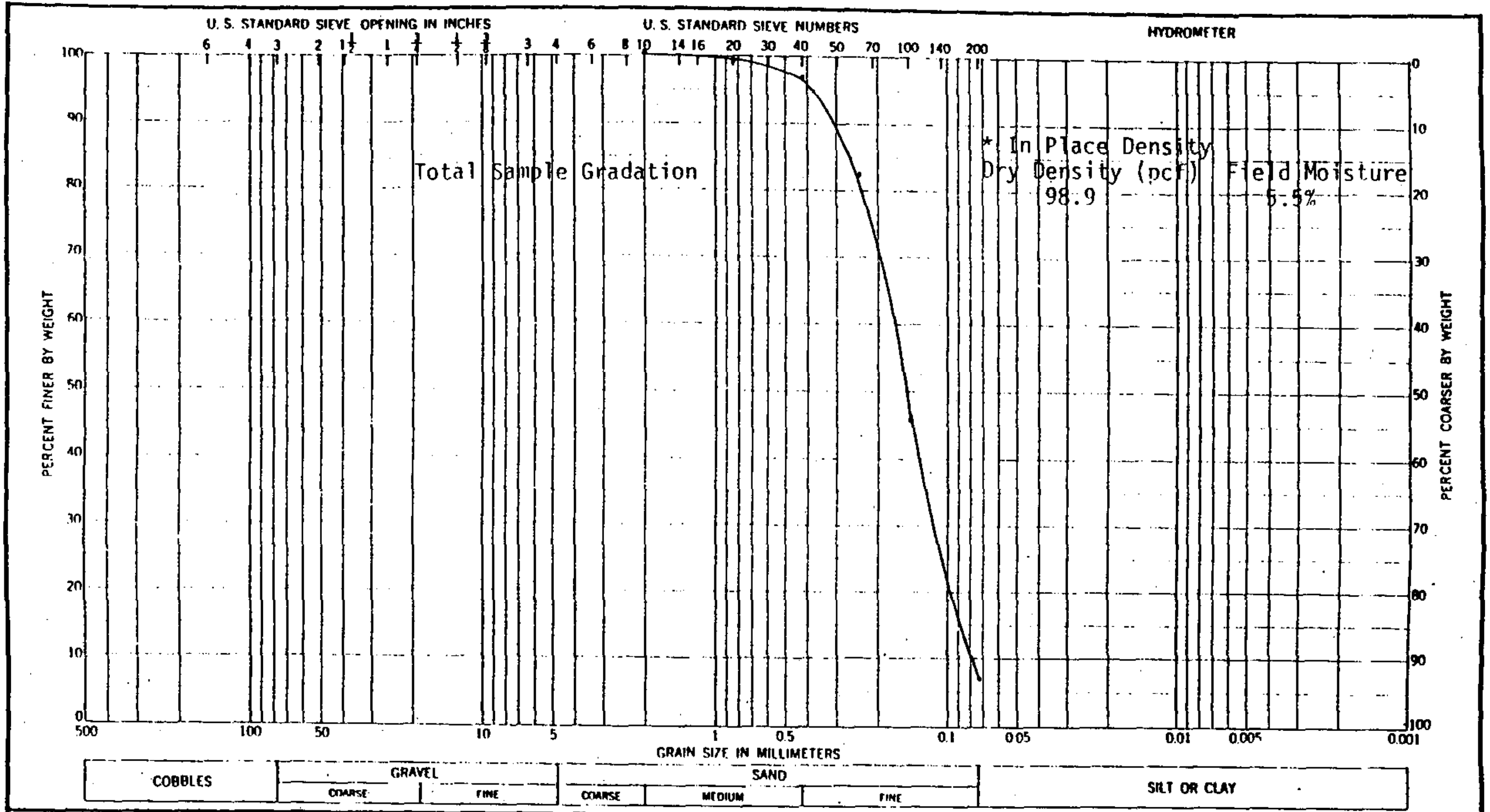
Project Kissimmee River
Lab. No. 4/3110*
Area Restoration Project
Boring No. HA-12, Sample No. 12D
Date 15 July 1991

GRADATION CURVES

* In place density test

ENG FORM 1 MAY 63 2087

Req. No. Rm-CW-91-0129



Total Sample Gradation

* In Place Density

Dry Density (pcf)	Field Moisture
98.9	5.5%

Sample No.	~~Elev~~ Depth	Visual Classification	Nat w %	LL	PL	PI
13D	12 - 18"	Lt. Gray, Poorly graded silty sand (SP-SM), w/a trace of shell fragments & mica.	-	Not Requested		

Project Kissimmee River

Lab. No. 4/3111*

Area Restoration Project

Boring No. HA-13, Sample No. 13D

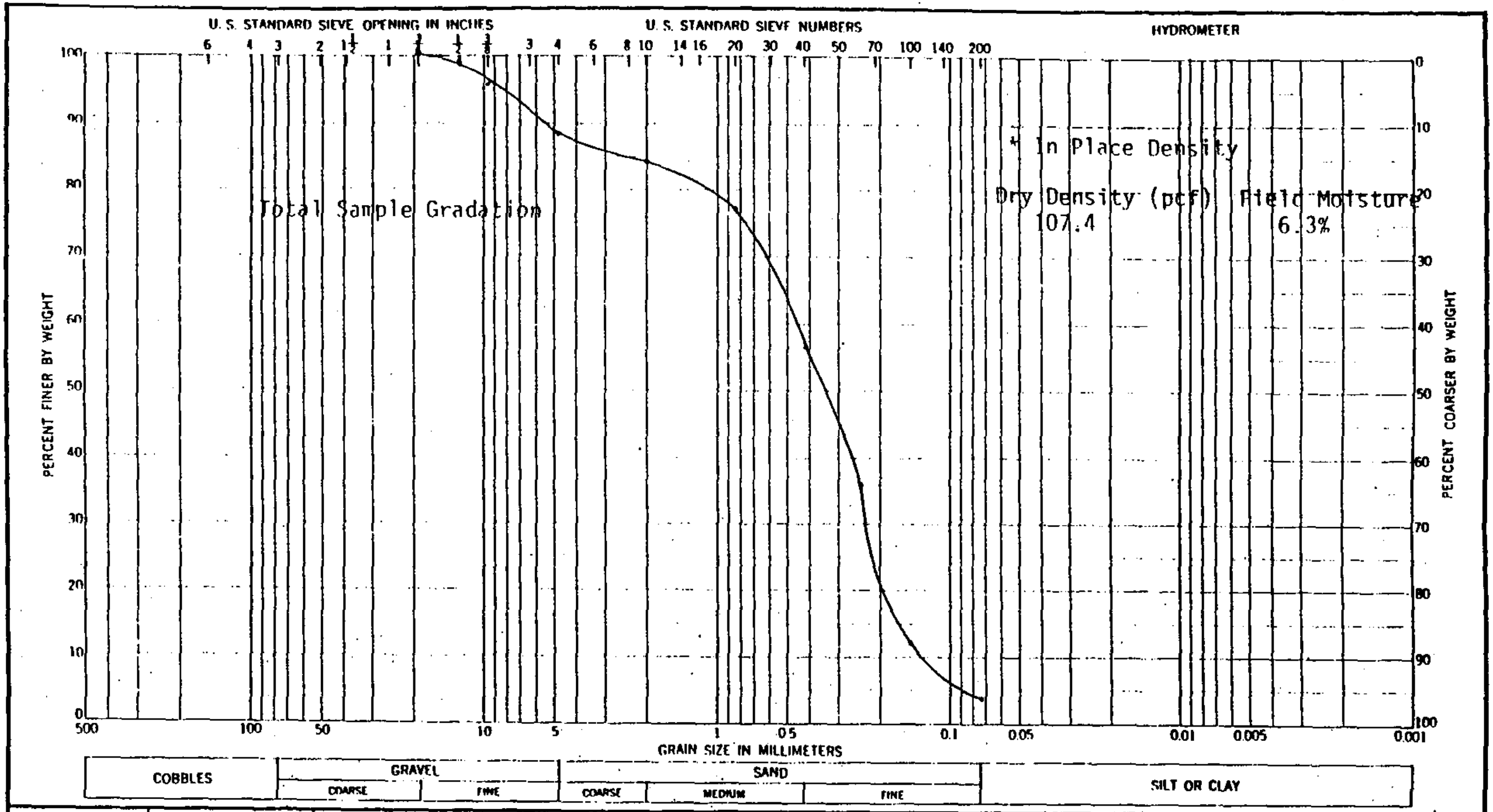
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

* In place density test

W. O. No. 6436
Req. No. RM-CW-91-0129



Total Sample Gradation

* In Place Density

Dry Density (pcf)	Field Moisture
107.4	6.3%

Sample No.	~~XXXX XX~~Depth	Visual Classification	Nat w %	LL	PL	PI
18D	12-18"	Tan, Poorly Graded Sand (SP) w/a little gravel size shell fragments & a trace of organic matter	-	Not	Reques	ted

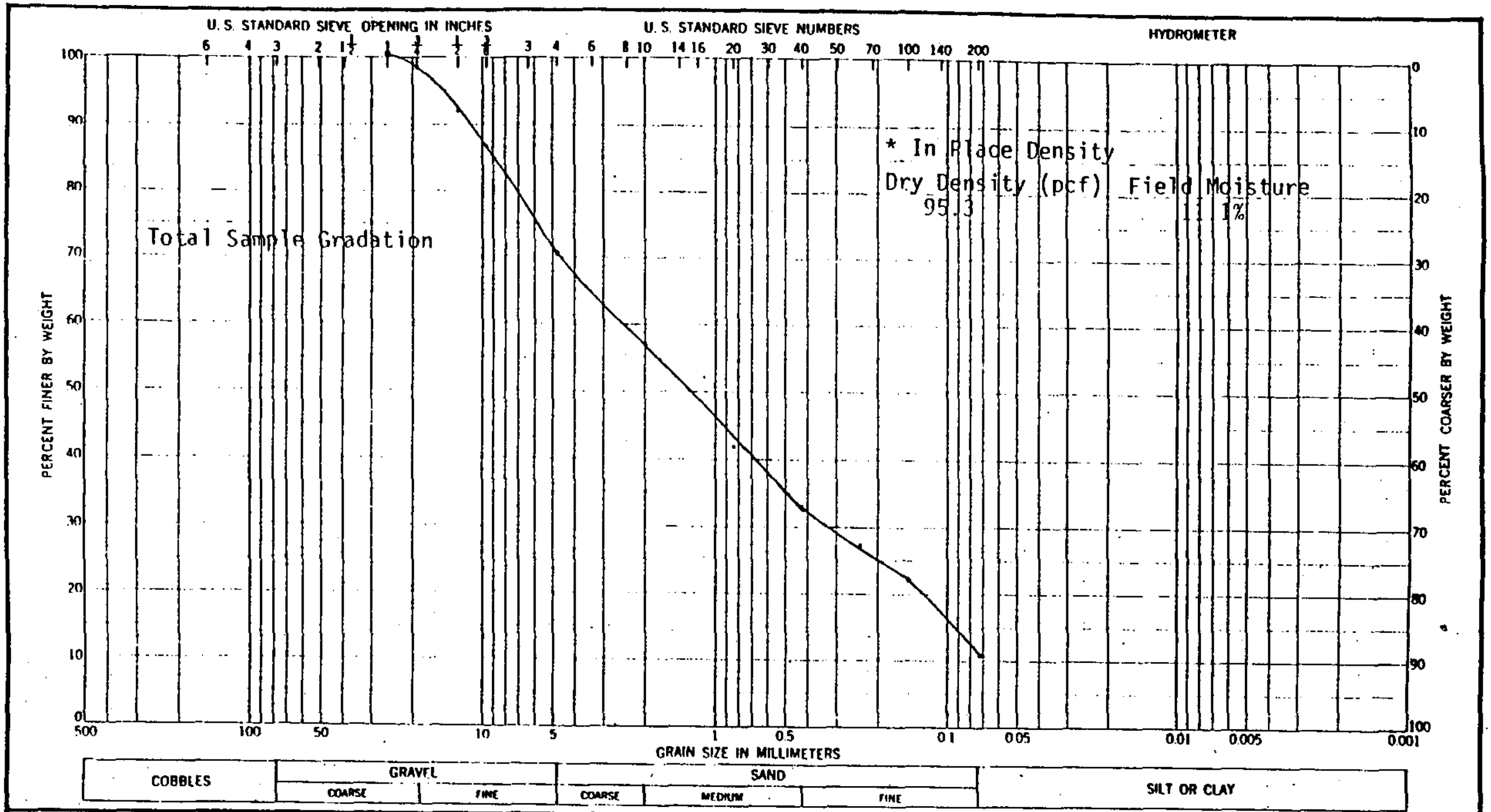
Project Kissimmee River
Lab. No. 4/3112*
Area Restoration Project
Boring No. HA-18, Sample 18D
Date 15 July 1991

GRADATION CURVES

ENG FORM 1 MAY 63 2087

* In Place Density Test

Req. No. RM-CW-91-0129



Total Sample Gradation

* In Place Density

Dry Density (pcf) Field Moisture
95.3 11.1%

Sample No.	Depth	Visual Classification	Nat w %	LL	PL	PI
20D	12 - 18"	Gray, poorly graded silty sand (SP-SM), w/some gravel size shell fragments & a trace of mica.	-	Not Requested		

GRADATION CURVES

Project Kissimmee River
Lab. No. 4/3113*
Area Restoration Project
Boring No. HA-20, Sample No. 20D
Date 15 July 1991

ENG FORM 1 MAY 63 2087

* In place density test

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

SUBAQUEOUS LAB TEST RESULTS

SUBAQUAEOUS LABORATORY TEST RESULTS

Test Procedure:

(1) Approximately 8% moisture was added to the samples to simulate in-place field densities.
(2) The samples were then placed in a beaker containing water and allowed to settle/consolidate underwater.
(3) The samples subaquaeous dry densities were then computed after being underwater 1.5 hours, 4 days, and after the sample was placed underwater while being vibrated. The vibrated subaquaeous dry density test was performed to simulate material being placed(pushed) into the canal(underwater) with earth moving equipment.
(4) The subaquaeous dry densities were then compared to field density test results obtained in the same general area as the samples location.

Subaquaeous			Field In-Place		
Sample No.	Dry-Density (pcf)	Water Cont. (%)	Test No.	Dry-Density (pcf)	Water Cont. (%)
After Underwater 1.5 Hours					
HA-8(SC)	68.7	56.4	8D(SM)	94.8	18.4
HA-13(SP-SM)	90.0	33.6	13D(SP-SM	98.9	5.5
HA-14(SM)	85.8	36.7	11D(SP)	99.3	7.6
After Underwater 4 Days					
HA-8(SC)	66.1	55.7			
HA-13(SP-SM)	87.5	33.3			
HA-14(SM)	86.7	33.5			
Samples Vibrated As Being Placed Underwater					
HA-8(SC)	66.8	57.6			
HA-13(SP-SM)	101.7	21.2			
HA-14(SM)	96.7	23.4			

APPENDIX D

SOCIO -ECONOMICS

APPENDIX D

SOCIO-ECONOMICS

TABLE OF CONTENTS

APPENDIX D

SOCIO-ECONOMIC

SOCIAL CHARACTERISTICS

General

The purpose of this appendix is to evaluate the effects of the modifications which are proposed to be made in the water control system presently existing in the Kissimmee River Basin. This portion of the appendix will describe the economic environment surrounding the study area and provide economic and demographic information useful in analyzing the resources within the boundary of the project.

The specific objectives to be addressed in this segment include the following:

A. a description of the study area along with a State and Regional Overview.
B. a discussion of the study area in a regional context.
C. an overview of the County area.
D. the economic base of the study area.

The general assumptions is this study are limited to the following:

A. During the project life there will be no major economic recessions which will seriously affect the long-term growth patterns of the Nation's economy.

B. There will be continued upward trends in population, employment, and production, accompanied by upward trends in total volume of consumption. International political tensions will remain at approximately the present level and there will be no widespread outbreak of hostilities.

Location and Description of Study Area

The area under study is the Upper and Lower section of the Kissimmee River Basin which covers approximately 2,380-square-miles. Since there are no major population centers in the Lower Basin, the demographics, social and economic statistics in this report will be for the counties adjacent to the Upper and Lower Kissimmee River Basin. The counties that will affect and influence the project site are Glades, Highlands, Okeechobee, Orange, Osceola and Polk.

The economic setting for this report will also be discussed in terms of the State and the above Counties perspective.

State and Regional Overview

Population growth and economic activity that surrounds the proposed project site are affected and influenced by external socio-economic characteristics and trends. This section outlines conditions in a Statewide and regional context.

FLORIDA IN THE NATIONAL CONTEXT

Population

The State began showing tremendous population growth after World War II. The number of people has more than quadrupled between 1950 and 1990 as shown in Table-1 primarily because of in-migration. During this 40-year period of growth, the State share of total United States' population increased steadily from 1.8 percent in 1950 to nearly 5.2 percent in 1990. The 1990 population for the United States is 249,632,692. OBERS projections of future population show approximately 19 million persons by the year 2035. Florida's share of the National population will then be over 6 percent. The University of Florida projects the States population to surpass 19 million in 2015. Table 2 and 3 displays estimates and population projections for the United States and the State of Florida.

Economic Base

Florida's economy is largely dependent on the trade, services and government sectors to generate income within the State. Much of this activity is supported by the large number of tourists who visit the State each year and the large number of people from other areas in the United States who select Florida as a retirement location. This increase in resident population requires a large service-oriented labor force which expands the job opportunities for existing residents and new in-migrants. Construction activity is also supported by the demands of these consumers. Agriculture is another important economic sector in the State. Florida is the national leader in citrus fruit growing and the manufacture of processed citrus products, accounting for over 70 percent of the nation's citrus production. Sugarcane, live stock, vegetables, and ornamental horticulture also represent substantial portions of the State's agricultural output. Manufacturing is primarily resource-oriented, utilizing the State's agricultural produce and minerals in the production activity. Over the past decade, there has been an emerging high technology manufacturing sector.

Much of this technology manufacturing sector is supported by military spending. This economic activity in Florida is in contrast to the national economy which is more dependent upon manufacturing. A comparison of employment and income by economic sector for Florida and the United States is shown in Table-4.

THE STUDY AREA IN A REGIONAL CONTEXT

Planning Regions

As the Florida economy has expanded, individual areas have tended to become diverse and take on their own distinct economic characteristics. In order to better describe each area, Florida has been divided into eleven planning areas. The area in which the proposed project is to be constructed is within planning area number six, seven, and nine which includes Polk, Osceola, Highlands, Okeechobee Orange, and Glades Counties.

Regional Population Growth

The three economic regions that comprise south and central Florida contained all but 21 percent of the state's total population in 1980. The share of total population in this area has been increasing as a result of its more favorable climate and location for retirement and industrial development. Since 1960, the central and south Florida area has accounted for approximately 72.7 percent of the state's population increases. Table 5 displays historic and current population.

The Central Economic Region maintained a 13 to 14 percent share of statewide population from 1960-1980. In 1990, the Central Region accounted for 16 percent of total state population. From 1960 to 1970, growth in this region was stimulated by NASA activity in Brevard County. Significant reductions in the space program at the turn of the decade negated gains made in the Orlando area with the advent of Walt Disney World. However, the region's share of statewide growth from 1960 to 1970 remained steady during 1970 to 1980. The region's share of statewide population growth from 1980-1990 is 21.4 percent which indicates an increase in the rate of growth since the 1970-1980 period.

The Southeast Economic Region's share of statewide growth declined from 42.8 during the period 1960-1970 to 37.2 percent during the period of 1970-1980, as increasing population densities and costs of living on the lower east coast drove large numbers of in-migrants to less crowded, less expensive Gulf Coast areas near Ft. Myers, Sarasota-Bradenton, and Tampa-St.

Petersburg. During the period from 1980-1990, there was a 28.2 percent increase in the Southeast Region population. The downward trend in the Region's share of statewide growth continued for the period 1980-1990, which saw the Southeast Region's share decline to 31.2 percent. The Southwest Economic region accounted for 27.0 percent of statewide population growth from 1960 to 1970. The Region's share of growth increased to 31.0 percent for the 1970 to 1980 period and remained stable at 31.0 percent for the 1980 to 1990 period.

Most of the state and regional population is located in SMSAs. Statewide, 86 percent of the population resides in the 16 metropolitan areas. Proportions are even higher in the three economic regions in which 89 to 91 percent of their populations are located in SMSAs. While this suggests a highly concentrated growth pattern, significant amounts of new growth have taken place in the smaller metropolitan areas (e.g., West Palm Beach, Sarasota, and Fort Myers). Population growth in SMSA counties other than the central urban counties (e.g., Hillsborough, Orange, and Pinellas) has actually declined.

In the future, population growth in the Central Region should increase in proportion to the state. Having adjusted to space program cutbacks, this region has reemerged as a major growth area in Florida, fueled largely by continued development in and around Walt Disney World. Moreover, the coastal counties of the Central Region - Brevard, Flagler, and Volusia should prove increasingly attractive to retirees. The Southwest Economic Region is also expected to continue to increase its share of statewide growth, but the Southeast Region is not. Projections of future population by region are shown in Tables 6 and 7.

Regional Economic Base

Each economic region has particular characteristics, but all are oriented mainly to serving tourists and/or a local retirement population. Manufacturing has a more dominant role in North Florida than in central and southern sections. Government-related economic activity is also more dominant in North Florida because of the presence of large military installations and state universities. The economic base of each region is discussed in this subsection.

The Central Economic Region includes one of the three SMSA counties in the study area. Its economy has developed around three industries: tourism, aerospace activities and related manufacturing, and citrus growing and processing. Volusia and Orange counties are the leading tourist areas, centering on coastal family resorts, Daytona Beach, and Walt Disney World.

Brevard and Orange counties are the principal manufacturing centers in the region, largely the result of the establishment of the Kennedy Space Center at Cape Canaveral in the late 1950's. Because of the Space Center, government and manufacturing sectors have been more prominent sources of income in the Central Economic Region than in either the Southeast or Southwest regions, as shown in Tables 8, 9, and 10. The manufacturing sector is projected to maintain the second largest share of regional earnings, after the service sector, through 2035. The government sector's share is projected to decline from 15.3 percent in 1983 to 11.3 percent in 2035.

The region's agricultural activities are centered in Lake and Orange counties, which rank third and sixth, respectively, in Florida, in the value of products sold. Agricultural produce in both counties has a direct bearing on local manufacturing activity. Nineteen percent of manufacturing employment in Orange County is in the food products industry, chiefly citrus processing, and 54 percent of manufacturing employment in Lake County is in the food products industry. See Table 11, 12 and 13 for Percent Distribution of Employment by Industry.

Orlando is the primary economic and transportation center in the Central Region and is located in the headwaters of the Kissimmee River Basin.

The coming of Disney World to Orange County has radically shifted the focus of the area economy to tourism. By all indications, tourism will continue to expand over the long term, more than offsetting future weaknesses in the agriculture and the aerospace industries.

The Southeast Economic Region includes two of the five non-SMSA counties in the study area - Glades and Okeechobee. The economy of the region is diversified both functionally and geographically. As a whole, the region's economy has been shaped by a long history of tourism and the in-migration of retirees along Florida's lower ocean coastline. Still, agriculture continues to play an important role in the region, and nearly 40 percent of all manufacturing employment in the state is located there. Palm Beach County ranks first in the state in the value of agricultural products. Sugarcane and vegetables are the principal cash crops. Urban Dade County ranks fourth in agricultural sales.

Dade County is also the state's principal manufacturing, transportation, and financial center. Nearly one-fourth of Florida's manufacturing employment is located in the Greater Miami area. Broward (Fort Lauderdale area) and Palm Beach counties are also important manufacturing centers, ranking second and seventh, respectively, in Florida in employment. Textiles and apparel head the list of manufacturing industries along with production of electronics and electrical equipment. The food products and electronics industries are important in Palm Beach County.

Further up the coast and in interior counties of the Southeast Region, agriculture and related food and dairy processing activities provide basic support for local economies. Tourism and retirement are becoming increasingly important components of the economics of Martin, St. Lucie, and Indian River counties, but agriculture and related activities are still more prominent. The interior counties of the Southeast Economic Region - Glades, Hendry, and Okeechobee - are dominated by agriculture. Glades and Hendry counties are leading sugarcane producers and refiners, while Okeechobee County is ranked second in the state in cattle production and first in dairy products. Glades and Hendry counties also rank high in cattle production. Northern coastal counties of the Southeast Region, particularly St. Lucie and Indian River counties, are major citrus growers, shippers, and processors.

There are no urban centers in the southeast region of the Kissimmee Basin. The Southwest Economic Region includes five designated metropolitan areas and two counties in the Lower Kissimmee River Basin - Highlands and Polk. The economy of the region is in transition from one dependent on agriculture, mining, and manufacturing to one centered around tourism and the in-migration of retirees. Mining and manufacturing activities are concentrated generally in the Tampa-St. Petersburg and Lakeland-Winter Haven (Polk County) SMSAs, while agriculture is more widespread. Tourism and retirement are widespread as well, but much of the region's growth is occurring in Gulf coastal counties to the north and south of the Tampa-St. Petersburg urbanized area.

Hillsborough, Pinellas, and Polk counties are among the leading manufacturing centers in Florida. Hillsborough County is a leading transportation center as well, with the Port of Tampa and a new international airport. Hillsborough and Polk counties lead the state in the manufacture of food products, chiefly from citrus fruits. As the center of the state's, as well as the nation's, phosphate mining industry, Polk County also ranks first in chemical manufacture in Florida. In Pinellas County, the electronics and electrical machinery industry is the principal manufacturing activity.

The region's main agricultural county is Polk County, which ranks only behind Palm Beach County in the value of agricultural products sold. Oranges are the principal farm commodity in the region, and the ridge area of Polk County is the citrus center of Florida.

Tampa and St. Petersburg are the major urban centers in the Southwest Region. The economy of Polk and Highlands counties is strongly linked to that of Tampa/Hillsborough County. Some of the citrus produce grown and rock mined in Polk County is processed in Hillsborough County. In addition, much of the citrus produce grown, boxed, and processed in Polk and Highlands counties and much of the phosphate rock and agricultural chemicals produced in Polk County are shipped through the Port of Tampa or via truck and rail transportation facilities serving the Tampa and Lakeland-Winter Haven areas. Tampa's airport is the main entry point for air travellers visiting tourist attractions in Polk and Highlands counties.

The completion of Interstate Route 4 between Orlando and Tampa and the development of Walt Disney World near northeastern Polk County has strengthened economic ties between Polk and Highlands counties and the growing Orlando area. The development of Poinciana, a large PUD, and the establishment of Circus World, both in eastern Polk County are links to the Orlando-Osceola-Walt Disney World area.

ECONOMIC DEVELOPMENT

Counties within the Kissimmee River Basin

The demography and economy of the counties within the Kissimmee River Basin area are discussed in this section. Recent trends are assessed and estimates are made for the following key indicators:

- Population - historic, and estimations, and projections
- Households - total numbers, and housing units
- Employment - total and for economic sectors by place of work
- Income - per capita, total personal, and by employment source
- Projections for the years 2015, and 2035

Metropolitan Counties

Osceola and Polk counties are at the center of the state's tourism, citrus, mining, and chemical industries. With the completion of Interstate Highway 4, followed by the development of Walt Disney World near Orlando, economic activity in this Central Florida area has increased dramatically during recent years. The outlook for continued growth in this area is as optimistic as it is for most regions in Florida.

Osceola County is part of the Orlando SMSA. Osceola County was added to the Orlando SMSA after 1970, in recognition of its close economic ties with Orange County. Although much of the county is rural and will remain so for many years to come, its northern sections are likely to become increasingly urbanized under the influence of Walt Disney World and improved highway connections with Orange County.

Osceola is one of Florida's largest counties with an approximate land area of 1,310 square miles. The center of the county's economy lies in the two incorporated cities of Kissimmee and St. Cloud, together accounting for more than 50 percent of total population. The remaining population is distributed throughout the unincorporated areas of the county.

Kissimmee is located 8 miles east of Disney World and 17 miles south of Orlando and is largely influenced by activities there. St. Cloud is primarily a retirement community. Urban development in these two communities accounts for less than 5 percent of the total county area.

Osceola County is dominated by agricultural land and vacant land which has soil characteristics that severely limit development potential. About 10 percent of the county area is dedicated to wildlife management areas.

Several major transportation routes traverse Osceola County, creating the potential for future development opportunities as well as easy access to other major cities. The North-South Florida Sunshine State Parkway and the East-West Interstate Highway 4 cross Osceola County, providing access to Daytona on the east coast and Tampa on the west coast.

Although the predominant land area is agricultural, the economic base of the county is characterized by relatively low wage or unskilled workers in the retail services and manufacturing sectors.

Polk County is a single county metropolitan area - the Lakeland-Winter Haven SMSA. The cities of Lakeland and Winter Haven, both much smaller than Orlando and most metropolitan centers in Florida, are the traditional urban centers of activity in Polk County. The county has its own economy based on the tourism, citrus, and phosphate industries. However, the county is also becoming increasingly influenced by the adjacent Orlando and Tampa-St. Petersburg SMSAs because of good cross-state connections afforded by Interstate Highway 4.

Polk County covers an area of 2,048 square miles and is coterminous with the Lakeland-Winter Haven SMSA. Approximately 500 square miles of the eastern portion of the county falls within the Kissimmee River Basin.

Agriculture, phosphate mining, and tourism all contribute to the economic base of the county. It is a favorable location for residential development, with easy access to Orlando to the east and Tampa to the west.

Polk County shares equal distinction in being the "World's Citrus Center," producing almost 25 percent of the state's annual crop, and the "Phosphate Capital of the World," accounting for almost one-half of the nation's entire phosphate production. However, phosphate production is expected to be at very low levels in 25 years, which will change the character of Polk County substantially.

The most significant development in the Kissimmee River Basin portion of Polk County will be the continued expansion of Poinciana, a large planned unit development (PUD) located in northern Polk and Osceola counties. This community attracts young and old alike, and 10 to 15 percent annual growth is expected in future years. All the homes are permanent, and an industrial park is being expanded, providing additional employment opportunities. The relative close proximity to Disney World also points to continued growth and expansion in this area of Polk County.

Non-metropolitan Counties

The five non-metropolitan counties in the eight-county Kissimmee Basin Economic study area are composed of two coastal counties (Martin and St. Lucie) and three interior counties (Glades, Highlands, and Okeechobee). All except Highlands and St. Lucie adjoin Lake Okeechobee. All counties are primarily rural, but Martin and St. Lucie counties have urban or developing coastlines.

None of the five counties are included in the state's Standard Metropolitan Statistical Areas (SMSAs). Glades, Martin, Okeechobee, and St. Lucie are part of the Southeast Market Region, which centers on the Miami-Ft. Lauderdale area. Highlands and Polk counties are part of the Southwest Market Region. Aside from some rural similarities near Lake Okeechobee, the level of development and the economies of all five counties are different. Most of Okeechobee County's land area and nearly all of its population and economic base are located in the Kissimmee River Basin. Only the largely undeveloped lowlands of Highlands County east of the central ridge and Lake Istokpoga are included in the basin. Very minor and undeveloped portions of Glades, Martin, and St. Lucie counties lie within the basin. Martin and St. Lucie counties are growing rapidly, but growth is occurring entirely outside the basin, largely along the coast. Similarly, growth in Highlands and Glades counties is occurring outside the basin. In both cases, only minimal activity is anticipated in the basin for many years.

The Kissimmee Basin area of these five counties is characterized by mostly rural undeveloped and agricultural land. Large cattle ranches and dairies account for most agricultural activity. The only concentration of urbanization occurs in and around the small but growing city of Okeechobee. Scattered development is found on the shoreline of Lake Okeechobee and along the Kissimmee River channel. Because most of the existing and potential agricultural and urban development occurs in Okeechobee County, it will receive more attention in this section than the other four counties.

Glades County

Glades County covers an area of 898 square miles, 16 percent of which consists of lakes and water bodies, including a portion of Lake Okeechobee. Growth has been slow in the county, and population density is among the lowest in Florida (1 person/75 acres of land). Agriculture dominates economic activities in the county, which includes beef cattle, dairy, sugarcane, forestry, and vegetable production. The county recognizes nine urban-suburban growth areas within which the majority of residential development and supporting commercial services occur. Some of these areas are Buckhead Ridge, Moore Haven, Palmdale, Ortona, and Port Labelle. However, none of these areas are within the 34-square-mile basin portion of Glades County. Only Buckhead Ridge, which is primarily a residential development on the northwest shore of Lake Okeechobee, may exert some growth pressure within the small vacant portion of the county that falls within the Kissimmee River Basin.

Highlands County

Highlands County covers an area of 1,040 square miles, 8 percent of which consists of water bodies, the largest of which is Lake Istokpoga. The portion of the county within the Kissimmee River Basin consists of a long narrow corridor along the eastern edge of the county. However, the principal urban centers of Avon Park and Sebring do not fall within this basin portion.

Beef cattle production is the key agricultural activity in the county, occupying 70 percent of the county's total area. Dairy operations and citrus farming also contribute to the economic base of the county.

Okeechobee County

Okeechobee County covers 780 square miles, 86 percent of which is devoted to agricultural use. The county is predominantly a rural agricultural community located on the northern shore of Lake Okeechobee. It has the largest concentration of dairy farms of any county in the state. Beef cattle ranching is also a major contribution to the economic base of the county. The only significant urban center is the city of Okeechobee located in the extreme southern end of the county adjacent to Lake Okeechobee. This urban area contains the majority of population in the county and is the center for employment which includes county government and private employment.

Transportation routes are primarily oriented to the city of Okeechobee in the southern portion of the county. The majority of the northern and central areas are completely devoid of any transportation arteries.

Almost all of the county, with the exception of the extreme northeast corner, falls within the Kissimmee River Basin.

Future growth in the county will depend on the growth of the coastal urban areas, primarily the West Palm Beach communities. If these areas continue to grow rapidly, encroachment into southern Okeechobee County is likely to expand as the planned industrial parks near Okeechobee County Airport begin to grow. However, the majority of the county will remain agriculturally based.

UPPER KISSIMMEE RIVER SUB-BASIN

The 1,595-square-mile Upper Kissimmee Sub-basin consists of parts of four counties: Orange, Osceola, Polk, and Lake. The areas of these counties within the Upper Basin are shown in Table 14.

The small 25-square-mile portion of Lake County contains only citrus lands and essentially no population and represents little influence on the Upper Basin as a whole.

The basin extends from Orlando southward to the outlet of Lake Kissimmee. Headwaters for the basin streams and lakes originate primarily along the eastern edge of the Lake Wales Ridge and the southern edge of the Osceola Plain, which encompasses a majority of the basin, and into the many interconnected Upper Chain of Lakes.

Population

The 1990 population within the Upper Kissimmee Basin was 1,190,601. The majority of the population resided in Orange County. Table 15 displays population for the three major counties in the Upper Basin (Orange, Osceola, and Polk). Table 16 displays population projections for counties in the Upper kissimmee River Basin.

Households

In 1990, there were 449,971 households in the Upper Kissimmee River Basin. The number of households in the Upper Kissimmee Basin of Osceola County more than doubled between 1980 and 1990 due primarily to the proximity of Disney World. This trend is expected to continue through the year 1994. The number of households in Orange and Polk counties increased by more than 70 percent during the same time frame.

Single-family homes support most households in the Upper Kissimmee Basin. Since 1970, however, the proportion of multifamily homes and mobile homes in the basin have increased. In 1980, the multifamily and mobile homes represented 39 percent of the total households in the Upper Basin counties, while in 1970, they represented only a 23-percent share of total households.

Single-family dwellings and multifamily units predominate in the urban areas of Orlando, Davenport, Haines City, Kissimmee, and St. Cloud. Single-family dwellings are also the major housing type around Disney World. However, mobile homes are found in increasingly larger numbers around some of the lakes in Polk and Osceola counties, particularly as land costs continue to rise.

Current and an estimated number of households for the Upper Basin counties (Orange, Osceola, and Polk) in the Upper Kissimmee Basin are displayed in Table 17. Unlike population projections, OBERS do not project households out to the year 2035.

Existing trends in housing types are likely to continue, that is, the increasing number of mobile homes, particularly in Osceola and Polk counties. Single-family dwellings and multifamily units will continue to predominate in the urban areas. Further development of single-family and multifamily units will continue to predominate in the urban areas. Further development of single-family and multifamily homes can be expected in the Poinciana PUD, which is located in both Polk and Osceola counties.

Employment

Employment in the Upper Kissimmee River Basin is dominated by services and trade, where, as of June, 1990, an estimated 591,494 people were employed out of a total basin employment of 640,137.

Since 1970, the trend in the Upper Kissimmee River Basin has been toward an increasing services and trade economy, fueled by the tourist-oriented Disney World and other recreational activities. Manufacturing appears to be employing less people today relative to total employment than it was in 1970; however, it still represents a stable element in the Upper Basin's economic base. The backbone of manufacturing in the basin is the Orange County-based electronics industry, whose growth was spurred by the aerospace activities at Cape Canaveral in the 1960's. Martin Marietta leads manufacturing sector employment with more than 5,500 employees.

Agricultural employment, which represents a 3.4-percent share of total basin employment, is oriented principally to citrus farming in Orange, Polk, and northern Osceola. Some agricultural employment is found in the southern portion of Osceola in beef cattle production. Almost all of this agricultural employment is basic employment in that the products, citrus crops, and beef are marketed and consumed outside of the basin. The number of employed persons and percent of employment by major industry are displayed in Table 18. Table 19 presents and average annual employment for counties in the Upper Kissimmee River Basin for the years 1988, 1989, and 1990.

All employment sectors are expected to show increases, with the services and trade sectors showing proportionately more than the other sectors. Agricultural employment is expected to decline in the Upper Basin from its current level due to increase of urban development and in addition to Disney World's expansion, the Poinciana PUD in Polk and Osceola counties will be a focal point for increased employment in the manufacturing, trade, and services sectors.

Income

Total personal income in the Upper Basin counties was estimated at $18.8 billion in 1989. More than 60 percent was earned in the Orange County part of the basin. Per capita income in the basin counties was estimated at $16,701. See Table 20.

LOWER KISSIMMEE RIVER SUB-BASIN

The 785-square-mile Lower Kissimmee Basin consists of parts of five counties: Polk, Osceola, Highlands, Okeechobee, and Glades. The areas of these counties within the Lower River Basin are shown in table 21. The major population centers for Polk and Osceola Counties are located in the Upper River Basin, therefore, social characteristics for the Lower River Basin will be for Highlands, Okeechobee, and Glades Counties.

The portions of Polk, Osceola, and Glades within the basin are relatively insignificant because of their relatively small area (94.6, 122.8 and 34.3 square miles respectively) and because there is essentially no population or economic activity in these areas. The Avon Park Bombing Range, a federally owned facility in the Polk County portion of the Lower Basin, is entirely vacant due to military activities. The economic and population centers in Osceola County (Kissimmee and St. Cloud) are in the Upper Basin.

Okeechobee and Highlands counties comprise the major land area of the Lower Basin, but there are no major urban centers located within the basin portion of these counties. The basin is currently dominated by agricultural activities and this will likely continue in the future.

Population

The 1990 population of the Lower Kissimmee Basin was 105,650 people. Table 22 displays population for the three counties (Glades, Highlands, Okeechobee) used for social characteristics in the Lower Basin . Table 23 displays population projections.

In Highlands County, two small communities, Fort Basinger and Cornwell, have approximately 200 people In Okeechobee County, the community of Basinger has about 300 people. A small residential area called River Acres adjacent to the Kissimmee River currently has about 15 people. The major urban concentration in the area is Okeechobee City, but this area is within the Taylor Creek-Nubbin Slough Sub-basin.

The small portion of Glades County in the basin has no significant population. Growth in the Lower Kissimmee Sub-basin has been very low, much of which is due to natural increase. The major growth areas are outside the basin in Avon Park and Sebring in Highlands County and in Okeechobee City in Okeechobee County.

Housing

In 1990, there were 42,643 households in the Counties located in the Lower Kissimmee River Basin Counties.

The households in the basin are made up of a mixture of single-family permanent residences and mobile homes, many of which are distributed among Cornwell, Fort Basinger, and Basinger. Kissimmee River Estates is a mix of about 100 mobile and permanent homes located in southern Highlands County. Kissimmee Shores is an area comprised of about 80 mobile homes along the Kissimmee River near Fort Basinger. The projected growth in number of households will occur in and around these areas and will be a mix of single-family permanent residences and low-density mobile homes.

The development of the Coquina Property, a 25-square-mile tract in north-central Okeechobee County in the Lower Basin, could increase the projections of population and households significantly. However, development is presently inactive, no homes exist and plots are being sold as investment properties. Furthermore, the plots are not advertised as homesites, and there is concern about proper drainage and other permit requirements. Therefore, because of these circumstances and the property's relative isolation from any major arteries and infrastructure, this area is not projected as a growth area in the Lower Basin. Current and projected number of households for the Lower Basin Counties (Glades, Highlands, Okeechobee) are displayed in Table 24.

Employment

It is estimated that about 27 percent of the employed people are engaged in agricultural activities; the remainder are employed in various trade and services sectors. Almost all of this agricultural employment is considered to be basic employment as the products, principally milk and beef are marketed and consumed outside the Lower Basin's boundaries. Most of the basin employment occurs in Highlands and Okeechobee counties. Glades and Okeechobee counties contribute the lowest labor force, only about 4.9 percent to overall employment.

Total employment increases in the Lower Basin will be modest. The major employment changes in Okeechobee County will occur in the Taylor Creek-Nubbin Slough Basin. There will be some increase in commercial employment as the industrial areas adjacent to the Okeechobee airport expand. The number of employed persons and percent distribution of employment by industry are shown in Table 26. Table 25 presents average annual employment for counties in the Lower Kissimmee River Basin for the years 1988, 1989, and 1990.

Total personal income in the Lower Basin is estimated at $1.3 billion in 1989. Total Per capita income for the counties in the basin is estimated to be $12,992. Table 27 gives per capita income in constant 1989 dollars. The sources of this income are expected to be dairy farming, beef cattle, row crops, and a small amount from citrus production. In addition, trade and services employment will contribute to the total personal income in the basin. The basin portions of Highlands and Okeechobee counties contribute more than 90 percent of the total income earned in the entire Lower Basin. The remainder is contributed by Glades County.

TABLES

TABLE-1
POPULATION IN FLORIDA

Year	Florida Population (in thousand)	Percent Change	Percent Share of U.S. Population
1950	2,771.3	-	1.8
1960	4,951.6	78.7	2.7
1970	6,791.4	47.9	3.3
1980	9,747.0	43.5	4.3
1985	11,287.9	16.8	4.9
1990	12,937.9	14.6	5.2

TABLE-2

POPULATION PROJECTIONS - OBERS
(Thousands)

YEAR	1995	2000	2005	2015	2035
United States	259,085.0	267,464.0	275,177.0	289,906.0	306,618.0
State of Florida	13,674.9	14,627.7	15,414.4	16,868.5	18,996.1

TABLE-3

POPULATION PROJECTIONS - UNIVERSITY OF FLORIDA
(Thousands)

YEAR	1995	2000	2005	2010	2015	2020
State of Florida	14,723.7	15,988.0	17,071.1	18,089.0	19,089.0	19,991.4

TABLE 4

PERCENT DISTRIBUTION OF EMPLOYMENT AND EARNED INCOME (1989/1990)

	U.S.		FLORIDA	
Industry Sector	(1989) Employment	(1989) Income	(1990) Employment	(1989) Income
Agriculture	N/A	1.8	N/A	1.7
Mining	0.7	1.0	0.2	0.4
Construction	4.9	6.2	6.0	7.2
Manufacturing	18.6	18.7	10.0	10.7
Transportation, Communications & Public Utilities	5.3	8.8	5.0	8.4
Wholesale & Retail Trade	23.8	18.0	27.0	18.9
Finance, Insurance, & Real Estate	6.4	7.0	7.0	7.8
Services	23.7	25.5	30.0	30.1
Government	16.8	15.6	16.0	16.0
TOTAL	100.0	100.0	100.0	100.0

SOURCES: Bureau of Labor/Employment, Wash., D.C.
1990 State & Metro Data Book

TABLE 5

REGIONAL POPULATION

Region	1960	1970	1980	1990	Percent Change 1980-90
Central	697,267	941,361	1,371,680	2,054,820	49.8
Southwest	1,302,300	1,799,063	2,777,270	3,766,322	35.6
Southeast	1,644,000	2,431,095	3,539,659	4,538,394	28.2
State of Florida	4,951,600	6,791,418	9,746,961	12,937,926	32.7

Source: 1970 and 1988 Florida Statistical Abstract, University of Florida

Florida 1990 Population Totals, Bureau of the Census, Department of Commerce

TABLE 6

REGIONAL POPULATION PROJECTIONS-OBERS
(Thousands)

Region	1995	2000	2005	2015	2035
Central	2,135.2	2,310.9	2,451.0	2,700.0	3,069.5
Southwest	4,085.0	4,401.7	4,661.0	5,143.8	5,857.7
Southeast	4,682.1	4,973.5	5,220.6	5,693.7	6,372.5

TABLE 7

REGIONAL POPULATION PROJECTIONS-UNIVERSITY OF FLORIDA
(Thousands)

Region	1995	2000	2005	2010	2015	2020
Central	2,389.4	2,653.3	2,882.8	3,099.0	3,310.9	3,503.5
Southwest	4,285.3	4,670.1	5,001.2	5,313.0	5,619.2	5,896.4
Southeast	4,920.4	5,217.1	5,450.9	5,657.8	5,841.5	6,013.0

TABLE 8

PERCENT DISTRIBUTION OF EARNED INCOME BY INDUSTRY
CENTRAL ECONOMIC REGION/ORLANDO-MELBOURNE-DAYTONA BEACH
(AREA 042)
(1970 - 2035)

Industry Sector	1970	1978	1983	1995	2000	2005	2015	2035
Agriculture	6.7	1.3	3.6	2.6	2.4	2.3	2.1	2.0
Mining	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Construction	7.5	7.0	7.3	7.0	6.8	6.7	6.4	6.3
Manufacturing	16.9	16.6	17.0	17.9	17.8	17.7	17.7	17.7
Trans., Communica., & Public Utilities	4.9	6.8	6.9	7.6	7.9	8.1	8.4	8.6
Wholesale and Retail Trade	17.4	19.2	18.2	16.9	16.7	16.5	16.1	15.9
Finance, Insurance, and Real Estate	5.1	6.3	5.6	6.5	6.6	6.6	6.6	6.6
Services	22.4	23.6	26.0	29.2	30.0	30.5	31.1	31.5
Government	19.0	19.0	15.3	12.1	11.7	11.6	11.4	11.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986.

TABLE 9

PERCENT DISTRIBUTION OF EARNED INCOME BY INDUSTRY
SOUTHEAST ECONOMIC REGION/MIAMI-FT. LAUDERDALE
(AREA 043)
(1970 - 2035)

Industry Sector	1970	1978	1983	1995	2000	2005	2015	2035
Agriculture	3.4	0.8	2.3	1.9	1.8	1.8	1.8	1.7
Mining	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.1
Construction	10.4	7.0	7.3	6.8	6.6	6.4	6.2	6.0
Manufacturing	12.9	13.2	12.0	12.6	12.5	12.4	12.5	12.6
Trans.,Communi, & Public Utilities	11.0	11.0	10.4	10.6	10.7	10.9	11.1	11.3
Wholesale and Retail Trade	20.4	21.0	20.1	19.4	19.3	19.1	18.6	18.7
Finance, Insurance, and Real Estate	6.9	8.3	8.4	9.8	9.9	9.9	9.9	8.9
Services	20.4	24.2	26.0	26.9	27.3	27.4	27.7	27.7
Government	14.4	14.4	13.2	11.9	11.8	11.8	11.9	12.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 10

PERCENT DISTRIBUTION OF EARNED INCOME BY INDUSTRY
SOUTHWEST ECONOMIC REGION/TAMPA-ST. PETERSBURG
(AREA 044)
(1970 - 2035)

Industry Sector	1970	1978	1983	1995	2000	2005	2015	2035
Agriculture	5.5	1.4	3.5	2.8	2.6	2.5	2.4	2.3
Mining	0.9	1.1	0.6	0.6	0.6	0.5	0.5	0.5
Construction	9.4	9.2	8.5	8.5	8.4	8.2	8.0	8.0
Manufacturing	15.4	14.4	13.1	13.7	13.6	13.6	13.7	13.8
Trans., Communi., & Public Utilities	6.9	8.1	7.3	7.9	8.0	8.2	8.3	8.4
Wholesale and Retail Trade	21.5	21.7	20.9	19.1	18.9	18.7	18.3	18.1
Finance, Insurance, and Real Estate	7.0	7.8	7.4	8.8	8.9	8.9	8.9	8.9
Services	18.3	20.8	23.6	26.0	26.6	26.9	27.4	27.7
Government	15.2	15.5	14.1	12.5	12.4	12.4	12.5	12.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986.

TABLE 11

PERCENT DISTRIBUTION OF EMPLOYMENT BY INDUSTRY
CENTRAL ECONOMIC REGION/ORLANDO-MELBOURNE-DAYTONA BEACH
(AREA 042)
(1970 - 2035)

Industry Sector	1970	1978	1983	1995	2000	2005	2015	2035
Agriculture	5.2	2.2	4.2	3.9	3.7	3.5	3.4	3.2
Mining	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Construction	8.1	6.6	7.0	6.7	6.6	6.5	6.3	6.2
Manufacturing	15.5	11.8	11.8	12.0	11.7	11.6	11.4	11.2
Trans., Communi., & Public Utilities	6.3	4.3	4.5	4.6	4.6	4.7	4.8	4.9
Wholesale and Retail Trade	22.8	23.9	23.7	24.1	24.2	24.3	24.4	24.5
Finance, Insurance, and Real Estate	5.3	5.7	6.0	6.3	6.4	6.4	6.4	6.3
Services	17.3	26.7	27.6	30.8	31.6	32.0	32.7	33.2
Government	17.7	18.6	15.0	11.7	11.2	11.0	10.7	10.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 12

PERCENT DISTRIBUTION OF EMPLOYMENT BY INDUSTRY
SOUTHEAST ECONOMIC REGION/MIAMI-FT. LAUDERDALE
(AREA 043)
(1970 - 2035)

Industry Sector	1970	1978	1983	1995	2000	2005	2015	2035
Agriculture	3.6	1.5	3.3	3.5	3.5	3.5	3.4	3.4
Mining	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Construction	8.8	6.5	6.6	6.2	6.0	5.9	5.7	5.5
Manufacturing	14.0	12.1	10.2	9.8	9.5	9.3	9.1	8.9
Trans., Communi., & Public Utilities	9.0	6.6	6.4	6.1	6.2	6.2	6.3	6.3
Wholesale and Retail Trade	24.1	25.4	25.4	26.3	26.5	26.7	26.9	27.2
Finance, Insurance, and Real Estate	6.6	7.4	8.2	9.0	9.2	9.3	9.3	9.4
Services	20.2	26.4	27.3	27.9	28.2	28.6	28.6	28.6
Government	13.6	14.1	12.5	11.0	10.8	10.7	10.7	10.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986.

TABLE 13

PERCENT DISTRIBUTION OF EMPLOYMENT BY INDUSTRY SOUTHWEST ECONOMIC REGION/TAMPA-ST. PETERSBURG
(AREA 044)
(1970 - 2035)

Industry Sector	1970	1978	1983	1995	2000	2005	2015	2035
Agriculture	5.7	2.3	4.1	4.3	4.1	4.1	3.9	3.8
Mining	1.0	0.7	0.4	0.4	0.4	0.4	0.3	0.3
Construction	9.2	8.5	8.2	8.0	7.8	7.7	7.6	7.4
Manufacturing	13.9	11.6	10.2	9.8	9.6	9.4	9.2	9.0
Trans., Communi., S Public Utilities	6.7	5.0	4.6	4.6	4.6	4.6	4.6	4.6
Wholesale and Retail Trade	24.9	26.0	25.8	26.2	26.4	26.5	26.8	27.1
Finance, Insurance, and Real Estate	6.1	6.9	7.5	8.2	8.3	8.3	8.3	8.3
Services	17.6	23.8	24.7	27.0	27.6	27.8	28.2	28.5
Government	14.9	15.3	13.5	11.6	11.3	11.2	11.1	11.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986.

TABLE 14

AREA RELATIONSHIP OF UPPER KISSIMMEE BASIN COUNTIES

County	Area of Basin in County (Square Miles)	Percent of Total Basin Area
Orange	323.3	20.3
Osceola	822.2	51.5
Polk	424.2	26.6
Lake	25.3	1.6
Total	1,595	100.0

TABLE 15

POPULATION IN THE UPPER KISSIMMEE BASIN

Percentage
Change

County	1970	1980	1990	1980-90
Orange	344,311	470,865	677,491	43.9
Osceola	25,267	49,287	107,728	118.6
Polk	227,222	321,652	405,382	26.0
Total	595,800	841,804	1,190,601	41.4

TABLE 16

POPULATION PROJECTIONS FOR COUNTIES IN THE UPPER KISSIMMEE BASIN

County	1995	2000	2005	2015	2035
Orange	678,401	726,581	764,895	838,109	945,069
Osceola	106,038	118,970	129,101	146,744	173,365
Polk	433,023	461,073	483,872	524,377	584,801
Total	1,217,462	1,306,624	1,377,868	1,509,230	1,703,235

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986

TABLE 17

HOUSEHOLDS FOR UPPER KISSIMMEE RIVER BASIN
BY COUNTIES
(1980-1990)
Percentage

County	1970	1980	1990	1994p	Change
Orange	108,659	170,754	254,852	273,973	49.3
Osceola	9,092	18,615	39,150	47,237	110.3
Polk	73,024	114,394	155,969	174,143	36.3
Total	190,775	303,763	449,971	495,353	48.1

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986
U.S. Bureau of Census, 1990

TABLE 18

PERCENT DISTRIBUTION OF EMPLOYMENT BY INDUSTRY FOR COUNTIES IN THE UPPER KISSIMMEE RIVER BASIN

Industry	(1970) Number	Percent of Total	(1987) Number	Percent of Total
Agriculture, Forestry, and Fisheries	15,979	7.4	19,027	3.4
Mining	3,520	1.6	4,009	0.7
Construction	18,043	8.3	32,220	5.8
Manufacturing	32,666	15.0	64,103	11.6
Transportation, Communications, and Utilities	14,422	6.6	24,818	4.5
Wholesale Trade and Retail Trade	51,632	23.8	138,532	25.0
Finance, Insurance, and Real Estate	12,578	5.8	35,494	6.4
Services	34,390	15.8	156,925	28.3
Government	33,923	15.6	78,455	14.2
Total	217,153	100.0	553,583	100.0

Source: Regional Economic Analysis Division, OBERS, Bureau of Economics Florida, 1970 General Social and Economic Characteristics

TABLE 19

AVERAGE ANNUAL EMPLOYMENT FOR COUNTIES IN THE UPPER KISSIMMEE BASIN FROM DEC. 1988 - JUN. 1990

County	1988	1989	1990
Orange	353,708	366,848	378,281
Osceola	46,540	48,269	49,774
Polk	163,376	164,052	163,439
Total	563,624	579,169	591,494

Source: Regional Economic Analysis Division, OBERS, Bureau of Economics Florida, 1970 General Social and Economic Characteristics

TABLE 20

TOTAL PERSONAL AND PER CAPITA INCOME FOR COUNTIES IN THE UPPER BASIN (1989)

County	TOTAL PERSONAL INCOME (In Mil. of Dollars)	PER CAPITA INCOME (In Dollars)
Orange	11,409.0	18,083
Osceola	1,662.0	17,796
Polk	5,768.0	14,246
Total	18,839.0	16,701

Source: Survey of Current Business, US Department of Commerce, Bureau of Economic Analysis, April, 1991, Vol. 71

TABLE 21

AREA RELATIONSHIP OF LOWER KISSIMMEE BASIN COUNTIES

County	Area of Basin in County (Square Miles)	Percent of Total Basin Area
Glades	34.3	4.3
Highlands	143.7	18.3
Okeechobee	389.4	49.5
Osceola	122.8	15.7
Polk	94.6	12.2
Total	784.5	100.0

TABLE 22

POPULATION FOR COUNTIES IN THE LOWER KISSIMMEE BASIN

County	1970	1980	1990	Percentage Change 1980-90
Glades	3,669	5,992	7,591	26.7
Highlands	29,507	47,526	68,432	44.0
Okeechobee	11,233	20,264	29,627	46.2
Total	44,409	73,782	105,650	43.2

Source: 1986 OBERS and 1990 Florida Census of Population, U.S. Department of Commerce, Bureau of Economic Analysis and Bureau of Census.

TABLE 23

POPULATION PROJECTIONS FOR COUNTIES IN THE LOWER KISSIMMEE RIVER BASIN

County	1995	2000	2005	2015	2035
Glades	7,646	7,986	8,288	8,787	9,598
Highlands	70,937	76,097	80,286	87,303	97,722
Okeechobee	31,526	33,836	35,722	39,064	44,164
Total	110,109	117,919	124,296	135,154	151,484

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, OBERS 1986

TABLE 24

HOUSEHOLDS FOR LOWER KISSIMMEE RIVER BASIN BY COUNTIES

County	1970	1980	1990	1994p	(1980-1990) Percentage Change
Glades	1,115	2,224	2,885	2,697	29.7
Highlands	10,468	18,960	29,544	35,108	55.8
Okeechobee	3,178	6,981	10,214	14,215	46.3
Total	14,761	28,165	42,643	52,020	51.4

Source: Regional Economic Analysis Division, OBERS, Bureau of Economics
Florida, 1970 General Social and Economic Characteristics

TABLE 25

AVERAGE ANNUAL EMPLOYMENT FOR COUNTIES IN THE LOWER KISSIMMEE BASIN FROM DEC. 1988 - JUNE 1990

County	1988	1989	1990
Glades	2,548	2,661	2,648
Highlands	22,506	23,275	23,618
Okeechobee	10,368	10,470	11,218
Total	35,422	36,406	37,484

Source: 1986 Regional Economic Analysis Division, OBERS, Bureau of Economics
1990 U.S. Bureau of Census

TABLE 26

PERCENT DISTRIBUTION OF EMPLOYMENT BY INDUSTRY FOR COUNTIES IN THE LOWER KISSIMMEE RIVER BASIN

Industry	(1970) Number	Percent of Total	(1987) Number	Percent of Total
Agriculture, Forestry, and Fisheries	3,893	26.6	3,804	14.2
Mining	23	0.2	53	0.2
Construction	1,200	8.2	1,768	6.6
Manufacturing	825	5.6	1,406	5.2
Transportation, Communications, and Utilities	744	5.1	866	3.2
Wholesale Trade and Retail Trade	3,043	20.8	7,170	26.7
Finance, Insurance, and Real Estate	448	3.1	1,110	4.1
Services	2,071	14.1	5,648	21.0
Government	2,395	16.4	5,058	18.8
Total	14,642	100.0	26,883	100.0

Source: 1986 Regional Economic Analysis Division, OBERS, Bureau of Economics Florida, 1970 General Social and Economic Characteristics

TABLE 27

TOTAL PERSONAL AND PER CAPITA INCOME FOR COUNTIES IN THE LOWER BASIN (1989)

County	TOTAL PERSONAL INCOME (In Mil. of Dollars)	PER CAPITA INCOME (In Dollars)
Glades	61.0	8,776
Highlands	964.0	13,932
Okeechobee	347.0	11,193
Total	1,372.0	12,992

Source: Survey of Current Business, US Department of Commerce, Bureau of Economic Analysis, April, 1991, Vol. 71

APPENDIX E

NAVIGATION AND RECREATION

APPENDIX E

NAVIGATION AND RECREATION

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APPENDIX E

NAVIGATION AND RECREATION

AUTHORIZED PROJECTS

The Congressionally authorized navigation project on the Kissimmee River extends from the town of Kissimmee to Fort Basinger, a distance of about 100 miles, and an additional 9.4 miles in Istokpoga Creek which connects the Kissimmee River to Lake Istokpoga. Figure 1 in the main report shows the project. The authorization was provided by the Rivers and Harbors Act of June 13, 1902, and provided for a channel 3 feet deep at ordinary low stage and 30 feet wide. The town of Kissimmee was at mile marker 137 and Fort Basinger was at mile marker 37 for a distance of about 100 miles. From Fort Basinger to Lake Okeechobee the river had a minimum depth of 5 feet over a distance of about 37 miles.

The 1954 Authorization for the Central and Southern Florida Flood Control Project provided for Canal 35 (C-35), Canal 36 (C-36), Canal 37 (C-37), and Canal 38 (C-38) which generally followed the existing navigation project from the town of Kissimmee to Fort Basinger. Figure 5 in the main report shows those canals and related structures. Canal 38 begins at Lake Kissimmee and extends past Fort Basinger south to Lake Okeechobee using only portions of the old Kissimmee River.

The 1954 authorization also included water control structures on each canal except on Canals 36 and 37 which connect Lakes Cypress, Hatchineha, and Kissimmee. The navigation channel and flood control canals coexist between those lakes. The water control structure (S-64) that was originally proposed for construction in Canal 37 was omitted from the project. That structure would have maintained a higher water level in the upper lakes of Hatchineha and Cypress. The other authorized and constructed structures are listed below with distances between them from the town of Kissimmee to Lake Okeechobee:

	MILES
Kissimmee Waterfront to S-61	10 1/2
S-61 to S-65	31
S-65 to S-65A	10 1/2
S-65A to S-65B	12
S-65B to S-65C	9
S-65C to S-65D	9
S-65D to S-65E	7 1/2
S-65E to Lake Okeechobee	8
Total:	97 1/2

In order to maintain navigation as authorized along the Kissimmee River, the 1954 authorization also included small locks for passing shallow-draft boats at the water-control structures. The lock dimensions at each of the above structures provide a width of 30 feet, length of 90 feet and depth of 6 feet. The C-38 flood control project improved the authorized navigation project from a depth of 3 feet to a year-round depth of 5 feet from Lake Kissimmee to Lake Okeechobee.

HISTORICAL BACKGROUND

Information of a historical nature is available from Annual Reports of the Chief of Engineers from 1921 to 1931 and prior reports on the Kissimmee River for both navigation and flood control. These reports provide a glimpse of the initial purpose of the projects and problems resulting from changing conditions.

Initial Study Findings

The United States Engineer Office in Tampa, Florida, completed the initial study and report which was a preliminary examination of the Kissimmee River and connecting lakes and canals flowing into Lake Okeechobee thence down the Caloosahatchee River to the Gulf of Mexico. The Engineer Office completed that report in August 1899 with a recommendation for a survey of the Kissimmee River. The Secretary of War directed the survey be done and the Engineer Office in Tampa completed the report on the survey in December 1901. The findings in the preliminary examination and survey reports were favorable only to the Kissimmee River portion from the town of Kissimmee to Fort Basinger. Below Fort Basinger south to Lake Okeechobee there was no commerce nor trade as the area was an uninhabited swamp at that time.

Commercial navigation from 1895 to 1899 from Fort Basinger to the town of Kissimmee involved the transport of oranges, hides and vegetables. Freight downstream from the town consisted of grain, forage, lumber, and general supplies for the population along the river. The town served as a supply depot for extensive cattle interests that were along the river and not close to any rail service that existed 30 to 50 miles to east and west. The roads in the area were few and swampy with mail riders being the primary users except during low water.

Low water was the main problem for navigation with local interests stating they needed 3 feet for commercial traffic. In the natural river sand bars were the main obstructions with a controlling depth of 2 feet at ordinary low water and with as little as 1 foot during extreme low water. Depth problems stopped navigation on the river for months at a time according to the preliminary examination report in 1899. The following data from that report shows the extent of the problem:

Year	Months without Navigation
1895	5
1896	0
1897	8
1898	5

Project Authorization to 1932

After authorization of the Kissimmee River navigation project in 1902, the channel work was completed in 1909. Based on Annual Reports of the Chief of Engineers from 1921 - 1931, there was a problem with shoaling after construction. The reports indicated that maintenance was never adequate on the project. From the early records there was channel maintenance through 1927 which was apparently the last maintenance on the project. Other maintenance work during that period involved repair and replacement of bulkheads and dams along the channel to control the flow. From 1927 to 1931 the records show no funds expended for maintenance.

The annual reports for that period had information on the status of operations with regard to maintenance on the waterway, adequacy of terminal facilities, effects of the project on vessel traffic, and data on commercial statistics. The discussions in those reports also included possible influences from other sources impacting on operating conditions. Those influences included the railroad expansion underway before 1920 as well as improvements in the local road system.

The problems with maintenance and low water, coupled with other competing modes of transportation, had an apparent impact on the river trade as noted in the commercial statistics discussed in subsequent paragraphs. From 1916 to 1927 the records have statements on the loss of shallow draft commercial boats with only a few boats remaining in business by 1927. No numbers were available on the vessels in those early years of record. The 1928 annual report indicated the loss of two freight boat lines in calendar year 1927 and a significant drop in tonnage occurred for that year. From 1927 to 1931 the vessels carrying the cargo had drafts of less than 2 feet. The last full Annual Report of the Chief of Engineers, describing conditions in the area, was in 1931.

Tonnage and passenger statistics on the navigation project came from the Annual Reports of the Chief of Engineers up to 1931. Information beyond that year came from the annual publication, Waterborne Commerce of the United

States, Part 2. Table E-1 provides the traffic statistics from those reports. The table shows a general decline in commercial tonnage and passengers on the river in the early years of the project as other transportation modes developed, competition increased, and low water depths hindered navigation.

From the early records the passenger counts were from a wide variety of sources. Passengers on freight boats, recreational craft, for-hire boats, and excursion vessels were included in the count. A major influence in those counts was the annual fluctuations in farm laborers based on demand in local work areas along the river. As the number of boats decreased and difficulty in operating on the river increased, the passenger count also dropped to lower levels and fluctuated similar to variations in cargo tonnages. From 1924 to 1931 the availability of data appeared to be a problem with no entries for that period.

Period 1932 to 1975

For the period between 1932 and 1975, there was very little specific information available. No operation and maintenance expenditures were evident for work on the Kissimmee River navigation project. The statistics in Table E-I show commercial tonnage and vessel trips on the river until about 1971 and sporadic passenger data until 1953. After those years no data came from local sources for use in compiling the statistics. The guidelines for collecting and reporting the data during this period were apparently not consistent in tabulating vessel trips and passengers. In some years the type of information in the reports on vessel trips and passengers was different, making it hard to logically follow trends with varying data bases.

From 1932 to 1945 commercial cargo was mainly fish, fresh citrus, empty fruit boxes, and fertilizer. The annual commodity movements ranged from a high of 1,184 tons in 1937 to a low of 12 tons in 1932 with an average for that period of about 597 tons annually. Commercial vessel movements averaged about 7400 trips a year which includes about 120 barge trips. The passenger statistics for that period were mostly unavailable with the amounts shown being mostly estimates with wide annual variations and based on reports from guide services for fishing and hunting parties. In 1944 the reported information was for passengers using for-hire services, passengers on private recreational craft, and farm laborers as passengers paying to ride on the commercial boats using the river.

From 1945 to 1953 the annual amounts in Table E-1 had an overall higher range than the previous 13 years of record. The annual commodity movements included mostly fresh citrus, fish, fertilizers, road oil, empty citrus boxes, and tractors. The amount of commerce ranged from a low of 763 tons to a high of

2,672 tons in 1947 with an average for the 8 year period of about 1,542 tons annually. The commercial vessel movements varied with a high of 29,732 trips a year in 1949 and an average of about 14,820 trips a year for the 8 years. Passenger statistics during the period appeared to be more of a measure of the passenger as a customer paying for a service associated with river use. The numbers did fluctuate with a high of 2,280 passengers in 1947 then generally dropped to lower numbers for the remainder of the period with an average of about 1,290 passengers a year.

From 1953 to the present, the data reported has become more of a summary without a lot of explanation or breakdown of the different elements. During the period there was no passenger data available as there were apparently no reports from local sources. The annual reports listed fresh citrus, fish, wood, fertilizers, and motor vehicles as the main commodity movements until 1958 when fresh fish became the only listed commodity. From 1953 to 1958 the average annual commerce was about 1,190 tons and vessel trips averaged about 19,100 a year. From 1958 to 1963, when fish was the only commodity, the average annual catch was about 235 tons and vessel trips averaged about 26,480 a year. In 1963 a large movement of fuel oil and water with some fish and other commodities caused a significant jump in tonnage.

In the 1964 to 1967 time frame there was a significant drop in vessel trips as there was no reported fresh fish catch landings. In 1964 fuel oil, water, and miscellaneous commodities comprised most of the tonnage items with no tonnage listing for fresh fish. In 1965-1966 the bulk of the commerce was machinery and manufactured goods requiring only a small number of vessel trips.

From 1967 to 1975 there was little reported commerce on the Kissimmee River. In 1967 the fish catch reappeared in the statistics along with tonnage for machinery and manufactured goods. After 1967 the fish catch was the primary statistic with a decreasing annual tonnage and vessel trips. In 1971 there was no commerce reported and the 1972 statistic was for a very small commodity movement. No commerce report was received in 1974 from the area.

Period 1975 to Present

From the information in the Waterborne Commerce of the United States publications no commercial reports were available from 1975 through the latest published data in 1988. However, since completion of the flood control Canals 36, 37, and 38 along with their associated control structures and locks in 1971, the South Florida Water Management District (SFWMD) has been operating both the water control structures and the navigation locks. As part of that operation, the SFWMD has accumulated records over the past 10 years on lockages and the number of vessels passing through the locks at S-65, S-65A, S-65B, S-65C, S-65D and S-65E. In recent years the locks have been operated according to the following schedule:

LOCK HOURS

S-61, S-65, S-65E	Mon. - Fri. all year	7:00 a.m. - 6:00 p.m.
S-65A, S-65B, S-65C, S-65D	Mon. - Fri. all year	8:00 a.m. - 6:00 p.m.
Weekend Hours for all locks	Mar. 1 - Oct. 31	5:30 a.m. - 7:30 p.m.
	Nov. 1 - Feb. 28	5:30 a.m. - 6:30 p.m.

Annual lockage data for those locks provide some insight as to the utilization of the river. Table E-2 provides data on the vessel use by month for calendar years 1981 through 1983. The records for calendar years 1984 through 1986 are in Table E-3.

The most active locks are S-65 and S-65E as demonstrated in these two tables. Beyond 1986 the SFWMD has lockage data but has not compiled it to provide monthly totals. As time was not available to compile all that data, only the records for 1990 and part of 1991 were compiled on the two most active locks as shown in Table E-4. This enabled an estimate of the increase over the past 10 years on those locks. From that information the S-65 usage appears to have grown at a faster rate than S-65E.

The peak season for boat use on the Kissimmee River extends from October through April, based on the available lock records. Special events which may tend to influence usage especially on the two busiest locks are the numerous bass tournaments and Kissimmee Boat-A-Cade trips. The Boat-A-Cade in a recent trip, started from a waterfront area at the town of Kissimmee and moved south through Lakes Tohopekaliga, Cypress, Hatchineha, and Kissimmee into a portion of Canal 38 between S-65A and S-65B. The distance was about 78 miles. Boaters in that event had small craft which could utilize the flood control depth of 5 feet along the navigation project. Once in the Canal 38 area the boaters could visit the older, meandering portions of the Kissimmee River.

During the year there are usually three Boat-A-Cade trips totalling some 300-400 boats. The first trip is about two days long and is held during the first week of April. That trip normally averages about 80 boats. As in the April 1991 trip, the boats usually travel to a destination on Canal 38 such as the Fort Kissimmee Campsite area. The summer trip is held in June and involves an average of about 100 boats. It is the longest trip with a duration of one week and varies in itinerary from the town of Kissimmee to either the east or west coast as the final destination. The last trip has a duration of about three days in October and usually averages about 175 -180 boats. From the town of Kissimmee the boaters proceed to a campground location on Lake Okeechobee.

No operation and maintenance expenses were evident from 1975 to the present except for the period between 1980 to 1987. During that time expenditures for operation and maintenance were for examination surveys. Based on the information available, there has been sufficient depth to enable navigation without significant problem.

EXISTING CONDITIONS

A description of the existing conditions is available from current site visit information, recent brochures, and current publications. It has been found that although portions of the original river are presently unnavigable, many of the original river oxbows remain intact and accessible via shallow draft boats and canoes. Boaters use C-38 for their main access to a specific spot, then enter the oxbows using paddles or trolling motors requiring little draft. The Kissimmee Boat-A-Cade trips are an example of such usage. Approximately 60 miles of oxbows and meander areas of the original river are accessible to boaters. Several roads also provide access, as shown on Figure E-1, to launching points for boaters with small-craft to enter or leave the river.

A navigation system limitation exists in Lake Hatchineha and Lake Cypress. The omission of Structure 64 (S-64) on Canal 37 causes the water levels in the two upper lakes to be a problem during low water. Under those conditions the two lake levels drop below the minimum authorized navigation depths approximately 10 percent of the time.

Current elevations of the pools along Canal 38 of the existing flood control project are as follows:

	(Ft. NGVD)
Between S-65 and S-65A (Pool A)	46.3
Between S-65A and S-65B (Pool B)	39.5
Between S-65B and S-65C (Pool C)	24.0
Between S-65C and S-65D (Pool D)	27.0
Between S-65D and S-65E	21.5

Interviews with local boaters and facility owners indicate that the navigation usage on the Canal 38 section of the navigation project is primarily recreational activities with a few commercial boaters. Available records list no commercial activity. The little commercial activity that does exist appears very small with no one reporting on it to the government. Available statistics indicate the more intense usage is near the lakes of Kissimmee and Okeechobee at Structures 65 and 65E, which are closer to areas of higher population densities and have more varied options for water related activities. Available records in Table E-4 show an increase in the lock usage at those sites from 1981 to 1991.

Fishing in Lake Okeechobee for largemouth bass, speckled perch, blue gill, and warmouth perch is popular and attracts boaters through several locks on the Kissimmee River for that activity. From lockage information and from conversations with boat operators the observation is that game fishing has a direct impact on the traffic statistics. For example, when speckled perch was plentiful during the months of January 1990 - March 1990, the number of boats through the lock at S-65E was three times more than other months when the fishing was not as plentiful.

Field interviews and public boat records provide an indication of the most dominant types of recreational boats in use on C-38. The most common vessels are the power boats, used for recreational fishing and boating. The general size and types of motor boats are shown in Table E-5 for locks at S-65 and S-65E. The information in that table came from detailed records on vessels compiled by the SFWMD in 1990 and part of 1991. Further clarification on the types of boats indicate that most of them fit into the category of bass boats (14'-18' in length), pontoon boats, canoes, jon boats, air boats and on occasion large house boats (25'-32' in length).

Boating Facilities and Use

On the existing reach of waterway from the town of Kissimmee to Lake Okeechobee, the heaviest boating usage occurs in the lake areas where there is more space for recreational activities. The perimeters of the lakes also have more waterfront development with boating access to the lakes. In the Kissimmee River restoration area, major access is at the various launching facilities which are both privately and publicly owned along Canal 38 and the old river meanders off that canal.

Within Canal 38, boating access is limited to the various launching ramps which are on the local road system in the area. Figure E-2 provides the location of existing facilities for boat launching. That figure also has the county, state, or Federal road that enables vehicle access to those sites. The main differences in the launching sites are the services offered to the public. The publicly owned sites offer primarily free launching ramps and bank fishing as their only features with Site "D" also having picnic and camping areas. The privately owned sites offer more extensive services to the public such as fishing gear, bait, boating supplies, boat rentals, fuel, lodging facilities, food, drinks, and other items.

Of the five active fishing resorts and fish camps that are under private ownership along Canal 38, information from three of them provides the basis for estimating existing boat usage on the river in that area. In the 2.0 mile reach north of S-65 where Lake Kissimmee enters Canal 38, there are three privately-owned facilities, shown on Figure E-2, with similar services. Information from those sites provides an estimate of usage in the vicinity of S-65. The data from those various businesses indicated the seasons, boat usage, and type usage with existing conditions. That information also provided a basis for estimating the amount of usage at other sites on the river.

The main season for business is generally from October to April with the peak period during that season being between December and March. Some variations were evident from discussions with different facility owners in regard to season, boats handled per day, and the number of people per boat. The information in Table E-6 accounts for those variations in estimating the boat usage during the year as well as the user days. Table E-6 lists the pertinent data collected on each facility in 1991 as well as the estimated boat days and user days. The listing of facilities in that table also includes the public facilities and an estimate of boat usage for them based on known sources. The site listings start at S-65E and go north in order of occurrence along Canal 38 and the river with the positioning of each structure shown in the table.

FUTURE CONDITIONS "WITHOUT PROJECT" CHANGE

The Florida Department of Natural Resources has the boat registration data collected by each county on a Fiscal Year basis. All owners of boats with motors over 10 horsepower are required to register them with the county. In most cases those records include nearly all the commercial and recreational boats within each county. From past experience in working with that data, there is usually a close relationship between registered boats and populations in each counties. That correlation is one of the ways used to estimate future boats in those counties that are reasonably close to the Kissimmee River. There are six counties which are within an easy travel distance of the river. The six counties within the study area are shown on Figure 4 in the main report and are listed in Table E-7 with each county's registration data on commercial and recreational boats.

Information available on commercial statistics for the river indicate that there is no traffic to report. The county registration data in Table E-7 for the six counties shows the total number of commercial boats in recent years appears to have reached a peak in the early 1980's with a decline in the latter part of that decade. There is no evidence that the number of commercial boats in those counties is increasing. What appears to be the most probable condition is a stabilization of the numbers within a range from 1500 to 1600 boats. As the available fish resource may vary from year to year within the six county area, the number of boats, associated with fishing, may also change as the resource would be unable to economically support more boats. Considering the available data, future commercial boats in the six county area are not expected to vary significantly in number from current levels. There is no reported commerce now on C-38 nor is any expected in the future.

The number of recreational boats in Table E-7 from 1974-75 to 1988-89 has increased from about 36,500 to 71,600. The 1989-90 total indicated a slight drop in the number of recreational boats. Overall those boats are expected to grow with the projected population in the counties. Available census data on population for the six county area is in Table E-8. The total prospective fleets for all six counties are in Table E-9 along with the projected populations in each county. With the fleet of registered vessels expected to increase in the future, usage of the Kissimmee River will likely increase proportionally to the number of registered vessels available for use.

Navigation usage of the Kissimmee River in recent years has only two sources of information. The records on lock usage give the total number of boats moving through the locks by month and year but do not provide a good measure of daily usage. The local facility owners indicate that many of the boaters using their facilities do not use the locks for access to other areas. Those lock records are in Tables E-2 and E-3 and are used mainly for comparison with facility use closest to them. The other source is information received in interviews with the staffs and owners of several privately operated fish camps, resorts, and marinas along Canal 38. The estimated daily boat usage at those facilities is in Table E-6 and possibly comes closer to existing usage. The interviews indicated the existence of transient boaters (boaters that reside outside the six county area and state) in the overall usage numbers, but no breakout of that information was possible from available data.

Table E-6 was used to project existing usage on Canal 38. Adjustments to that data are possible using the boat trips through the lock. Current annual boat usage at the four facilities (three private and one public) in Table E-6 to the north of S-65 totals about 40,800 days a year. The lock usage at that structure indicates only about 7,100 boat trips in 1990. Assuming that each boat makes two trips through the lock each day, the daily use associated with that lock would be only 3,550 days a year. Part of that lock usage is also the Boat-A-Cade trips which may average about 2 boat days for each of the 350 round trips a year through Canal 38 for a total usage of about 700 boat days. Deducting the Boat-A-Cade from the total lockage numbers leaves 6,400 trips a year or 3,200 boat days annually. That is about 8 percent of the listed facility usage to the north of that structure.

The four facilities north of S-65 are not within the area considered for restoration. Deducting their usage from Table E-6 provides a revised total of 55,200 boat days, 95,400 user days fishing, and 36,600 user days on other boating activities. No other adjustments are made in that table for estimated user days which are associated with 1990. The Boat-A-Cade trips are somewhat of a special event that are not reflected in the usage shown in Table E-6. The annual trips involve about 350 boats for 2 days on the river per trip or 700 boat days. With an average of 3 people per boat the total usage amounts to about 2,100 (700 boat days x 3 people per boat) user days a year. Table E-10 gives the different categories of usage. Using the growth rate estimated for boats in the county, the estimated user day totals for each category are projected into the future with the existing conditions as shown in Table E-10.

FUTURE CONDITIONS WITH RESTORATION

The Kissimmee River restoration plan would fill a portion of the existing flood control canal (C-38) and return flow into the old river channel and onto the floodplain in an effort to restore the ecosystem to its natural state. The primary concept is to block or "dechannelize" the flood control canal and redirect flow through river bends (cutoff by the canal construction) along the course of the canal. The linear extent of this filled section would be approximately 29 miles. Structures 65B, 65C, and 65D with the adjoining locks would be made inoperable by filling the canal, and the structures removed. Sections of Canal 38 which had cut through the old river channel would be filled and a new river channel would be created adjacent to the filled area. A new flood gate would be added in the approach channel to the north of the lock at S-65E.

Navigation Problems

The navigation depth along the 56 contiguous mile section of restored river would depend on the availability of flowing water, thus wet and dry seasons will have a direct impact on navigation. Three factors are important in evaluating the impact to navigation. One is the depth of water necessary for navigation. Second is the magnitude of flow necessary to maintain that depth for navigation in the river section (threshold flow). The third factor is the frequency and duration of periods when the flow is available to provide that depth.

From field experience and analysis of small boat navigation, the depth of 3 feet, initially authorized and constructed for navigation, would be very marginal for safe operation of most boats in the recreational fleet now using the deeper flood control canal. Most of the smaller boats up to 25 feet in length on the existing waterway have water lines which may vary from 0.5 foot to 1.5 feet above the very bottom of the hull in a loaded condition. With the motor extending down below the hull, the boat may gain an additional 1.5 to 2.5 feet in draft. Allowing a 0.5 foot for squat with the motor operating, boaters would need depths of 2.5 to 4.5 feet with no clearance between the bottom of the motor and the channel. The majority of boaters on the existing waterway now require depths over 3 feet for navigation. They are concerned about the 3-foot depth that will result from the proposed plan.

The section of river to be restored would be identical in length and cross-section to the section that existed in 1954 prior to the Canal 38 channelization. Removal of the existing locks and water control structures (S-65B, C, and D) would provide uninterrupted navigation from S-65A to S-65E. Based on those conditions and prior historical data, a flow of 150 cfs would be available in the restored river approximately 91 percent of the time. Higher flows of 250 cfs and 350 cfs had frequencies of 90 percent and 70 percent, respectively. The duration of low flows would have a significant impact on navigation only in extreme dry years. During the pre-channelization period, the river experienced such extreme dry periods. During those periods, the depth available for navigation would be less than 3 feet about 10 percent of the year due to low water discharges less than 250 cfs. For discharges of at least 150 cfs, a depth of 3 ft or greater would be maintained in the channel except for four locations as shown on Figure E-3. The low water periods would most likely occur in the months of January through April.

If the rainfall regime in the Kissimmee basin returns to the wetter pre-channelization period, those frequencies would be greater. During the wet season the water levels would rise and the conditions at S-65E could be a problem for navigation. When the water level in that area reaches 23 feet, the new operating procedure would be to close the new flood gate on the north side of the lock. Closure of that gate would allow no through navigation to occur at the lock. The closures would likely occur in the months of September and October and disrupt navigation about 5 percent of the year.

Abandoned river channels have silted during the last 20-30 years, but with the new project plan allowing discharges of at least 150 cfs, those river channels would quickly return to original cross-section. However, those sections from prior experience did not insure a depth of 3 feet. The Annual Reports on the old authorized river project indicated that controlling depths of 1.5 to 2.0 feet were more the standard condition with the 3-foot depth being difficult to maintain in the old river channel. With the remaining water control structures on the Kissimmee River, it may be possible to provide a more consistent, higher level of flow over longer periods to better help maintain the channel depths.

Impacts on Boaters

The impacts to boaters fall basically into three categories, the first is the boater whose main objective is to fish. The second is the casual boater out to ride while enjoying the beauty of the river and surrounding scenery. Those two groups of boaters are using the boating facilities and ramp areas along the river in reaches mainly between locks. Past records indicate that most of them are not making trips through the locks. The third category is the Kissimmee River Boat-A-Cade group which appear to be the primary users of the locks and waterway as through traffic. To best present the impacts on that category, the subsequent discussions start with a separate analysis on that group followed by an analysis on the other categories.

The removal of the locks at S-65B, C, and D with the filling of the Canal 38 to restore the old river would lengthen the journey for those trips that went to Lake Okeechobee and farther. From S-65A to Lake Okeechobee the distance is now About 45.5 miles. With the restoration of the Kissimmee River the distance would become about 74.5 miles as shown below:

Location	Distance (miles)
S-65A to start of restoration	8.0
Start to end of restoration	56.0
End of restoration to S-65E	2.5
S-65E to Lake Okeechobee	8.0
TOTAL	74.5

From the town of Kissimmee to Lake Okeechobee the distance with restoration becomes 126.5 miles compared to 97.5 miles on the existing condition. The added distance of about 29 miles would probably be a minor inconvenience rather than a restriction reducing boat usage. Low water in the months of January through April would be a consideration except for the trip in April. That trip does not use the entire waterway and could stop before reaching the restored river portion with the shallower depths. The second trip in June would probably encounter deeper water than the 3 feet in the restored river channel making passage possible for most boats 25 feet and under. The trip in October runs the risk of having the lock at S-65E blocked by closure of the flood gate during high water.

The impacts appear most probable with the second and third trips on the Boat-A-Cade. The vessels, needing 3 feet or more to operate, would be most of those over 25 feet and some 25 feet and under. Usage of the waterway indicates the larger group of boats represent about 2 percent of the traffic. The Boat-A-Cade would possibly have a higher percentage of the larger boats on the longer trips. The trip in June may be difficult for those boats as sufficient channel width and depths could be a problem discouraging usage. The estimated reduction in boat usage for that trip is 10 percent. The trip in October is subject to closure of the flood gate across the lock channel at S-65E about 5 percent of the time. Planning ahead could avoid disappointment. The estimated reduction in usage for that trip is 5 percent.

With locks at S-65 and S-65A remaining in place, usage in that reach is not anticipated to change significantly for the first and second category of boaters. From S-65A to S-65B there is one launching facility (J) which is in the restored river area near S-65B as shown on figure E-2. Improved fishing in the river channel would likely continue that activity with the estimated reduction in usage being in other activities. Between S-65B, C and D similar conditions would exist in prospective usage as well as for the three launching areas near S-65D on the south side between it and S-65E. Those areas are all in the restored river section. Outside the restored river section no significant change in the first or second category of use is foreseen in the future.

Based on usage in the lakes versus the river, most boating activities are occurring in the lakes which offer more space to boaters and less crowded conditions. In the river environment the recreational fisherpersons do not tend to bother each other, whereas the active boater pursuing other activities could become a problem. The fisherpersons would likely adapt to the shallower water conditions to fish where the boater in other activities would simply avoid those conditions and use other areas. With construction activity to restore the river there may be an initial drop in fishing activity until the fish population adapts to the changing environment. The reduction is likely to occur over a five-year period from 1990 to 1995. Overall, the reduction in fishing is estimated at about 5 percent of the 1990 usage. The revised 1990 usage is then increased based on the projected growth in county boats between 1990 and 1995. Other boating activities in the restored river areas will likely drop significantly with lower overall water depths and more confining conditions in the narrow, meandering river channel. The reduction could range from 40 to 60 percent or higher in some areas. Overall, the loss in usage is estimated at 50 percent of the 1990 usage for those activities other than fishing. Once the loss reduction in the 1990 usage is computed, the resulting usage is projected from that reduced value based on the growth rate of estimated boats in the county.

Usage Projections

Based on the impacts to boaters as discussed in previous paragraphs, usage with the restored river section would result in an overall reduction. Table E-11 has the projection of user days that relate to the three categories of boaters. That table starts with existing 1990 data a portion of which is extracted from Table E-6. Growth in the future is at the same rate as the projected county boats in Table E-9 but with the estimated percentage reduction in usage as discussed previously.

Navigation Markers

Navigation channel markers would be needed to assist boaters in traversing the waterway and avoiding dead-end channels. Additional markers would be needed near the critical sections of localized low depths under extreme low flow conditions to warn boaters of that danger. In response to a request for assistance, the United States Coast Guard (USCG) indicated no interest in marking the channel because of the shallow depth constraints. Coast Guard equipment is such that the work could not be economically done by them. Consequently, the channel marking is part of the restoration plan as a local responsibility. The estimated cost for constructing, installing, and maintaining the markers is in Appendix B. The number of markers to be placed is 68.

USER DAY BOATING VALUES

The economic evaluation of boating use is by the unit day value method as described in *Engineering Regulation (ER) 1105-2-100.* In that regulation the two categories of outdoor recreation are general and specialized. In this analysis the recreational fishing and other boating activities from the launching facilities along the river are considered general recreation for estimating value. The Boat-A-Cade events are considered a special usage and are valued under the specialized recreation. The point values assigned under the general and specialized recreation are in Table E-12 with an abbreviated reasoning for the selection. The point values may have some variation between the with or without restoration conditions; however, no further effort was made to evaluate that difference since the user day values reflect the changed conditions.

The point values in Table E-12 provide the basis for arriving at dollar amounts on the user day experience. Using the *Economic Guidance Memorandum Number 91-1: Fiscal Year 1991 Evaluation Data*, the point values, as shown in Table E-13, were converted to the appropriate dollar amounts as follows:

Recreation	21 points	$2.92 a user day
Fishing	22 points	$3.85 a user day
Boat-A-Cade	27 points	$10.45 a user day

ECONOMIC ANALYSIS OF BOATING USAGE

The above dollar values combine ($ x user days) with the user days in Tables E-10 and E-11 for an economic evaluation of the restoration conditions versus leaving Canal 38 as it is today. That evaluation is in Table E-14.

LOWER KISSIMMEE RIVER BASIN RECREATION

The Kissimmee River basin contains six counties within the resident market area. The center of growth in this six county area is Orlando and Orange County. Growth around the lakes on the north end of the basin and the counties adjacent to Orange County will provide future demand for recreation opportunities within the project area. Table E-7 shows the population projections for these six counties. It should be noted that although Orange County is in the upper Kissimmee River Basin, it is not within the lower basin where restoration will occur and the majority of boat owners from Orange County are not expected to be as affected by the planned restoration of the river as boat owners in the other counties.

A large number of out of state visitors bring their boats with them to spend the winter in this portion of the State. During their stay, they participate in fishing and boating activities along the Kissimmee River. As a result, visitation along the canal cut is not wholly attributable to Florida residents only. While there are no current figures available as to how many visitors to the area are from out of state or how many of these visitors bring their boats, it is known that their influence and contributions to the local economy are substantial. Boating activity on the canal cut, as recorded by the passage of vessels through the locks, for the 1990 calendar year is about 20,000 vessels.

The large urban populations around Orlando, the Tampa Bay area, and the central coastal cities are all within a one to two hour drive from the project area. The main highways leading to the project area are heavily traveled and well maintained. The main constraint to access lies with the condition of the secondary service roads leading from the main highways to sites on or along the canal cut. Many of the secondary roads are unpaved or are not well maintained if they are paved.

The six counties in which the Kissimmee River Basin is located are in three different regions according to the State Comprehensive Outdoor Recreation Plan (SCORP), published in 1989. Orange and Osceola are in Region VI; Polk, Highlands and Okeechobee are in Region VII; and Glades County is in Region IX.

The SCORP contains a caveat in the Introduction in which its preparers admit that the SCORP is useful for State and Regional planning, but that it should not be used for local planning because of problems which may occur. The SCORP admits that *"their use in evaluation of specific recreation needs for local purposes within a region is not warranted... there may well be valid needs for any local resource or facility within a region where needs statistics in this plan may indicate no need for the region as a whole."* (SCORP, pages XV and XVI). Larger counties with an abundance of public facilities within a SCORP Region have a tendency to overpower the Needs and Demands of the smaller counties within the same region. This is reflected in the SCORP and is certainly applicable to the lower Kissimmee River basin project. However, the abundance of available water bodies in the central and south Florida area makes this entire region of the State unique in that fishermen and boaters have numerous choices available from which to select the site on which to recreate. This abundance is reflected in the SCORP as *"no additional water acreage needed"* for boating and fishing activities in the SCORP regions which cover this portion of the State.

Existing Conditions

Recreation in the lower Kissimmee River basin is moderate to heavy with emphasis on camping, general boating, boat fishing and bank fishing. Camping is primarily centered at the two ends of the lower basin. Camping occurs year round, but is heaviest during the late fall, winter and early spring months. There are about a dozen sites for access into the river for bank fishermen while boaters have access to almost any point along the river from the available public boat ramps. The available facilities are not used at full capacity the majority of the time, however.

Heaviest boating usage occurs around the Lake Kissimmee and Lake Okeechobee ends of the river system. This is most likely due to the larger numbers of boat owners who keep their boats at one of the marinas on these lakes, more waterfront property owners with their own moorage facilities, and more convenient access to these larger water bodies than to the river. Heaviest fishing use occurs during the 4-5 months from late fall to early spring, although there are fishermen out on a year round basis.

There are four public boat ramps at the lock and dam structures along the river system; two are at Structure 65 and one each at 65B and 65C. All of the existing ramps are used frequently with occasional delays to load and unload experienced on weekends and during the better fishing seasons. These delays are not long and are taken in stride by boaters. In addition to these ramps there are other public boat ramps into the river as well. These include:

1. The Avon Park Bombing Range. This area also includes campgrounds, picnic areas, trails, a hunting area and a nature trail.
2. The Underhill Road Extension ramp operated by Highlands County.
3. The Boat Ramp Road ramp operated by Highlands County.
4. Platt's Bluff operated by Okeechobee County. This site also includes camping and picnicking areas.
5. An unimproved access area at the northern end of Hoover Dike Road.
6. Okee-Tantie Park, operated by Okeechobee County, is at the mouth of the river. The park contains camping, picnicking, restrooms with showers, a triple boat ramp and a playground.
7. Riverside Road ramp is on the opposite side of the river from Okee Tantie Park.

Private recreation facilities also exist along the Kissimmee River. These facilities vary from the resort type of multi-use development to the provision of basic services. Some of these private recreation facilities reflect a substantial investment and are well maintained. Many of these facilities will be affected in some way by the proposed restoration project.

1. River Ranch Resort is located off State Road 60 about 2 miles south of S-65.
2. The 4-E Fish Camp is located on the original river channel with access to the canal cut.
3. Hidden Acres Campground is about 2 miles south of State Road 721 and is on the original river channel with access to the canal cut.
4. River Acres Boat Ramp is located in River Acres Subdivision.
5. Tut and Lou's Fish Camp is located at the end of Underhill Road on the original river channel.
6. The Kissimmee River Fish Resort is located north of State Road 70 on the west side of the canal cut.

7. River Bluff is on the north side of State Road 70 on the east side of the canal cut.
8. The Kissimmee Fish Camp is on State Road 78 on the east side of the canal cut.

The Florida Trail Association is currently working with the SFWMD to develop additional hiking trails on District lands in the Kissimmee River Basin. Some primitive campsites will be designated along these trails for use by backpackers. Maintenance of the trails will be the responsibility of the Florida Trail Association. The proposed trail system and any primitive camping areas will not be a cost-shared part of the restored Kissimmee River Basin project.

Conditions After Restoration

Four of the launching ramps located at the lock structures (S-65, S-65B and S-65C) will be impacted by restoration. These ramps were constructed by the counties in which they are located soon after the structures were completed. Replacement as a mitigative feature will be necessary. Mitigation will require that these facilities be replaced with suitable facilities in a location as close to the existing ramps as possible. Whenever possible, parking, fish cleaning facilities, restrooms, courtesy docks and a fishing pier paralleling the channel should be considered in an effort to attract more users to these sites. These features would be new facilities and would require cost sharing with a local sponsor for construction.

The two ramps at S-65 will be impacted by construction of a control weir along the west side of the river and just south of Highway 60. These two ramps will be relocated to an area on the east side of the river in the vicinity of the lock tenders' residence.

The potential for development of small recreation sites exists. These sites could include campgrounds or picnic areas, but at the least should include launching facilities, parking, restrooms and landscape planting for shade. However, no willingness to develop the recreation potential of these sites has been expressed by the SFWMD. Without this willingness to participate by the SFWMD or a county as the local cost sharing partner, the Corps cannot pursue recreation development on its own. A preliminary cost estimate has been developed for two sites in anticipation of acquiring a local sponsor for this type of development.

Existing recreational opportunities along the central portion of the lower Kissimmee River basin are limited by the lack of public lands available and marginal private resort services. Major development of recreation opportunities are on the ends of the lower river basin and serve lake users and campers as well as those who wish to use the river.

Those public and private facilities at the Lake Kissimmee and Lake Okeechobee ends of the river will not be impacted by any of the alternatives for restoration including the Recommended Plan. Those sites along the old river channels between the ends of river will be affected to a degree by seasonally fluctuating water levels. None of these facilities are in a location on the canal cut which will be filled during restoration.

Fish camps and marinas along the restored river channel will be subject to more boating traffic than they received prior to backfilling operations on the canal cut. This increase in boating traffic will increase sales volume, but will also increase the potential for damage to docks and moored vessels through wake action. No Wake signage and some dredging to increase depths for these facilities may be necessary, possibly as a mitigative measure.

Visitation at Lake Kissimmee State Park is not expected to be affected by restoration of the lower river. Visitation at the park has fluctuated in the past, due in part to weather and fishing conditions on the upper chain of lakes as well as on the upper portion of the river. Visitation is heaviest in the park during the months of better fishing. According to the State, day use at the park accounts for almost two-thirds of park visitation on a yearly basis.

Completion of the additional trail system proposed by the Florida Trail Association will bring some additional recreational use into the Kissimmee valley, but not enough to be considered significant.

Fishing and General Recreation Benefits:

General boating, bank fishing and boat fishing along with some hunting and camping occurs in the lower Kissimmee River basin. Public hunting is mainly limited to the canal cut and the river oxbows as well as the Avon Park Bombing Range. Hunting on private land is not included in the figures used to compute recreation benefits. Camping occurs in many primitive locations along the river, but only the figures from the established campgrounds are used in the computations.

Partial backfilling of the C-38 canal will have some short-term negative effects on general boating and boat fishing. Short-term effects include delays in negotiating the canal past dredge and other equipment involved in the restoration work and the need to learn the bends and meanders of the restored river channel. Those boaters who at first will be unhappy with the restored river system will eventually become familiar with the basin, or be replaced by others willing to negotiate the meandering river system or those looking for a tranquil getaway. Long-term effects of a restored river system include loss of use of the river system by larger houseboats and other deep draft vessels. Water sports, such as water skiing, will be limited to those reaches not included in restoration. This loss will be offset in part by canoeists and the smaller boats used by fisherpersons. Fishing success on the restored river is expected to increase over the long term. Recreational use of the river system after restoration is complete will change, but will not affect the objectives of restoration.

Camping is not expected to substantially increase on the restored Kissimmee River project due in part to a lack of available land and competition from other sites in the central and south Florida area. Boating and fishing will increase in direct relation to an increase in population. Hunting may increase more than these other activities since more public lands may become available for this use.

Costs Associated with Ramp Mitigation:

Four ramps will require replacement as a result of restoration of the Kissimmee River. These ramps are located at Structures 65, 65B and 65C. These replacement ramps and parking areas will be located near the existing sites in order to provide the public with suitable access to the river in the same general vicinity to sites currently in use. The two single lane ramps should be replaced with double ramps to assist in handling current usage at the sites, however. The following estimates are based upon 26' wide double lane ramps and one acre parking lots. Although none of the existing parking areas are paved, the replacements should be paved to reduce dust, erosion, potholes and Operations and Maintenance costs.

4-Double lane boat ramp 26'x50'	$15,600 ea.	$62,400
4-One acre parking lots, paved	9,680 Sq. Yds	
(includes site preparation)	@ $27.88 per SY	$539,756

Total Cost		$602,156*

*It should be noted that this figure does not include Engineering and Design, Maintenance Costs or Contingencies.

Cost Associated with New Recreation Construction:

The costs associated with new recreation construction is based upon locating two sites on the project on land which is in or soon will be in current ownership of the SFWMD. One site for possible development is located on the east side of the river near the Highway 98 crossing. The other can be located near the site of Structure 65B on high ground on the west side of the structure. These sites could include campgrounds or picnic areas, but at the least should include launching facilities, parking, restrooms and landscape planting for shade. However, no willingness to develop the recreation potential of these sites has been expressed by the SFWMD. Without this willingness to participate by the SFWMD or a county as the local cost sharing partner, the Corps cannot pursue recreation development on its own. For information purposes only, the following costs have been compiled based upon one of the sites being a campground and the other being developed as a picnic site. Both would have a launching ramp and restroom. Cost of land and access road work are not included in this preliminary estimate.

Picnic Area	
Picnic Shelter	14,500
10 Tables	7,000
Waterless Restroom Structure	25,000
Launching Ramp, Single Lane	7,800
Parking, Paved, 4840 SY	135,000
Total Cost	$189,300
Campground	
15 Campsites	40,000
Waterless Restroom Structure	25,000
Launching Ramp, Single Lane	7,800
Parking, Paved, 4840 SY	135,000
Total Cost	$207,800

It should be noted that these figures do not include Engineering and Design, Maintenance Costs or Contingencies.

TABLES

TABLE E-1
KISSIMMEE RIVER STATISTICS

YEAR	TONS	PASSENGERS	YEARS	TONS	PASSENGERS
1916	13625	3540	1942	591	ND
1917	12014	100	1943	729	ND
1918	10181	1650	1944	560	520
1919	10508	1480	1945	1028	1070
1920	7125	1000	1946	763	1580
1921	2215	500	1947	2692	2280
1922	4458	500	1948	1208	1728
1923	2412	550	1949	2582	1000
1924	6734	ND	1950	870	614
1925	5654	ND	1951	1267	1400
1926	7117	ND	1952	1928	660
1927	50	ND	1953	1435	ND
1928	205	ND	1954	1195	ND
1929	188	ND	1955	1132	ND
1930	425	ND	1956	1374	ND
1931	370	ND	1957	810	ND
1932	12	ND	1958	255	ND
1933	150	1800	1959	141	ND
1934	750	ND	1960	143	ND
1935	760	ND	1961	310	ND
1936	1069	ND	1962	325	ND
1937	1184	ND	1963	6030	ND
1938	330	10380	1964	3945	ND
1939	566	8400	1965	895	ND
1940	499	ND	1966	1356	ND
1941	563	480	1967	457	ND

ND - No Data

TABLE E-2
VESSELS PASSING THROUGH NAVIGATIONAL LOCKS 1981-1983

LOCK	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1981													
S-65	158	244	381	336	217	141	85	77	185	311	193	110	2438
S-65A	55	78	141	95	93	75	39	42	72	165	53	31	939
S-65B	56	51	70	81	77	36	35	22	31	163	39	22	683
S-65C	36	74	102	70	59	37	26	20	36	164	50	35	709
S-65D	41	74	52	75	85	41	35	14	30	32	42	31	552
S-65E	280	440	515	253	130	45	42	15	55	203	270	144	2392
1982													
S-65	191	257	304	271	373	176	380	224	176	364	241	182	3039
S-65A	38	75	57	147	104	60	205	72	75	216	50	48	1147
S-65B	33	111	55	123	61	38	148	64	75	210	54	81	1053
S-65C	100	165	79	103	71	41	148	45	63	116	45	104	1080
S-65D	37	130	57	85	98	38	134	61	76	20	57	73	866
S-65E	460	941	813	296	184	70	247	115	124	111	280	438	4079
1983													
S-65	326	398	386	555	178	491	502	329	439	609	494	376	5083
S-65A	103	65	53	120	37	186	89	100	106	112	102	69	1162
S-65B	53	46	70	89	39	193	89	82	69	98	100	61	989
S-65C	94	56	110	88	26	180	98	62	94	59	49	80	996
S-65D	56	59	73	115	29	188	113	88	60	63	48	16	908
S-65E	483	810	717	273	0	257	222	86	98	190	283	360	3779

Source: South Florida Water Management District

TABLE E-3
VESSELS PASSING THROUGH NAVIGATIONAL LOCKS 1984-1986

LOCK	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1984													
S-65	288	542	601	667	494	485	460	441	450	446	500	341	5715
S-65A	67	123	115	175	159	181	119	138	136	97	130	0	1440
S-65B	95	101	124	141	110	136	47	76	106	56	56	0	1448
S-65C	99	123	157	130	108	124	67	57	75	76	77	0	1093
S-65D	65	81	137	98	129	134	67	82	112	61	55	0	1021
S-65E	1077	1118	1169	464	281	267	158	164	165	203	117	763	5946
1985													
S-65	383	831	937	789	626	560	699	858	596	737	1220	752	8988
S-65A	121	237	161	116	88	259	195	312	129	447	149	94	2308
S-65B	49	107	96	87	47	377	147	290	68	80	115	85	1548
S-65C	60	78	153	107	88	289	144	228	59	83	106	64	1459
S-65D	37	109	165	115	93	233	132	184	43	72	94	0	1277
S-65E	572	765	1054	635	460	437	297	460	232	499	673	628	6712
1986													
S-65	471	792	598	745	803	981	715	707	644	0	0	0	6456
S-65A	155	121	137	231	321	358	183	292	208	0	0	0	2006
S-65B	274	127	165	255	282	340	157	152	85	0	0	0	1837
S-65C	140	112	87	262	219	289	135	112	70	0	0	0	1417
S-65D	78	121	94	187	234	275	149	127	67	0	0	0	1332
S-65E	1245	1501	1028	885	478	421	209	197	111	0	0	0	6075

Source: South Florida Water Management District

TABLE E-4
SUMMARY OF NAVIGATIONAL LOCK OPERATION FOR STRUCTURES S-65 & S-65E FROM 1981 TO 1990

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
LOCK S-65E													
1981	158	244	381	336	217	141	85	77	185	311	193	110	2438
1982	191	257	304	271	373	176	380	224	176	364	241	182	3039
1983	326	398	386	555	178	491	502	329	439	609	494	376	5083
1984	288	542	601	667	494	485	460	441	450	446	500	341	5715
1985	383	831	937	789	626	560	699	858	596	737	1220	752	8988
1986	471	792	598	745	803	981	715	707	644	--	--	--	6456
1990	930	1064	1726	700	120	887	900	454	591	704	674	591	9341
LOCK S-65													
1981	280	440	515	253	130	45	42	15	55	203	270	144	2392
1982	460	941	813	296	184	70	247	115	124	111	280	438	4079
1983	483	810	717	273	0	257	222	86	98	190	283	360	3779
1984	1077	1118	1169	464	281	267	158	164	165	203	117	763	5946
1985	572	765	1054	635	460	437	297	460	232	499	673	628	6712
1986	1245	1501	1028	885	478	421	209	197	111	--	--	--	6075
1990	826	942	1158	1083	643	195	180	119	317	448	652	551	7114

TABLE E-5
VESSEL TRAFFIC DATA FOR LOCKS S-65 & S-65E

S-65	YEAR 1990											YEAR 1991		
MONTHS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
NUMBER OF U VESSELS	732	859	1090	949	589	193	172	115	309	435	642	547	1585	1269	1214
NUMBER OF X VESSELS	48	54	45	110	35	0	0	0	0	0	0	0	3	1	0
NUMBER OF 0 VESSELS	46	29	23	16	11	1	8	4	6	10	9	3	15	26	143
NUMBER OF A VESSELS	0	0	0	8	8	1	0	0	2	3	1	1	2	0	1

S-65E	YEAR 1990											YEAR 1991		
MONTHS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
NUMBER OF U VESSELS	910	1029	1699	688	114	840	559	400	506	666	615	510	391	687	826
NUMBER OF X VESSELS	0	0	0	0	0	39	325	36	66	28	49	62	32	49	62
NUMBER OF 0 VESSELS	20	35	27	12	6	6	6	8	17	7	10	18	5	10	18
NUMBER OF A VESSELS	0	1	0	0	6	2	10	10	2	3	0	1	0	0	1

VESSEL CLASS: U = under 25', 0 =over 25', A = airboat, X = other

powered

TABLE E-6

Estimated Boat Usage by Facility

Site 1/ Identification	Days in Year by Seasons		Boats/day By Seasons		Total 2/ Annual boat use in days	No. 3/ per Boat	4/ Est. User Days	
	In	Out	In	Out			Fishing	Other
				S-65E				
2 5/	59	306	24	6	3200	2	5400	1000
3	59	306	40	10	5400	2	9200	1600
D 5/	60	305	24	6	3300	2	5600	1000
E 5/	60	305	24	6	3300	2	5600	1000
4 5/	90	275	29	14	6500	2	9100	3900
				S-65D				
5	182	183	48	24	13100	3	19600	19600
				S-65C				
F 5/	120	245	29	14	6400	2	10400	3400
				S-65B				
J 5/	120	245	17	12	5000	2	7500	2500
				S-65A				
12	151	214	28	20	8500	3	23000	2600
				S-65				
K 5/	120	245	30	14	7000	2	10500	3500
13	121	244	73	25	15000	3	27000	18000
14	212	153	52	21	14200	2	22700	5700
15	212	153	16	8	4600	3	11000	2800
TOTAL					96000		166600	66600

1/ Based on facilities identified by numbers and letters on Figure E-2.

2/ Totals rounded to nearest 100 boat/days.

3/ Estimated average number of people per boat from interviews in 1991.

4/ Estimate of user days obtained by multiplying average people per boat times annual boat use in days. Fishing usage estimated as a percent of total user days from interviews in 1991.

5/ Field information not available from these sites so the values are estimated using information from other evaluated sites.

TABLE E-7

County Boat Registration

Counties	Boat Use*	Number of boats by State Fiscal Year** 1974-75	1982-83	1988-89	1989-90
Glades	Commercial	87	116	123	127
	Recreation	458	684	804	822
Highlands	Commercial	142	270	137	120
	Recreation	2,793	4,774	7,010	7,352
Okeechobee	Commercial	211	177	240	253
	Recreation	1,700	2,958	4,273	4,231
Orange	Commercial	250	229	320	325
	Recreation	16,175	22,522	28,826	29,205
Osceola	Commercial	183	204	316	319
	Recreation	1,741	3,311	5,029	5,297
Polk	Commercial	578	893	468	425
	Recreation	13,634	20,175	25,653	24,342
TOTAL	Commercial	1451	1,889	1,604	1,569
	Recreation	36,501	54,424	71,595	71,249

* Commercial boat registration data includes all boats registered for commercial activities such as charters, rentals, and fishing.

** State Fiscal Year is June - May

TABLE E-8

Census Data on Six Counties

	1970	1975*	1980	1990
Glades	3,669	4,689	5,992	7,591
Highlands	29,507	37,448	47,526	68,432
Okeechobee	11,233	15,087	20,264	29,627
Orange	344,311	402,646	470,865	677,491
Osceola	25,267	35,289	49,287	107,728
Polk	227,222	270,345	321,652	405,382
TOTAL	641,209	765,504	915,586	1,296,251

* Estimated Data

TABLE E-9

Projected Population and Recreational Boats

	1995	2000	2005	2015	2035
			County Population		
Glades	7,646	7,986	8,288	8,787	9,598
Highlands	70,937	76,097	80,286	87,303	97,722
Okeechobee	31,526	33,836	35,722	39,064	44,164
Orange	678,401	726,581	764,895	838,109	945,069
Osceola	106,038	118,970	129,101	146,744	173,365
Polk	433,988	461,073	483,872	524,377	584,801
TOTAL	1,328,536	1,424,543	1,502,164	1,644,384	1,854,719
			Number of Boats		
Recreational Boats	74,630	80,023	84,384	92,373	104,188

TABLE E-10

Projected Usage Without Restoration

	User Days		
Year	Fishing	Other	Boat-A-Cade
1990	95,800	38,700	2,100
1995	100,340	40,540	2,200
2000	107,590	43,470	2,360
2005	113,450	45,840	2,490
2015	124,190	50,180	2,730
2035	140,080	56,600	3,080

TABLE E-11

Projected Usage With Restoration

Site 1/	Boater Category	User Days by Years 2/ 1990	1995	2000	2005	2015	2035
--	Boat-A-Cade						
	Trip 1 3/	480	500	540	570	620	700
	Trip 2 3/	600	560	600	640	700	790
	Trip 3 3/	1020	1010	1090	1150	1260	1410
	Subtotals	2100	2080	2230	2360	2580	2900
2,3 4/	Fishing	14600	14530	15580	16430	17980	20280
	Other	2600	1360	1460	1540	1680	1890
D,E,4,	Fishing	57800	57320	61460	64810	70940	80010
5,F,J,	Other	31400	16440	17630	18590	20350	22950
12 4/	Fishing	23400	23280	24960	26320	28810	32500
	Other	2600	1360	1460	1540	1680	1890
	Subtotals						
	Fishing	95800	95130	102000	107560	117730	132790
	Other	36600	19160	20550	21670	23710	26730
TOTALS							
	Fishing	95800	95130	102000	107560	117730	132790
	Other	38700	21240	22780	24030	26290	29630

1/ Site locations and identification are shown on Figure E-4.
2/ User days rounded to nearest 10 days.
3/ Boat-A-Cade trips are considered other activities in the totals.
4/ Site location outside the restoration area and not impacted.

TABLE E-12

Point Assignments for General and Special Boating Activities

Criteria/Judgement Factors	General		Special
	Recreation	Fishing	Boat-A-Cade
(a) Recreation experience:			
General - boater involved mainly in one activity.	2	2	
Special - Small groups with events subject to water level changes.			5
(b) Availability of opportunity:			
General - several access points within short travel distance and lots of river.	3	3	
Special - events occurs two to three times a year.			5
(c) Carrying capacity:			
General - Scattered entry points to river for larger capacity usage.	5	6	
Special - long river with capacity for small boat traffic.			6
(d) Accessibility:			
General - access to certain areas on waterway poor others good.	4	5	
Special - long trips with difficulty in accessing some areas.			4
(e) Environmental:			
General - scenic river for boater either fishing or other.	7	6	
Special - scenic river helps make journey less tiring.	—	—	7
TOTAL POINT VALUES	21	22	27

TABLE E-13

DOLLAR VALUE OF GENERAL AND SPECIAL BOATING ACTIVITIES[1]

POINT VALUES	GENERAL RECREATION VALUES[2]	GENERAL FISHING & HUNTING VALUES[2]	SPECIAL-IZED FISHING & HUNTING VALUES[3]	SPECIAL-IZED RECREATION VALUES OTHER THAN FISHING & HUNTING
0	2.13	3.12	14.93	8.54
10	2.49	3.46	15.30	9.25
20	2.87	3.78	15.68	9.95
30	3.34	4.12	16.08	10.67
40	3.84	4.12	16.46	11.38
50	4.58	4.99	17.97	12.82
60	4.94	5.43	19.50	14.23
70	5.31	5.85	21.03	17.07
80	5.67	6.09	22.57	19.92
90	6.05	6.31	24.08	22.77
100	6.41	6.37	25.61	25.61

[1] CECW-PD Memorandum, January 24, 1991, subject, Economic Guidance Memorandum 91-2: Fiscial Year 1971 Unit Day Values for Recreation.

[2] Point judgement factors obtained from Table 6-29 in ER1105-2-100 and listed in table E-12.

[3] Point judgement factors obtained from Table 6-30 in ER1105-2-100 and listed in table E-12.

TABLE E-14

Economic Analysis of Boat Usage With and Without Restoration

User		Annual Amounts (000)				
Categories	Condition	1995	2000	2005	2015	2035
Boat-A-Cade	Without	23	25	26	28	32
	With	22	23	25	27	30
	Net 1/	1	2	1	1	2
Recreation	Without	160	171	180	198	223
	With	86	92	97	106	120
	Net 1/	74	79	83	92	103
Fishing	Without	580	622	656	719	811
	With	562	603	636	696	785
	Net 1/	18	19	20	23	26
Total of Nets		93	100	104	116	131

1/ Net is the difference between the with and without condition.

TABLE E-15

SUMMARY OF DEMAND FOR SELECTED ACTIVITIES - 1995
(IN THOUSANDS)

	F/WATER BEACH	F/WATER BOAT FISHING	F/WATER NON-BOAT FISHING	F/WATER BOAT RAMP USE	HIKING	HORSEBACK RIDING	HUNTING	CANOEING
REGION VI	3,646	3,420	1,452	1,975	975	872	234	780
REGION VII	902	2,428	917	1,184	300	222	224	88
REGION IX	1,901	902	511	240	748	682	250	374

TABLE E-16

SUMMARY OF NEED FOR SELECTED ACTIVITIES - 1995

	F/WATER BEACH (MILES)	F/WATER BOAT FISHING	F/WATER NON-BOAT FISHING (LI. FT.)	F/WATER BOAT RAMP USE (LANES)	HIKING (MILES)	HORSEBACK RIDING (MILES)	HUNTING (ACRES)	CANOEING
REGION VI	1.3	0	1,401	0	0	107.5	0	0
REGION VII	0	0	0	0	0	35.1	219,679	0
REGION IX	2.6	0	8,259	0	32.8	109.2	0	0

SOURCE: FLORIDA STATE COMPREHENSIVE OUTDOOR RECREATION PLAN, 1989

TABLE E-17

PARK ATTENDANCE
LAKE KISSIMMEE STATE PARK

	YEAR					
MONTH	1985	1986	1987	1988	1989	1990
JANUARY	3053	3191	2698	3435	3012	3172
FEBRUARY	4292	4485	3793	4815	4527	4459
MARCH	4336	4532	3832	4900	4278	4505
APRIL	4425	4626	3911	5000	4367	4597
MAY	3628	3792	3206	4100	3580	3769
JUNE	2787	2913	2463	3150	2750	2896
JULY	3717	3884	3284	4200	3667	3861
AUGUST	3230	3376	2854	3650	3187	3356
SEPTEMBER	3451	3607	3050	3900	3405	3585
OCTOBER	4380	4578	3871	4950	4322	4551
NOVEMBER	4071	4254	3597	4600	4016	4229
DECEMBER	2876	3006	2542	4297	2838	2988
TOTAL	44264	46242	39101	49997	43656	45968

Source: Florida Department of Natural Resources

Visitation at Okee-Tantie Park has also shown a fluctuating yearly figure. This park has been operated by Okeechobee County since April of 1989. The South Florida Water Management District, which had operated the park prior to that date, is in the process of transferring complete control of the park to the county.

TABLE E-18

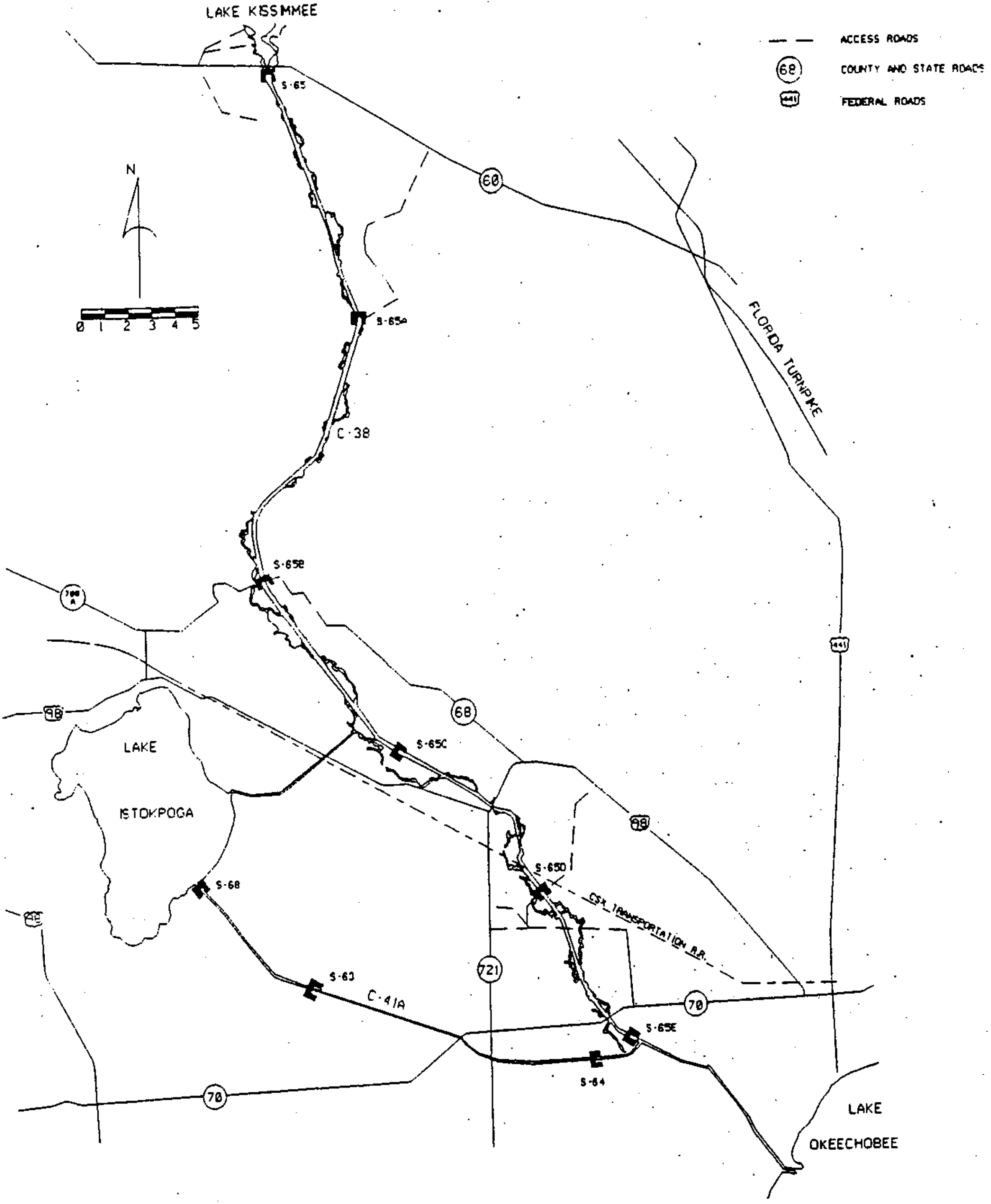
PARK ATTENDANCE
OKEE-TANTIE PARK

1985	1986	1987	1988	1989	1990
24,333	23,006	22,530	23,911	25,133	24,146#

85-90 figures for visitation to campground only.

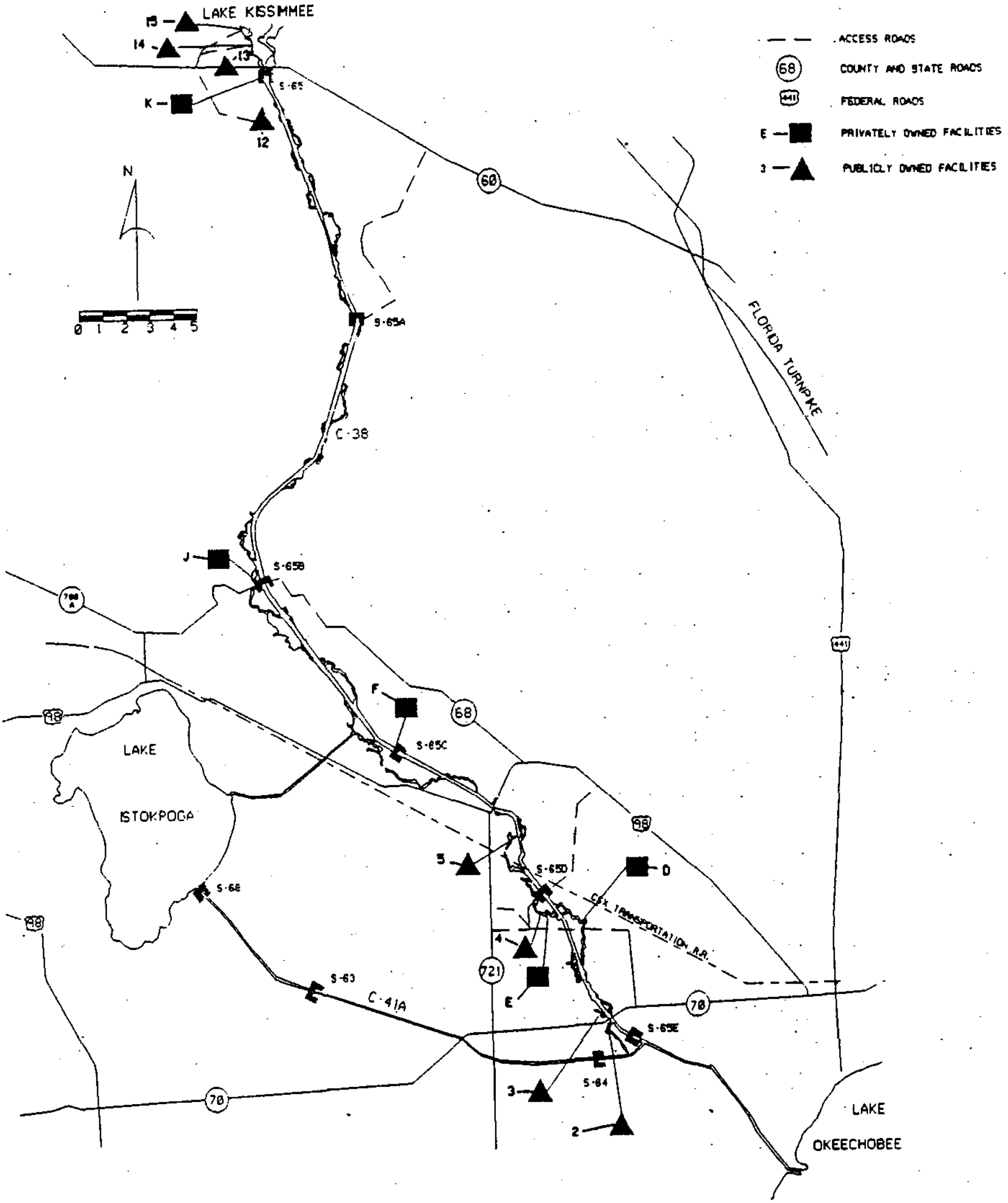
Sources: South Florida Water Management District, Corps of Engineers and Okeechobee County

FIGURES



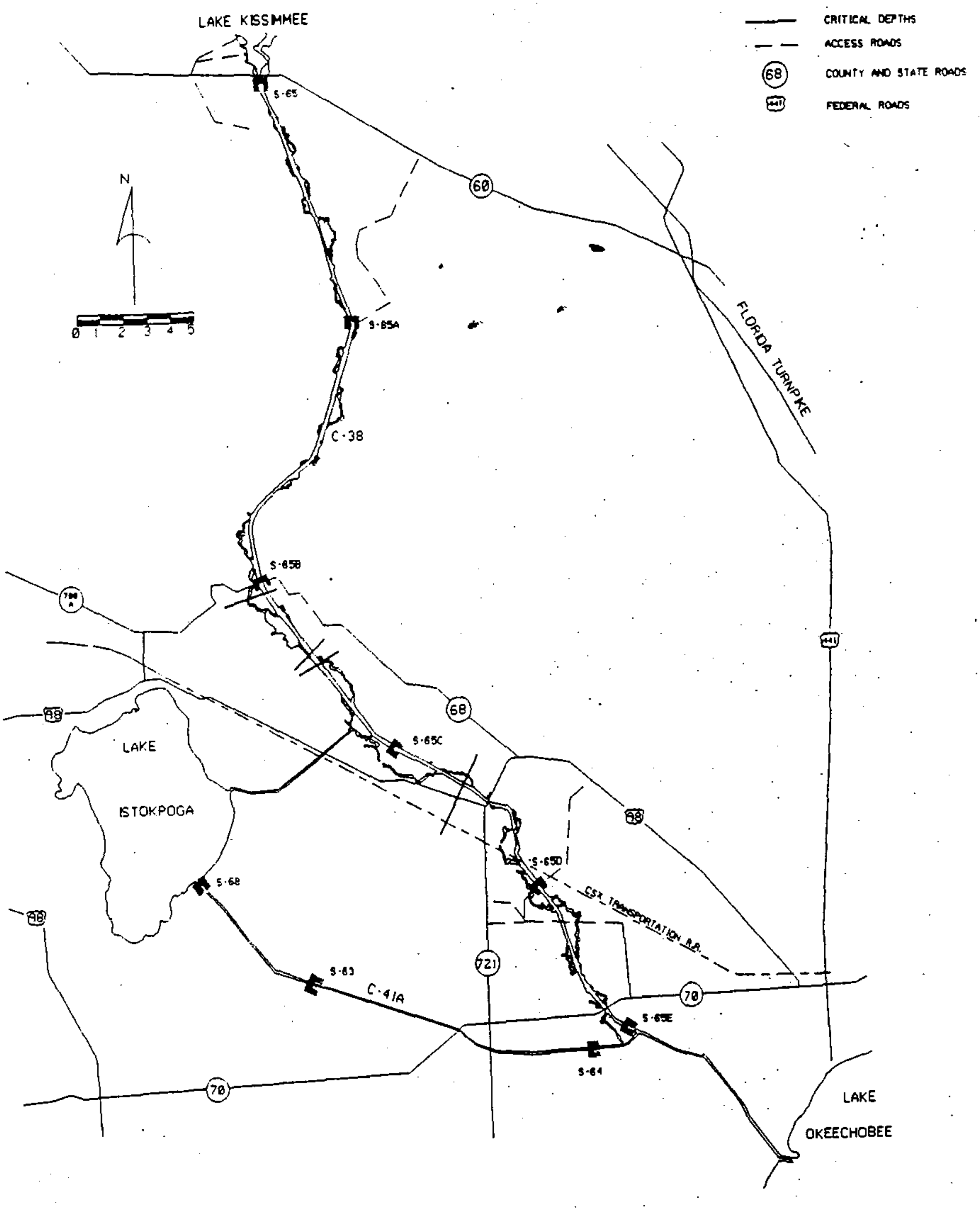
ACCESS ROADS
TO LAUNCHING POINTS

FIGURE E-1



EXISTING FACILITIES

FIGURE E-2



CRITICAL LOW DEPTH AREAS

FIGURE E-3

APPENDIX F

REAL ESTATE SUPPLEMENT

APPENDIX F

REAL ESTATE SUPPLEMENT

TABLE OF CONTENTS

EXHIBITS

PLATES

APPENDIX F

REAL ESTATE SUPPLEMENT

Project Total: Headwaters Revitalization and River Restoration

O1 LANDS AND DAMAGES

O1A	PROJECT PLANNING		$ 350,000
O1AO	CONTINGENCIES	87,000	
O1B	ACQUISITIONS		
O1B2	LS OBTAINED		3,799,000
O1B3	REVIEW OF LS		524,000
O1BO	CONTINGENCIES	1,082,000	
O1C	CONDEMNATIONS		
O1C2	BY LS		6,400,000
O1C3	REVIEW OF LS		630,000
O1CO	CONTINGENCIES	1,758,000	
O1E	APPRAISALS		
O1E1	GOVT (REVIEW)		388,000
O1E3	LS		1,114,000
O1EO	CONTINGENCIES	375,000	
O1F	PL 91-646 ASSISTANCE		
O1F2	BY LS		2,535,000
O1F3	REVIEW OF LS		423,000
O1FO	CONTINGENCIES	738,000	
O1G	TEMPORARY PERMITS		
O1G2	LS OBTAINED		203,000
O1G3	REVIEW OF LS		104,000
O1G6	DAMAGE CLAIMS		25,000
O1GO	CONTINGENCIES	83,000	
O1H	LCA COMPLIANCE REVIEW		17,000
O1HO	CONTINGENCIES	4,000	
O1J	REAL ESTATE PAYMENTS		
O1J1	LAND PAYMENTS		
O1J3	BY LS		119,273,000
O1J6	PL 91-646 ASSISTANCE PAYMENTS		
O1J8	BY LS		17,593,000
O1JOO	CONTINGENCIES	34,217,000	
TOTAL REAL ESTATE COSTS (EXCLUDING CONTINGENCIES)			$153,378,000
TOTAL REAL ESTATE CONTINGENCIES		$ 38,344,000	
TOTAL REAL ESTATE COSTS			$191,722,000

APPENDIX F

REAL ESTATE SUPPLEMENT

Total for Headwaters Revitalization

01 LANDS AND DAMAGES

01A	PROJECT PLANNING		$ see total
01AO	CONTINGENCIES		
01B	ACQUISITIONS		
01B2	LS OBTAINED		994,000
01B3	REVIEW OF LS		257,000
01BO	CONTINGENCIES	313,000	
01C	CONDEMNATIONS		
01C2	BY LS		3,400,000
01C3	REVIEW OF LS		309,000
01CO	CONTINGENCIES	927,000	
01E	APPRAISALS		
01E1	GOVT (REVIEW)		154,000
01E3	LS		351,000
01EO	CONTINGENCIES	126,000	
01F	PL 91-646 ASSISTANCE		
01F2	BY LS		1,452,000
01F3	REVIEW OF LS		242,000
01FO	CONTINGENCIES	423,000	
01G	TEMPORARY PERMITS		
01G2	LS OBTAINED		70,000
01G3	REVIEW OF LS		51,000
01G6	DAMAGE CLAIMS		10,000
01GO	CONTINGENCIES	33,000	
01H	LCA COMPLIANCE REVIEW		see total
01HO	CONTINGENCIES		
01J	REAL ESTATE PAYMENTS		
01J1	LAND PAYMENTS		
01J3	BY LS		42,769,000
01J6	PL 91-646 ASSISTANCE PAYMENTS		
01J8	BY LS		9,762,000
01JOO	CONTINGENCIES	13,133,000	
TOTAL REAL ESTATE COSTS (EXCLUDING CONTINGENCIES)			$ 59,821,000
TOTAL REAL ESTATE CONTINGENCIES		$ 14,955,000	
TOTAL REAL ESTATE COSTS			$ 74,776,000

APPENDIX F

REAL ESTATE SUPPLEMENT

Total for River Restoration - Lower Basin (Segments 1, 2 and 3)

O1	LANDS AND DAMAGES		
O1A	PROJECT PLANNING		$ 350,000
O1AO	CONTINGENCIES	87,000	
O1B	ACQUISITIONS		
O1B2	LS OBTAINED		2,805,000
O1B3	REVIEW OF LS		267,000
O1BO	CONTINGENCIES	769,000	
O1C	CONDEMNATIONS		
O1C2	BY LS		3,000,000
O1C3	REVIEW OF LS		321,000
O1CO	CONTINGENCIES	831,000	
O1E	APPRAISALS		
O1E1	GOVT (REVIEW)		234,000
O1E3	LS		763,000
O1EO	CONTINGENCIES	249,000	
O1F	PL 91-646 ASSISTANCE		
O1F2	BY LS		1,083,000
O1F3	REVIEW OF LS		181,000
O1FO	CONTINGENCIES	315,000	
O1G	TEMPORARY PERMITS		
O1G2	LS OBTAINED		133,000
O1G3	REVIEW OF LS		53,000
O1G6	DAMAGE CLAIMS		15,000
O1GO	CONTINGENCIES	50,000	
O1H	LCA COMPLIANCE REVIEW		17,000
O1HO	CONTINGENCIES	4,000	
O1J	REAL ESTATE PAYMENTS		
O1J1	LAND PAYMENTS		
O1J3	BY LS		76,504,000
O1J6	PL 91-646 ASSISTANCE PAYMENTS		
O1J8	BY LS		7,831,000
O1JOO	CONTINGENCIES	21,084,000	
TOTAL REAL ESTATE COSTS (EXCLUDING CONTINGENCIES)			$ 93,557,000
TOTAL REAL ESTATE CONTINGENCIES		$ 23,389,000	
TOTAL REAL ESTATE COSTS			$116,946,000

APPENDIX F

REAL ESTATE SUPPLEMENT

River Restoration - Segment 1: Pools A, B and C

01	LANDS AND DAMAGES		
01A	PROJECT PLANNING		$ 350,000
01AO	CONTINGENCIES	87,000	
01B	ACQUISITIONS		
01E2	LS OBTAINED		1,406,000
01B3	REVIEW OF LS		52,000
01BO	CONTINGENCIES	365,000	
01C	CONDEMNATIONS		
01C2	BY LS		1,600,000
01C3	REVIEW OF LS		63,000
01CO	CONTINGENCIES	416,000	
01E	APPRAISALS		
01E1	GOVT (REVIEW)		52,000
01E3	LS		336,000
01EO	CONTINGENCIES	97,000	
01F	PL 91-646 ASSISTANCE		
01F2	BY LS		36,000
01F3	REVIEW OF LS		6,000
01FO	CONTINGENCIES	10,000	
01G	TEMPORARY PERMITS		
01G2	LS OBTAINED		68,000
01G3	REVIEW OF LS		10,000
01G6	DAMAGE CLAIMS		5,000
01GO	CONTINGENCIES	21,000	
01H	LCA COMPLIANCE REVIEW		17,000
01HO	CONTINGENCIES	4,000	
01J	REAL ESTATE PAYMENTS		
01J1	LAND PAYMENTS		
01J3	BY LS		27,054,000
01J6	PL 91-646 ASSISTANCE PAYMENTS		
01J8	BY LS		201,000
01JOO	CONTINGENCIES	6,814,000	
TOTAL REAL ESTATE COSTS (EXCLUDING CONTINGENCIES)			$ 31,256,000
TOTAL REAL ESTATE CONTINGENCIES		$ 7,814,000	
TOTAL REAL ESTATE COSTS			$ 39,070,000

APPENDIX F

REAL ESTATE SUPPLEMENT

River Restoration - Segment 2: Pool D

01	LANDS AND DAMAGES		
01A	PROJECT PLANNING		$ see total
01AO	CONTINGENCIES		
01B	ACQUISITIONS		
01B2	LS OBTAINED		915,000
01B3	REVIEW OF LS		132,000
01BO	CONTINGENCIES	262,000	
01C	CONDEMNATIONS		
01C2	BY LS		200,000
01C3	REVIEW OF LS		159,000
01CO	CONTINGENCIES	90,000	
01E	APPRAISALS		
01E1	GOVT (REVIEW)		132,000
01E3	LS		270,000
01EO	CONTINGENCIES	100,000	
01F	PL 91-646 ASSISTANCE		
01F2	BY LS		630,000
01F3	REVIEW OF LS		105,000
01FO	CONTINGENCIES	184,000	
01G	TEMPORARY PERMITS		
01G2	LS OBTAINED		35,000
01G3	REVIEW OF LS		26,000
01G6	DAMAGE CLAIMS		5,000
01GO	CONTINGENCIES	16,000	
01H	LCA COMPLIANCE REVIEW		see total
01HO	CONTINGENCIES		
01J	REAL ESTATE PAYMENTS		
01J1	LAND PAYMENTS		
01J3	BY LS		25,472,000
01J6	PL 91-646 ASSISTANCE PAYMENTS		
01J8	BY LS		4,620,000
01JOO	CONTINGENCIES	7,523,000	
TOTAL REAL ESTATE COSTS (EXCLUDING CONTINGENCIES)			$ 32,701,000
TOTAL REAL ESTATE CONTINGENCIES		$ 8,175,000	
TOTAL REAL ESTATE COSTS			$ 40,876,000

APPENDIX F

REAL ESTATE SUPPLEMENT

River Restoration - Segment 3: Pool E

O1 LANDS AND DAMAGES

O1A	PROJECT PLANNING		$ see total
O1AO	CONTINGENCIES		
O1B	ACQUISITIONS		
O1B2	LS OBTAINED		484,000
O1B3	REVIEW OF LS		83,000
O1BO	CONTINGENCIES	142,000	
O1C	CONDEMNATIONS		
O1C2	BY LS		1,200,000
O1C3	REVIEW OF LS		99,000
O1CO	CONTINGENCIES	325,000	
O1E	APPRAISALS		
O1E1	GOVT (REVIEW)		50,000
O1E3	LS		157,000
O1EO	CONTINGENCIES	52,000	
O1F	PL 91-646 ASSISTANCE		
O1F2	BY LS		417,000
O1F3	REVIEW OF LS		70,000
O1FO	CONTINGENCIES	121,000	
O1G	TEMPORARY PERMITS		
O1G2	LS OBTAINED		30,000
O1G3	REVIEW OF LS		17,000
O1G6	DAMAGE CLAIMS		5,000
O1GO	CONTINGENCIES	13,000	
O1H	LCA COMPLIANCE REVIEW		see total
O1HO	CONTINGENCIES		
O1J	REAL ESTATE PAYMENTS		
O1J1	LAND PAYMENTS		
O1J3	BY LS		23,978,000
O1J6	PL 91-646 ASSISTANCE PAYMENTS		
O1J8	BY LS		3,010,000
O1JOO	CONTINGENCIES	6,747,000	
TOTAL REAL ESTATE COSTS (EXCLUDING CONTINGENCIES)			$ 29,600,000
TOTAL REAL ESTATE CONTINGENCIES		$ 7,400,000	
TOTAL REAL ESTATE COSTS			$ 37,000,000

APPENDIX F

REAL ESTATE SUPPLEMENT

STATEMENT OF PURPOSE

This Real Estate Supplement is tentative in nature for planning purposes only and both the final real property acquisition lines and the estimate of value are subject to change even after approval of this Feasibility Report.

PROJECT AUTHORIZATION

A general comprehensive plan for flood damage prevention for central and southern Florida was brought about by the drought of 1944-45, and the hurricane of 1947 which caused wide-spread flooding. The inclusion of the Kissimmee basin in the comprehensive plan was directly pursuant to *Public Law 534, 1947*, and this plan was presented to Congress in 1948.

The comprehensive plan for the existing flood control system was presented in the report to the Chief of Engineers on Central and Southern Florida, published as *House Document Numbered 643, Eightieth Congress, second session*. It was authorized by the *Flood Control Act approved 3 September 1954 (Public Law 780, 83d Congress, 2d Session)*. The existing project works now in the Kissimmee basin conform closely with the general plan outlined in the 1948 report to Congress. The major lakes of the Upper Basin, which are used as water conservation reservoirs, are connected by channels - in most cases channels excavated in the 1880's but enlarged to varying degrees under the Congressionally authorized plan. Nine control structures regulate water levels and flows into the lake channel system. A 56-mile canal now connects Lake Kissimmee with Lake Okeechobee. Canal C-38, some 48 miles in length from Lake Kissimmee to Structure S-65E, and the previously constructed borrow canal below S-65E of some 8 miles to Lake Okeechobee, comprise this watercourse. Five control structures control water elevations in the canal and regulate flows originating in both the Upper and Lower Basins. These structures also have locks which provide year-round navigability within and through the Kissimmee basin.

Work in the Upper Basin was started in the early 1960's. Regulation of the levels in some of the major lakes started in 1964. Work in the Lower Basin started shortly thereafter with the lower control structure, S-65E, being completed in mid-1964. In 1965, control of flows and water levels in the

Kissimmee basin started under this project. Channel excavation of C-38 was completed in late 1970.

The Kissimmee River Headwaters Revitalization Project is authorized under *Section 1135 of the Water Resources Development Act of 1986 (P.L. 99-662)*, as amended. *The Feasibility Study for the Kissimmee River Restoration Project* is authorized under *Section 116(h) of the Water Resources Development Act of 1990 (P.L. 101-640).*

PROJECT LOCATION AND DESCRIPTION

The Kissimmee River basin study area contains approximately 2,300 square miles and extends from Orlando southward to Lake Okeechobee. Lake Okeechobee is the second largest freshwater lake in the United States, and a major water storage reservoir for south Florida. Lake Kissimmee was originally the principle source of the Kissimmee River but the construction of connecting canals between the upper chain of lakes now places the source just south of Orlando.

The basin occupies parts of Osceola, Okeechobee, Orange, Lake, Polk, Glades and Highlands Counties. The area is bounded on the north by the lakes of the Orlando area, on the west by the Peace River basin and the Lake Istokpoga basin, on the south by Lake Okeechobee and on the east by the upper St. Johns River basin and the Taylor Creek-Nubbin Slough basin. The largest municipalities in the area include Orlando, Kissimmee, Okeechobee, Haines City and St. Cloud, as shown on Plate 1.

The Kissimmee River basin contains two sub-basins. The northern portion of the basin, the Upper Basin, is comprised of a series of lakes some of which are interconnected by canals and managed by water control structures. This large sub-basin encompasses approximately 1,595 square miles and is referred to as the "Headwaters". This sub-basin is bounded on the southern end by State Road 60 where the basins's largest lake, Lake Kissimmee, discharges into the Kissimmee River, as shown on Plate F-1.

The sub-basin that contributes lateral inflow to the Kissimmee River is termed the Lower Basin. The Lower Basin consists of a 48 mile channel called Canal 38 (C-38) and six water control structures between Lake Kissimmee and Lake Okeechobee. Five of the water control structures form pools with constant water surface elevations. The Lower Basin receives flow from the Upper Basin through Lake Kissimmee at S-65. The Lake Istokpoga basin is a 422 square mile tributary to the Lower Basin, though only a portion of these historical flows now reach the Kissimmee River, as shown on Plates F-2 through F-6.

This supplement addresses two separate projects: the Kissimmee River Headwaters Revitalization Project and the Kissimmee River Restoration Project.

Kissimmee River Headwaters Revitalization Project Plan:

Headwaters Revitalization consists of necessary structural and operational modifications to the upper chain of lakes. Environmental benefits will be realized in the Upper Basin as a result of enlarged littoral zones in Lake Kissimmee, Lake Cypress and Lake Hatchineha and in the Lower Basin as a result of re-establishing the historic seasonal timing of inflows.

The overall objective of this plan is to restore ecosystem form and functions in the Kissimmee River basin. This consists of Upper Basin works which include modification to regulation schedules, channel enlargement and modification of structures.

The headwaters includes the area tributary to the upper chain of lakes (Tohopekaliga and East Tohopekaliga, Hart, Mary Jane, Myrtle, Preston, Alligator, Gentry, and Lake Cypress). Upper Basin lakes also include Lakes Marion, Hatchineha, Pierce, Rosalie, Weohyakapka, Tiger, Marian, Jackson and Kissimmee. The main municipalities of the Upper Basin include the southern half of Orlando, Kissimmee (which is the hub of the cattle industry in central Florida) St. Cloud and Haines City. This section of the Kissimmee River basin is the most heavily populated and the most intensively developed.

The Upper Basin is characterized by numerous lakes ranging in size from a few acres to 54 square miles. The total surface area of these lakes at normal water surface elevations is more than 10 percent of the total area in the Upper Basin. Lake levels are controlled by a system of canals and control structures.

Modification of the regulation schedule for the upper chain of lakes would restore the ability to simulate the historic seasonal flow from Lake Kissimmee to the Lower Basin and provide higher fluctuations of water levels in six lakes (Kissimmee, Hatchineha, Cypress, Rosalie, Tiger and Jackson). The upper level of the preliminary proposed schedule would be increased from 52.5 feet to 54 feet which will require purchasing fee simple, flowage easements and affected structures around these six lakes. Additionally, the schedule would be zoned to provide varying discharges based upon season and water levels.

Kissimmee River Restoration Project Plan:

Prior to channelization, the Kissimmee River meandered 103 miles within a one to two-mile wide flood plain. The flood plain, approximately 56 miles long, slopes gradually to the south from an elevation of 50 feet at Lake Kissimmee to 15 feet at Lake Okeechobee. Construction of C-38 within the Lower Basin has reduced flooding and enabled more intense land use in the basin. Its construction, however, led to a number of environmental effects such as a modification of fish and wildlife habitat, the possible loss of assimilative capacity of the river, and the loss of the aesthetic quality inherent in a natural meandering Kissimmee River system.

The primary concept of this restoration plan is to block or "dechannelize" the flood control canal (C-38) and redirect flow through bends of the original river and over the river flood plain to the extent possible.

In order to provide continuous flow as determined necessary for river restoration, a new spillway structure is proposed to be constructed at S-65 to provide flows that correspond closely to pre-project flows from Lake Kissimmee. A downstream channel with a scour protected stilling basin will provide flows into C-38.

The downstream end of the dechannelized section would be located in the middle reaches of Pool E. Linkages between river bends and canal linkages to the boat locks would be filled. The result would be one continuous backfilled section from the middle reaches of Pool B to middle reaches of Pool E. The linear extent of this filled section would be approximately 25 to 30 miles, most of the central reach of the river. Because of this extensive filling, the spillways, boat locks, existing auxiliary structures, and tieback levees at S-65B, S-65C, and S-65D would be removed. The structure at S-65E would be modified to allow higher headwater stages. The plan would keep C-38 intact from S-65E to approximately one mile upstream of State Road 70.

The River Restoration Plan also includes new channel excavation. In sections of the river/flood plain, the original river channel has been eliminated by the prior excavation of the canal or by the placement of material removed during project construction. In order to provide river conveyance along these reaches, a "new" channel is to be excavated. These newly created river sections would provide linkage between "restored" river sections.

Lower Basin tributary flooding will be mitigated through the acquisition of appropriate real estate interests. In two flood plain areas it was decided that levee protection from induced backwater flood damages is a more viable alternative than the acquisition of real estate interests. These areas are Yates

Marsh/Chandler Slough, located east of C-38 and upstream of S-65D, and Lake Istokpoga, located west of C-38 in Pool C.

The acquisition of lands, easements, rights-of-way and relocations are required to construct the project features and to provide flood control.

GOVERNMENT-OWNED LAND IN PROJECT AREA

Kissimmee River Headwaters Revitalization Project Plan:

Upper Basin Works and "Old" Agreements with Land Owners Adjacent to Chain of Lakes:

The Headwaters Revitalization portion is the only area perceived as affected by the following comment at this time:

There exists some agreements entered into in 1962 between land owners adjoining the upper lakes and Central and Southern Florida Flood Control District regarding the initial Kissimmee improvements. These preliminary agreements address an understanding regarding the placement of improvements by Central and Southern Florida Flood Control District in exchange for the land owners provision of the lands needed for the improvements.

The existence of these agreements was only recently known by the Jacksonville District and their legal implications are currently being investigated by the State of Florida Attorney General's Office and the South Florida Water Management District. This is an issue that must be resolved by the State regarding its ownership and use rights. Not all of these type agreements have been reviewed. Copies of the two known agreements are provided as Exhibits "A" and "B".

The Real Estate Supplement does not reflect a reduction for the land costs for the Upper Basin works at this time due to the uncertainty of the impact of these "old" agreements on land costs.

Kissimmee River Restoration Project Plan:

Use of Prior River Bed Lands:

The former Kissimmee river bed lands that were not utilized for the Canal 38 improvement are still subject to Federal navigational servitude. This allows their non-compensable use by the Federal Government for the

Kissimmee River Restoration Project. This determination is based upon application of the case of *Miller v. United States,* Claims Court, 550 F. Supp. 669 (1982) to this case. The Court's opinion on page 674 states its holding:

> *Looking at these stipulated responses in light of the Bonelli case, I find that they are dispositive of this case. Since all of the land in controversy is within the former river bed, and the flooding of the land is necessary to the navigation project which caused the emergence of the land initially, then the Government has a navigational servitude over all of the land in controversy. Therefore, there has been no taking under the fifth amendment.*

The *Miller* case has not been overruled nor cited in subsequent cases.

Avon Park Bombing Range:

The portion of the Avon Park Bombing Range affected by the Restoration Project consists of approximately 3,470 acres of Federally owned land. This area is located on the west side of C-38, south of S-65A and north of S-65B. This land is north of Lake Istokpoga and encompasses parts of Polk County and Highlands County. Coordination with the Air Force is continuing to determine solutions relating to the following areas of concern:

1. Availability, method and cost of provision of the lands needed for the project.
2. The cost to the Local Sponsor for land acquisition from the Air Force.
3. Responsibility, method and cost of ordnance removal and clean-up.
4. Fencing and other features designed for safety and security from trespass.
5. Probability of increased bird strikes due to project.
6. Effect of project on cattle grazing.

Agreement to be entered into between the Air Force and the Army is intended to ensure everyone's concurrence.

Project Impoundments and C-38 Right-of-Way:

Project impoundments are associated with the pools behind the structures, consist of a total of 7,606 acres and are owned by the Local Sponsor. The C-38 right-of-way is also owned by the Local Sponsor and consists of 2,764 acres.

Three Lakes Management Area and Lake Kissimmee State Park:

The portion of Three Lakes Management Area that is within the project consists of 770 acres and is state owned. Lake Kissimmee State Park contains approximately 715 acres within the project area.

APPRAISAL INFORMATION

A Gross Appraisal Report covering the areas discussed in the Supplement is being forwarded concurrently for approval. The following information was extracted from this report.

Kissimmee River Headwaters Revitalization Project Plan:

Description:

The Kissimmee River Headwaters Revitalization Project will increase the highest regulation pool from elevation 52.5 to elevation 54 and will require purchasing fee simple, flowage easements and affected structures around six lakes (Kissimmee, Hatchineha, Cypress, Rosalie, Tiger and Jackson). These six lakes are located in the area from approximately twelve miles south of Kissimmee to structure S-65, just south of the south shore of Lake Kissimmee.

The existing project limit for the Upper Basin is at the 52.5 foot contour. The new project influence to the 54 foot contour will cause inundation of approximately 5,300 acres that are below the 52.5 foot contour. These acres were previously excluded from the existing project because a berm prevented inundation below the 52.5 foot contour.

Subject lands in the Kissimmee River Headwaters Revitalization include wetlands, agricultural, transitional, residential and commercial lands. Approximately 514 ownership tracts will be affected by this project.

Highest and Best Use: The majority of this land is for agricultural use, primarily as cattle grazing land. There are some wetlands, transitional, residential and commercial land.

Kissimmee River Restoration Project Plan:

Description:

The Kissimmee River Restoration Project will fill portions of the C-38 Canal and provide non-structural flood control for the Kissimmee River and its tributaries by purchasing flood plain lands in fee or by easement, and affected structures. The meanders of the river and Canal 38 were excluded from the valuation. The restoration project area will begin at the S-65 structure (south of Lake Kissimmee at State Highway 60) and extend south approximately 44 miles to the S-65E Kissimmee River structure (at State Highway 70).

Subject lands in the Kissimmee River Restoration Project will include all privately owned lands below the after project 100 year flood elevation, affecting a total of approximately 532 ownership tracts. Wetlands, agricultural, transitional, commercial and residential lands will be affected.

Highest and Best Use: The majority of this land is for agricultural use, primarily as cattle grazing land. There are some wetlands, agricultural, transitional, commercial and residential land.

RELOCATION ASSISTANCE (PUBLIC LAW 91-646, AS AMENDED BY PUBLIC LAW 100-17)

Kissimmee River Headwaters Revitalization Project Plan:

Under this project there is a total of 481 residences and 3 commercial businesses affected under Public Law 91-646. Of this total, 431 residences will be acquired and 50 trailers will be relocated.

The 50 trailers are occupant owned but are situated on leased land, therefore, they are considered personal property and the relocation payments for these trailers under PL 91-646 are restricted to moving expenses only. Relocating the 50 trailers is physically possible without substantial damage or unreasonable cost, and will still provide decent, safe and sanitary housing to the occupants.

Estimates of costs to comply with Public Law 91-646 total $9,762,000. This figure represents an average payment of $22,000 for each of the 431 residential acquisitions ($9,482,000), and $10,000 for each of the 3 commercial acquisitions ($30,000). These payments allow for expenses incurred for recording fees, transfer taxes and costs for prepayment of pre-existing mortgages incident to conveying real property to the Sponsor. Also included in this figure, for residences, are the costs associated with providing displaced persons with comparable decent, safe and sanitary housing. A payment of $5,000 each ($250,000) is estimated for relocation of the 50 affected trailers.

A preliminary survey of the area indicates that there appears to be sufficient decent, safe and sanitary replacement housing available for persons affected under project. The Local Sponsor will document with a written report on specifics of available housing.

Kissimmee River Restoration Project Plan:

Estimates of costs to comply with *Public Law 91-646* for this project are as follows:

Segment 1 (Pools A, B and C):

The estimated costs for this segment of the Restoration Project total $201,000. This amount represents payments for the acquisition of 11 residences and 1 commercial (agricultural) business, which consists of 4 structures. Of the 11 residences, 7 are on single home parcels. The other residential parcel contains 4 homes of which 3 are rental homes. An amount of $22,000 is applied to 8 of the residences ($176,000), the rental homes are allowed $5,000 each ($15,000), and $10,000 is estimated for the commercial business.

Segment 2 (Pool D):

The estimated costs for this segment of the Restoration Project total $4,620,000. This amount represents payments for the acquisition of 210 residences, with each residence being allowed a payment of $22,000. However, the estimate may be reduced by providing flood proofing such as ring levees or modifications to site and structure elevations, in lieu of relocations.

Segment 3 (Pool E):

The estimated costs for this segment of the Restoration Project total $2,970,000. This amount represents payments for the acquisition of 135 residences, with each residence being allowed a payment of $22,000, and 4 commercial (agricultural) businesses, consisting of 10 structures, at $10,000 each ($40,000). However, the estimate may be reduced by providing flood proofing such as ring levees or modifications to site and structure elevations, in lieu of relocations.

These payments allow for expenses incurred for recording fees, transfer taxes and costs for prepayment of pre-existing mortgages incident to conveying real property to the Sponsor. Also included in this figure, for residences, are the costs associated with providing displaced persons with comparable decent, safe and sanitary housing.

A preliminary survey of the area indicates that there appears to be sufficient decent, safe and sanitary replacement housing available for persons affected under project. The Local Sponsor will document with a written report on specifics of available housing.

ACQUISITION/ADMINISTRATIVE COST ESTIMATES

Estimates of project acquisition/administrative costs for both the Local Sponsor and the Federal Government are explained below. South Florida Water Management District provided cost estimates for the non Federal costs.

Based on South Florida Water Management Division's experience, it is estimated that 20% of the total parcels to be acquired will result in condemnation, refer to Exhibit C.

Kissimmee River Headwaters Revitalization Project Plan:

The ownership data used in calculating the acquisition/administrative costs includes a total of 514 ownership tracts of which 484 are improved (481 residential and 3 commercial) and 30 are vacant.

Based on the above data, the estimated Federal acquisition/administrative costs (rounded) are as follows:

Review of Acquisitions (514 x $500)	$ 257,000
Review of Condemnations (103 x $3,000)	309,000
Review of Appraisals (514 x $300)	154,000
Review of PL 91-646 Assistance (484 x $500)	242,000
Review of Temporary Permits (514 x $100)	51,000
Total Federal Acquisition/Administrative Cost	$1,013,000

Applying the unit costs provided by the Local Sponsor for this project, the estimated non Federal acquisition/administrative costs (rounded) are as follows:

Acquisitions: 481 x $ 1,050 = $505,050	
3 x 3,400 = 10,200	
30 x 15,945 = 478,350	
Total Acquisition Cost	$ 994,000
Condemnations	3,400,000
Appraisals: 481 x $ 400 = $192,400	
3 x 3,000 = 9,000	
30 x 5,000 = 150,000	
Total Appraisal Cost	351,000
PL 91-646 Assistance (484 x $3,000)	1,452,000
Temporary Permits	70,000
Damage Claims	10,000
Total Non-Federal Acquisition/Administrative Cost	$6,277,000

Kissimmee River Restoration Project Plan:

Estimates of acquisition/administrative costs for this project are as follows:

Segment 1 (Pools A, B and C):

The ownership data used in calculating the acquisition/administrative costs for this segment includes a total of 104 ownership tracts of which 9 are improved (*8 residential ownerships and 1 commercial) and 95 are vacant.

*The 8 residential ownerships consist of 7 single home parcels and 1 parcel which contains 4 homes of which 3 are rental homes, for a total of 11 residential structures.

The Federal acquisition/administrative costs for this segment are listed below. The project planning and LCA compliance review costs shown below are the totals estimated for both Kissimmee Headwaters Revitalization and Kissimmee Restoration.

Project Planning (based on costs incurred)	$ 350,000
Review of Acquisitions (104 x $500)	52,000
Review of Condemnations (21 x $3,000)	63,000
Review of Appraisals (104 x $500)	52,000
Review of PL 91-646 Assistance (12 x $500)	6,000
Review of Temporary Permits (104 x $100)	10,000
LCA Compliance Review	17,000
Total Federal Acquisition/Administrative Costs	$ 550,000

Applying the unit costs provided by the Local Sponsor for this segment, the estimated non Federal acquisition/administrative costs (rounded) are as follows:

Acquisitions: 9 x $ 1,050 = $ 9,450	
95 x 14,700 = 1,396,500	
Total Acquisition Cost	$1,406,000
Condemnations	1,600,000
Appraisals: 9 x $ 400 = $ 3,600	
95 x 3,500 = 332,500	
Total Appraisal Cost	336,000
PL 91-646 Assistance (12 x $3,000)	36,000
Temporary Permits	68,000
Damage Claims	5,000
Total Non-Federal Acquisition/Administrative Cost	$3,451,000

Segment 2 (Pool D):

The ownership data used in calculating the acquisition/administrative costs for this segment includes a total of 263 ownerships of which 210 are improved residential parcels and 53 are vacant. This data, however, does not include possible flood proofing, such as ring levees or modifications to site and structure elevations to limit the possibility of impacts due to restoration. During later pre-construction engineering and design, further analysis will be conducted to determine where structural solutions can be implemented.

The Federal acquisition/administrative costs for this segment are listed below.

Review of Acquisitions (263 x $500)	$ 132,000
Review of Condemnations (53 x $3,000)	159,000
Review of Appraisals (263 x $500)	132,000
Review of PL 91-646 Assistance (210 x $500)	105,000
Review of Temporary Permits (263 x $100)	26,000
Total Federal Acquisition/Administrative Cost	$ 554,000

Applying the unit costs provided by the Local Sponsor for this segment, the estimated non Federal acquisition/administrative costs (rounded) are as follows:

Acquisitions: 210 x $ 1,050 = $ 220,500	
53 x 13,100 = 694,300	
Total Acquisition Cost	$ 915,000
Condemnations	200,000
Appraisals: 210 x $ 400 = $ 84,000	
53 x 3,500 = 185,500	
Total Appraisal Cost	270,000
PL 91-646 Assistance (210 x $3,000)	630,000
Temporary Permits	35,000
Damage Claims	5,000
Total NonFederal Acquisition/Administrative Cost	$2,055,000

Segment 3 (Pool E):

The ownership data used in calculating the acquisition/administrative costs for this segment includes a total of 165 ownerships of which 135 are improved residential parcels, 4 are commercial and 26 are vacant. This data, however, does not include possible flood proofing, such as ring levees or modifications to site and structure elevations to limit the possibility of impacts due to restoration. During later pre-construction engineering and design, further analysis will be conducted to determine where structural solutions can be implemented.

The Federal acquisition/administrative costs for this segment are listed as follows.

Review of Acquisitions (165 x $500)	$ 83,000
Review of Condemnations (33 x $3,000)	99,000
Review of Appraisals (165 x $300)	50,000
Review of PL 91-646 Assistance (139 x $500)	70,000
Review of Temporary Permits (165 x $100)	17,000
Total Federal Acquisition/Administrative Costs	$ 319,000

Applying the unit costs provided by the Local Sponsor for this segment, the estimated non Federal acquisition/administrative costs (rounded) are as follows:

Acquisitions: 135 x $ 1,050 = $ 141,750	
4 x 3,400 = 13,600	
26 x 12,630 = 328,380	
Total Acquisition Cost	$ 484,000
Condemnations	1,200,000
Appraisals: 135 x $ 400 = $ 54,000	
4 x 3,000 = 12,000	
26 x 3,500 = 91,000	
Total Appraisal Cost	157,000
PL 91-646 Assistance (139 x $3,000)	417,000
Temporary Permits	30,000
Damage Claims	5,000
Total NonFederal Acquisition/Administrative Cost	$2,293,000

RELOCATIONS

There are no relocations to be affected by the Headwaters Revitalization Project but there are several utility relocations to be affected by the River Restoration Project. These relocations are along the CSX railroad causeway and the Highway 98 bridge. Both of these cross the historic flood plain and require their relocation and the relocation of the utilities built within their rights-of-way. The utilities built along the CSX causeway requiring relocation consist of the following: north side--a fiber optic underground cable owned by Williams Telecommunications; south side-an overhead power line owned by CSX and an underground fiber optic cable owned by MCI. Along the Highway 98 bridge on the north side is constructed an overhead telephone cable, which is submarine at the river crossing, owned by United Telephone and a 69 kv overhead power line owned by Seminole Coop. Along the south side of the Highway 98 bridge is a 25 kv overhead power line owned by Glades Electric. Refer to Figures ME-1 and ME-2. The CSX railroad crossing will be relocated to allow the opening of the causeway at two locations on each side of the existing canal to allow water flow. The highway 98 bridge will be raised and widened to accommodate water flow.

Also to be relocated are public boat launching ramps at S-65, S-65B and S-65C which will be relocated to the edge of the flood plain. Ramps will be connected with the restored river by access channels.

It is presumed at this time that the existing rights-of-way are sufficient to support the relocations together with the fee lands to be acquired adjacent to the current project right-of-way. A more detailed discussion of the relocation requirements will be addressed in the Relocations Design Memorandum intended to be prepared.

The accomplishment of these relocations is the responsibility of the local sponsor as part of its local cooperation requirements for which it will receive cost sharing credit.

Attorney opinions of compensability will be provided as part of the Relocations Design Memorandum to be submitted by the District.

NON-FEDERAL OPERATION/MAINTENANCE RESPONSIBILITIES

The South Florida Water Management District, as the Local Sponsor of the projects, will operate and maintain during life of the projects at 100% local cost, pursuant to the directions and guidelines of the United States Government.

NON-FEDERAL AUTHORITY TO PARTICIPATE IN THE PROJECTS

The South Florida Water Management District was created by virtue of *Florida Statutes, Chapter 373, Section .069*. The South Florida Water Management District was created to further the State policy of flood damage prevention, preserve natural resources of the State including fish and wildlife and to assist in maintaining the navigability of rivers and harbors. (There are other enumerated purposes but they are not directly applicable to this project.) The South Florida Water Management District is specifically empowered to

> *"Cooperate with the United States in the manner provided by Congress for flood control, reclamation, conservation, and allied purposes in protecting the inhabitants, the land, and other property within the district from the effects of a surplus or a deficiency of water when the same may be beneficial to the public health, welfare, safety, and utility". (Section 373.103)*

To carry out the above purposes, the South Florida Water Management District is empowered to

> *"...hold, control, and acquire by donation, lease, or purchase, or to condemn any land, public or private, needed for rights-of-way or other purposes, and may remove any building or other obstruction necessary for the construction, maintenance, and operation of the works; and to hold and have full control over the works and rights-of-way of the district".*

The term "works of the district" is defined by *Section 373.019* to be

> *"those projects and works, including, but not limited to, structures, impoundments, wells, and other water courses, together with the appurtenant facilities and accompanying lands, which have been officially adopted by the governing board of the district as works of the district".*

Section 373.139 specifically empowers the South Florida Water Management District

> *"...to acquire fee title to real property and easements therein by purchase, gift, devise, lease, eminent domain, or otherwise for flood control, water storage, water management, and preservation of wetlands, streams and lakes, except that eminent domain powers which may be used only for acquiring real property for flood control and water storage".*

The eminent domain power is potentially limited to the above cited purposes and a resort to Federal acquisition might be required if it is construed that South Florida Water Management District's power is limited to the above cited purposes (flood control, water storage or district works). The question essentially becomes whether the governing board's adoption of the project as a district works allows use of its eminent domain powers under *Section 373.086* or whether the project is for flood control and/or water storage purposes. The restoration project provides for water storage in the historic flood plain and continues the flood control capabilities of the project with non-structural features having been substituted for structural.

The South Florida Water Management District has a Real Estate Division which has acquired 50 percent of the lands needed for the project and is currently obtaining information concerning the remaining lands. The South Florida Water Management District is budgeting to acquire the balance of the lands.

HAZARDOUS AND TOXIC WASTES

As a result of preliminary coordination with the Air Force, the existence of ordnance on lands required for the project in the Avon Park Bombing Range is probable. Coordination is pending on responsibility, cost and method for clean-up.

RECREATION LANDS

There are no known separable recreation lands included within project lands. Recreational development on project lands will be within the fee taking boundary which will preclude requirements for additional estates.

STRUCTURES AND FACILITIES

There are no known structures or facilities that come within the purview of Section III of the Act of Congress approved 3 July 1958 (Public Law 85-500).

OUTSTANDING RIGHTS

Known outstanding rights include easements for roads, power lines and communications cables.

MINERAL RIGHTS

Based on South Florida Water Management District's experience to date, there is a minimal amount of outstanding mineral rights in the project area. These mineral rights will be acquired by the Local Sponsor.

TIMBER/VEGETATIVE COVER

Proposed acquisition of lands for project implementation will not consist of any area which will include standing timber or other vegetative cover that has significant recreation or scenic value, therefore, there will be no reservation of standing timber for the proposed acquisition. Standing timber has been determined to have no merchantable value.

TOWNS AND CEMETERIES

There are no known towns or cemeteries located within the project area.

CULTURAL RESOURCES

Preliminary coordination with the State Historic Preservation Office (S.H.P.O.) in 1985, indicated that at least 17 sites of historic or archaeological significance were located within the Kissimmee River valley and the Taylor Creek-Nubbin Slough basins. It was estimated by S.H.P.O. that another 30-50 or more presently unrecorded sites were likely to occur in the area.

In a letter dated June 18, 1991, S.H.P.O. reaffirmed the archaeological and historical potential of this region. Inspection of the Florida Master Site File in Tallahassee revealed that at least 50 archaeological sites are now recorded in the river basin. Approximately 3,000 archaeologic and historic properties are recorded in the four counties of the Lower Basin. Prior to initiation of any Federal restoration activities, an archaeological survey would be conducted.

ESTIMATED COST OF LANDS, EASEMENTS, RIGHTS-OF-WAY AND RELOCATIONS (LERR) FOR THE PROJECTS

In accordance with SAD guidance dated 11 May 1989, a 25% contingency is recommended to be used in normal circumstances within the Real Estate Appendix based on Gross Appraisal Lands and Damages Costs.

Kissimmee River Headwaters Revitalization Project:

The following is a summary of estimated real estate costs for subject project.

1. Lands and Damages		
Lands (17,282.56 acres total)		
Fee Simple:		
Residential: 202.19 acres	$ 3,451,000	
Commercial: 3.00 acres	60,000	
Total (Rounded)	3,511,000	
Flowage Easement:		
Wetlands: 1,034.49 acres	518,000	
Agricultural: 15,545.11 acres	15,546,000	
Transitional: 41.00 acres	123,000	
Residential: 456.21 acres	6,260,000	
Commercial: .56 acres	56,000	
Total (Rounded)	22,503,000	
Total		$ 26,014,000
Improvements		
Residential: 431	$ 15,129,000	
Commercial: 3	307,000	
Miscellaneous: docks	874,000	
Total (Rounded)		$16,310,000
Severance Damages		$ 445,000
Minerals		0
Total Lands and Damages (Rounded)		$ 42,769,000
2. Acquisition-Administrative costs		
Federal		1,013,000
NonFederal		6,277,000
3. Public Law 91-646		9,762,000
4. Contingencies: 25% (Rounded)		14,955,000
Total Estimated Real Estate Costs		$ 74,776,000

Kissimmee River Restoration Project Plan:

Under this project, construction is to be completed in three segments. The following lists the total estimated real estate costs for each segment.

Segment 1: Pools A, B and C

1. Lands and Damages		
Lands (38,355.20 acres total)		
Fee Simple:		
Riverlands: 3,138.84 acres	$ 0	
Wetlands: 11,089.00 acres	5,544,500	
Agricultural: 19,807.21 acres	19,807,210	
Residential: 24.98 acres	499,600	
Total (Rounded)	25,852,000	
Flowage Easement:		
Agricultural: 4,240.64 acres	424,064	
(Rounded)	425,000	
Levee Easement:		
Agricultural: 22.30 acres	22,300	
(Rounded)	23,000	
Channel Easement:		
Agricultural: 12.37 acres	12,370	
(Rounded)	13,000	
Temporary Construction Easement:		
Agricultural: 19.86	4,965	
(Rounded)	5,000	
Total (Rounded)		$ 26,318,000
Improvements		
Residential: 11	$ 593,000	
Agricultural: 4	120,000	
Miscellaneous: 3	23,000	
Total (Rounded)		$ 736,000
Severance Damages		0
Minerals		0
Total Lands and Damages (Rounded)		$ 27,054,000
2. Acquisition-Administrative costs		
Federal		550,000
NonFederal		3,451,000
3. Public Law 91-646		201,000
4. Contingencies: 25% (Rounded)		7,814,000
Total Estimated Real Estate Costs		$39,070,000

Segment 2: Pool D

1. Lands and Damages		
Lands (15,097.92 acres total)		
Fee Simple:		
Riverlands: 1,419.06 acre	$ 0	
Wetlands: 2,042.00 acres	1,021,000	
Agricultural: 8,842.93 acres	8,842,930	
Residential: 382.48 acres	9,636,800	
Total (Rounded)	19,501,000	
Flowage Easement:		
Agricultural: 2,298.78 acres	229,878	
(Rounded)	230,000	
Levee Easement:		
Agricultural: 47.56 acres	47,560	
(Rounded)	48,000	
Channel Easement:		
Agricultural: 29.99 acres	29,990	
(Rounded)	30,000	
Temporary Construction Easement:		
Agricultural: 35.12 acres	8,780	
(Rounded)	9,000	
Total		$ 19,818,000
Improvements		
Residential: 210*	$ 4,687,000	
Miscellaneous: 11*	390,000	
Total (Rounded)		$ 5,077,000
Severance Damages: 262.91 acres		577,000
Minerals		0
Total Lands and Damages (Rounded)		$25,472,000
2. Acquisition-Administrative costs		
Federal		554,000
NonFederal		2,055,000
3. Public Law 91-646		4,620,000
4. Contingencies: 25% (Rounded)		8,175,000
Total Estimated Real Estate Costs		$40,876,000

* These estimates include areas which may be excluded from acquisition by providing a flood proofing alternative.

Segment 3: Pool E

1. Lands and Damages

Lands (14,389.30 acres total)		
Fee Simple:		
Riverlands: 796.46 acres	$ 0	
Wetlands: 526.00 acres	263,000	
Agricultural: 10,004.84 acres	10,004,840	
Residential: 412.82 acres	9,257,800	
Total (Rounded)	19,526,000	
Flowage Easement:		
Agricultural: 2,603.16 acres	260,316	
(Rounded)	261,000	
Levee Easement:		
Agricultural: 19.42 acres	19,420	
(Rounded)	20,000	
Channel Easement:		
Agricultural: 12.25 acres	12,250	
(Rounded)	13,000	
Temporary Construction Easement:		
Agricultural: 14.35 acres	3,587	
(Rounded)	4,000	
Total		$ 19,824,000
Improvements		
Residential: 135*	$ 3,318,000	
Miscellaneous: 10*	213,000	
Agricultural: 10*	299,000	
Total (Rounded)		$ 3,830,000
Severance Damages: 325.72 acres		324,000
Minerals		0
Total Lands and Damages (Rounded)		$ 23,978,000
2. Acquisition-Administrative costs		
Federal		319,000
NonFederal		2,293,000
3. Public Law 91-646		3,010,000
4. Contingencies: 25% (Rounded)		7,400,000
Total Estimated Real Estate Costs		$37,000,000

* These estimates include areas which may be excluded from acquisition by providing a flood proofing alternative.

Summary of Estimated Project Real Estate Costs

Headwaters Revitalization	$74,776,000
River Restoration	
Segment 1	39,070,000
Segment 2	40,876,000
Segment 3	37,000,000
TOTAL ESTIMATED PROJECT REAL ESTATE COSTS	**$191,722,000**

REAL ESTATE ACQUISITION SCHEDULE

Kissimmee River Headwaters Revitalization Project Plan:

Project lands for the Headwaters Revitalization are scheduled to be acquired by May of 1995. This schedule has been coordinated with South Florida Water Management District.

Certificates of title, individual tract appraisals, and land surveys will be accomplished by the Local Sponsor and monitored by the Corps of Engineers.

Kissimmee River Restoration Project Plan:

As coordinated with South Florida Water Management District, project lands for River Restoration will be acquired in three stages as follows:

Segment 1: Pools A, B, and C: April 1994
Segment 2: Pool D: April 1996
Segment 3: Pool E: April 1998

Certificates of title, individual tract appraisals, and land surveys will be accomplished by the Local Sponsor and monitored by the Corps of Engineers.

ESTATES TO BE ACQUIRED

Fee Simple

The fee simple title, subject however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

Flowage Easement (Permanent Flooding)

The perpetual right, power, privilege and easement permanently to overflow, flood and submerge the land described in Schedule A (Tract Nos. ________, and ______) in connection with the operation and maintenance of the 1135 Kissimmee River Headwaters Revitalization on project lands and the Kissimmee River Restoration project as authorized by Acts of Congress approved _____________ and _____________; and the continuing right to clear and remove any brush, debris and natural obstructions which, in the opinion of the representative of the United States in charge of the project, may be detrimental to the project, together with all right, title and interest in and to the timber, structures and improvements situate on the land (excepting ________); provided that no structures for human habitation shall be constructed or maintained on the land, that no other structures shall be constructed or maintained on the land except as may be approved in writing by the representative of the United States in charge of the project, and that no excavation shall be conducted and no landfill placed on the land without such approval as to the location and method of excavation and/or placement of landfill; the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and easement hereby acquired; provided further that any use of the land shall be subject to Federal and State laws with respect to pollution.

Flowage Easement (Occasional Flooding)

The perpetual right, power, privilege and easement occasionally to overflow, flood and submerge (the land described in Schedule A, Tract Nos. ________, ________, and ________) in connection with the operation and maintenance of the Kissimmee River Project as authorized by the Act of Congress approved _______________ together with all right, title and interest in and to the structures and improvements for human habitation whose first floor elevation is below _______, NGVD and providing that no structures shall be constructed or maintained on the land that has a floor elevation below _____, NGVD and further that the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Congress or abridging the rights and easement hereby acquired; provided further that any use of the land shall be subject to Federal and State laws with respect to pollution.

Water Inundation Easement (Structures Remain)

The perpetual right, power, privilege and easement permanently to flood and inundate with water to ground elevation _____NGVD the land described in Schedule A (Tracts _____) in connection with the operation and maintenance of the Section 1135 Kissimmee Headwaters Revitalization Project and the Kissimmee River Restoration project as authorized by Acts of Congress approved _________ and ____________; provided that no structures for human habitation shall be constructed or maintained on the land which requires ground water elevation below _____NGVD for any uses of the land; the above estate is taken subject to existing public easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Congress or abridging the rights and easement hereby acquired.

Water Inundation Easement (No Human Habitation)

The perpetual right, power, privilege and easement permanently to flood and inundate with water to ground elevation _____NGVD the land described in Schedule A (Tracts _____) together with all right, title and interest in and to all structures for human habitation now situated on the land in connection with the operation and maintenance of the Section 1135 Kissimmee Headwaters Revitalization Project and the Kissimmee River Restoration Project as authorized by Acts of Congress approved _________ and ____________; provided that no structures for human habitation shall be constructed or maintained on the land; the above estate is taken subject to existing public easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Congress or abridging the rights and easement hereby acquired.

Flood Protection Levee Easement

A perpetual and assignable right and easement in (the land described in Schedule A) (Tracts Nos. ____, ____ and ____) to construct, maintain, repair, operate, patrol and replace a flood protection level, including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

Channel Improvement Easement

A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over and across (the land described in Schedule A) (Tracts Nos. ____, ____, and ____) for the purposes as authorized by the Act of Congress approved ______________, including the right to clear, cut, fell, remove and dispose of any and all timber, trees, underbrush, buildings, improvements and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

Temporary Work Area Easement

A temporary easement and right-of-way in, on, over and across (the land described in Schedule A) (Tracts Nos. ____, ____, and ____), for a period not to exceed ________, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a (borrow area) (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the Kissimmee River Restoration Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

EASEMENTS OBTAINED BY SOUTH FLORIDA WATER MANAGEMENT DISTRICT

South Florida Water Management District has been acquiring land interests in the Lower Basin. South Florida has been obtaining fee, conservation easements and lease-back agreements. A synopsis of each item is provided below.

Fee: The entire interest has been acquired.

Conservation Easement: The South Florida Water Management District has secured easements "*...for the right to permanently or intermittently flood, flow or store water on any part of the area described...*". These easements prohibit "*...activities detrimental to drainage, flood control, water conservation, erosion control, soil conservation, of fish and wildlife habitat preservation*". A copy of a sample Conservation Easement is attached as Exhibit A.

Lease-Back Agreement (Interim Phase): In some areas where the South Florida Water Management District has acquired fee, they have entered into lease-back arrangements with land owners allowing cattle grazing and other agricultural pursuits. The initial lease period is ten years, which will expire about the time of the completion of contract for Pool C. This contract is scheduled for completion in the year 2000. The one year remaining on the lease is not unacceptable to the restoration effort. The terms of any renewal of these will be subject to terms and conditions agreed to by South Florida Water Management District and the Corps of Engineers as being compatible with the restoration project. A copy of a sample Lease-Back Agreement is attached as Exhibit B.

OFFSETTING OF BENEFITS UNDER FLORIDA LAW FOR REAL ESTATE ACQUISITIONS

Under *Section 73.071 of Florida Statues* entitled *73.071 Jury Trial, Compensation; Severance Damages,* the following is contained:

> *"When the action is by the Department of Transportation, county, municipality, board, district, or other public body for the condemnation of a road, canal, levee, or water control facility right-of-way, the enhancement, if any, in value of the remaining adjoining property of the defendant property owner by reason of the construction or improvement made or contemplated by the petitioner shall be offset against the damage, if any, resulting to such remaining adjoining property of the defendant property owner by reason of the construction or improvement. However, such enhancement in the value shall not be offset against the value of the*

property appropriated, and if such enhancement in value shall exceed the damage, if any, to the remaining adjoining property, there shall be no recovery over against such property owner for such excess."

Judicial case decisions provide that project benefit offsets may only be used to offset severance damages to remaining lands.

JUSTIFICATION FOR PURCHASE OF EASEMENTS TO 100 YEAR FLOOD

As a project feature, the acquisition of a flowage easement substantially to the 100 year flood elevation will be required. This requirement is not based on the determination that a "taking" of these real estate interests will occur as a result of project impacts. This requirement is based on prudent real estate practices in light of the time and money (18 months at approximately $500,000) required to obtain the factual information to determine if a taking is a possibility as compared to the estimated cost of these easements. The factual information that would result as a product of the hydraulic and hydrologic study effort would be of questionable reliability (less than 50%) in light of the very limited historic information available.

RECOMMENDATIONS REGARDING ESTATES BEING ACQUIRED BY LOCAL SPONSOR

Fee Acquisition by Local Sponsor to Substantially the Five Year Flood Line: Fee acquisition to this line is recommended. Conservation easement to five year only where fee not possible due to prior acquisition or negotiation for acquisition by local sponsor of only easement. Continued use of a lease-back arrangement together with conditions of allowable use will be further refined. The lease-backs will terminate in the year 2001 so that restoration may begin, following completion of construction.

Conservation Easement: The Conservation easement being acquired by the Local Sponsor is sufficient to support the needs of the Restoration Project subject to refinement regarding (a) the allowance of existing structures that are unsafe for human habitation or impede materially the conveyance capacity of the discharges for Structure 65 and (b) the compatibility of fences with the conveyance capacity of Structure 65 below the five year flood elevation. The conservation easement specifically provides *"...for the right to permanently or intermittently flood, flow or store water on any part of the area described."*

RECOMMENDATION REGARDING FEE ACQUISITION OF LANDS COSTING IN EXCESS OF 75% OF THEIR VALUE

The Local Sponsor has been engaged in land acquisition within the Kissimmee basin for several years. The Local Sponsor has acquired fee where possible and if not possible, a conservation easement. The Local Sponsor has made representations to the landowners regarding their acquisition plans which have resulted in an understanding that fee would be acquired outside the Milleson Line only if a landowner was willing to sell, otherwise a conservation easement is to be acquired. In light of this land acquisition practice, it is recommended that Federal participation in fee acquisition occur up to the five year line except where fee cannot be acquired due to historic acquisition practice and that the conservation easement be accepted in its place. Beyond the five year flood line, recommendation is made of only occasional flowage easement credit given for acquisition.

MAPS

For the purpose of this Supplement, the Jacksonville District and the Local Sponsor established the perimeter boundaries of the project. In the Upper Basin the limits are between the contours at elevation 52.5 and 54 feet, NGVD. The Lower Basin limits are the five year flood plain for the area to be acquired in fee and between the five year and the 100 year flood plain for the flowage easement acquisition.

The maps shown as Plates F-1 through F-6 are computer generated from maps furnished by the Local Sponsor. Final segment/acquisition maps and tract descriptions will be prepared by the Local Sponsor and furnished to the District office for review.

Return to:
SOUTH FLORIDA WATER MANAGEMENT DISTRICT
P.O. Box 24680
West Palm Beach, FL 33416-4680

This instrument prepared by:
Thomas J. Schwartz, Esquire,
South Florida Water Management District
3301 Gun Club Road, P. O. Box 24680
West Palm Beach, FL 33416-4680

Project: Kissimmee River

CONSERVATION EASEMENT

THIS INDENTURE made this ____ day of __________________________, 19____, by and between ____________________________________, a ________________ corporation, whose mailing address is ________________________________, hereinafter referred to as Grantor, and SOUTH FLORIDA WATER MANAGEMENT DISTRICT, a public corporation of the State of Florida, whose mailing address is 3301 Gun Club Road, P. O. Box 24680, West Palm Beach, Florida 33416-4680, hereinafter referred to as Grantee.

WITNESSETH:

For and in consideration of the sum of Ten Dollars ($10.00) and other good and valuable consideration in hand paid by the Grantee to the Grantor, the receipt of which is hereby acknowledged, the Grantor hereby grants, bargains, sells and conveys unto the Grantee, SOUTH FLORIDA WATER MANAGEMENT DISTRICT, its successors and assigns a Conservation Easement, and right for and to the use and enjoyment of the following described lands situate in the County of __________________________, Florida, it wit:

for the right to permanently or intermittently flood, flow or store water on any part of the area described, in carrying out the purposes and intents of the statutes of the State of Florida relating to the SOUTH FLORIDA WATER MANAGEMENT DISTRICT presently existing or that may be enacted in the future pertaining thereto.

and also for the purpose of maintaining and retaining said lands and water areas, if any, predominately in their natural, scenic, open or wooded condition; retaining said lands as suitable habitat for fish, plants, or wildlife and maintaining existing land uses to prohibit the following:

(a) The placement or construction of any buildings, structures or other improvements of any kind (including, without limitation, fences, roads, and utilities) other than the following:

Exhibit

(1) The maintenance, renovation, expansion or replacement of existing agricultural, residential and related buildings, structures and improvements in their present location as shown on Exhibit "____"; provided that any expansion or replacement of an existing building, structure or improvement may not substantially alter its character or function and must be done with prior approval of the Grantee.

(b) Dumping or placing of soil or other substance or material as landfill or dumping or placing of trash, waste, or unsightly or offensive materials.

(c) Removal of trees for any purposes.

(d) Removal or destruction of trees, shrubs, or other vegetation.

(e) Excavation, dredging, or removal of loam, peat, gravel, soil, rock, or other material substance in such manner as to affect the surface.

(f) Surface use except for purposes that permit the land or water area to remain predominately in its natural condition.

(g) Activities detrimental to drainage, flood control, water conservation, erosion control, soil conservation, or fish and wildlife habitat preservation.

(h) Acts or uses detrimental to such retention of land or water areas.

(i) Acts or uses detrimental to the preservation of the structural integrity or physical appearance of sites or properties of historical, architectural, archaeological, or cultural significance.

(j) Dairy operation of any type will not be permitted.

Nothing herein shall prohibit the grantor from mowing or aerating land to continue its existing use as native or improved pasture.

The grantee shall be entitled to enter upon the land in a reasonable manner and at reasonable times to assure compliance with the purposes and prohibitions set forth herein. This instrument shall be governed and interpreted according to the provisions of chapter 704.06, Florida Statutes, which are incorporated herein and made a part hereof by reference.

Reserving unto the Grantor the right to make such use of said lands as is not inconsistent with the water control program of the Grantee; provided, however, that Grantor shall not dike, fill or perform any water control activities on said lands without written permission from the Grantee.

Also reserving unto the Grantor the right to engage in any and all agricultural uses of the property in accordance with sound, generally accepted agricultural practices. For the purpose of this Easement "Agricultural Uses" shall be defined as:

> Agricultural uses shall be defined as native pasture together with facilities to filter runoff containing cattle waste; improved pasture together with facilities to filter both runoff containing cattle waste and containing fertilizer; minimal supporting access pathways and fences; low density crops not requiring water table changes and extensive chemical treatments together with facilities to filter chemicals and fertilizer; support buildings together with facilities to filter equipment petroleum products, building may not be used for storage or disposal of materials hazardous to water quality. Water management uses of the land shall be designed to disperse stormwater (rather than concentration into streams). Water management facilities designed to retain stormwater shall, before construction, be submitted to and approved by the District.

All covenants herein contained shall extend to and be binding upon the parties hereto and their respective successors and assigns.

To have and to hold the same together with all and singular the appurtenances thereunto belonging or in anywise incident or appertaining to the proper use, benefit and behoof of the Grantee, its successors and assigns forever.

IN WITNESS WHEREOF, the said Grantor ____________________ has caused these presents to be executed in its name and its corporate seal affixed by its duly authorized officers the day and year first above written.

BY:______________________________
President

(Corporate Seal)

ATTEST:

____
Secretary

STATE OF FLORIDA

COUNTY OF ______________________

I HEREBY CERTIFY that on the _____ day of __________________, 19___, before me, the undersigned authority, personally appeared ________________________ and ____________________________, President and Secretary, respectively, of __________________, a corporation of the State of _____________ to me known to be the persons who signed the foregoing instrument as such officers and acknowledged the execution thereof to be their free act and deed as such officers, for the purposes and uses therein mentioned, and that they affixed thereon the official seal of the said corporation and that the said instrument is the act and deed of the said corporation.

WITNESS my signature and official seal at City of __________________, County of ______________________________, Florida, the day and year last aforesaid.

____
Notary Public

(Seal) My Commission expires:

EXHIBIT B

LEASE-BACK AGREEMENT

LEASE AGREEMENT

BETWEEN THE

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

AND

OTIS P. CLEMONS

This **LEASE AGREEMENT ("LEASE")**, entered into on ________, 1991, between "the Parties", the South Florida Water Management District, 3301 Gun Club Road, West Palm Beach, Florida 33406, a public corporation of the State of Florida (the "**DISTRICT**"), and Otis P. Clemons (the "**LESSEE**").

<u>WITNESSETH:</u>

WHEREAS, the **DISTRICT** is an agency of the State of Florida created by the Florida Legislature and given those powers and responsibilities enumerated in Chapter 373, Florida Statutes; and

WHEREAS, the **DISTRICT** is empowered to enter into contracts with public agencies, private corporations or other persons, pursuant to section 373.083, Florida Statutes; and

WHEREAS, the **DISTRICT** is empowered to lease lands or interests in land, to which the **DISTRICT** has acquired title, pursuant to section 373.093, Florida Statutes and Rule 40E-9.957, Florida Administrative Code; and

WHEREAS, the **DISTRICT** owns certain lands legally described in Exhibit A attached to and made a part of this **LEASE** which contains parcels that are suitable for grazing activities; and

WHEREAS, the **DISTRICT** seeks to manage the subject property utilizing livestock as a tool in the maintenance of native range lands; and

WHEREAS, the **DISTRICT** wishes to grant grazing rights to the subject property to an outside party to accomplish this objective; and

WHEREAS, the **LESSEE** represents that he is qualified and willing to provide said services; and

Exhibit

WHEREAS, the **DISTRICT** and the **LESSEE** wish to enter into this lease agreement ; and

WHEREAS, the Governing Board of the **DISTRICT**, at its regular July monthly meeting, has awarded this **LEASE** to the **LESSEE**;

NOW THEREFORE, the Parties, in consideration of the following and mutual benefits flowing from each to the other, do hereby agree as follows:

1. Unless extended or terminated, the period of performance of this **LEASE** shall commence on the date of execution and extend for a period of 10 years.

2. As full consideration for the grazing rights conferred upon the **LESSEE** by the **DISTRICT** pursuant to this **LEASE**, the **LESSEE** shall:

A. Be responsible for the establishment and implementation of sound grazing practices generally followed in the area.

B. Lessor leases to Lessee one concrete block barbecue building containing 478 square feet at $1,650 annual rent. Term of the lease for the improvements is for year to year for ten (10) years. The **LESSEE** has the option to renew each year commencing upon execution of this Agreement and terminating on ______________. Lessor is not liable for any maintenance or upkeep of buildings. Said building is located on Tract KR-102-016.

Lessor leases to Lessee for the sum of One Dollar ($1.00) per acre per year for a term of Ten (10) years commencing up on execution of this agreement and terminating on __________. Payment shall be made upon execution of the Lease. All future payments shall be mailed to the address shown in paragraph 24 of this Lease. The lease may be renewable for an additional Ten (10) year period at the discretion of the District. It is understood by the Lessor and Lessee that should Lessor decide to again lease the property for cattle grazing, it will have an appraisal made of the value of the cattle lease and ask for public bids for the cattle lease. In no case shall the property be leased at less than the minimum acceptable amount for the lease as established by the Lessor. The Lessee will be allowed to match or offer the same amount as the highest bid, and, if Lessee agrees to pay the highest bid, then the lessee shall receive the lease. The Lessee will be subject to a possible period of land use interruption during the Kissimmee River Restoration Construction. One additional year of post-construction will also be a necessary interruption for the re-establishment of vegetation. The Lessee will receive approximately a twelve (12) month notice prior to the beginning of any project construction. During any interruption of land use, there will be suspension of rental payment during the interruption or the Lease will be extended at the end for an amount of time equal to the period of interrupted use.

3. **LESSEE** understands and agrees that pursuant to Rule 40E-9.957, Florida Administrative Code, upon execution of this **LEASE**, the leased lands shall be placed upon the tax rolls in **LESSEE'S** name and **LESSEE** shall pay all applicable property taxes. The amount of taxes will be determined by the county property appraiser.**LESSEE** acknowledges that it shall be assessable for such ad valorem taxes as are applicable for the leased premises, on and from the effective date of this **LEASE**.

4. **LESSEE** shall pay such taxes promptly upon receipt of an assessment notice from the taxing authority, and shall furnish proof of such payment to the **DISTRICT**. Failure by the **LESSEE** to pay such taxes assessed before or by their due date shall constitute a material default of this **LEASE**.

5. **LESSEE** acknowledges that any failure to make timely periodic payments of the annual fee required in Paragraph 2B to the **DISTRICT**, of this **LEASE**, shall constitute a material default of this **LEASE** for which the **DISTRICT** may exercise such rights, including termination of the **LEASE**, as are provided for herein.

6. **LESSEE** agrees that his activities on the subject property are for purposes of livestock production (beef cattle only), and those approved, incidental uses which are directly related to livestock production. **LESSEE** shall not engage in any business or other activity on the leased lands not expressly authorized in writing by the **DISTRICT**. All animal husbandry principles and practices applicable to the proper and efficient use of grazing resources shall be followed at all times.

7. **LESSEE** agrees to use the subject property for and only for the grazing of cattle and will not use or permit any use or entry upon the Premises for any other purpose. No hogs or other animals may be kept on the Premises either in enclosures or otherwise. Dairy operations will not be conducted on the property.

8. **LESSEE** shall not hunt, trap, fish or capture any wildlife upon the subject property or allow others to do so except in accordance with established regulations.

9. In addition to this grazing lease, it is understood by the **DISTRICT** and the **LESSEE** that the property will also be open and available to public use. **The DISTRICT is not responsible for** any loss of livestock, livestock operation equipment or improvements resulting from any public use program. Prior to open **land for public use, the DISTRICT agrees to install a five (5) strand barbed wire fence, at its expense, between Tract** KR-102-016 and Tract KR-102-017 located in Pool C, also between Tract KR-103-004 and **KR-103-005; in Pool D.**

10. There shall be a livestock deferment of ninety (90) days on ranges that are roller chopped and a deferment of forty-five (45) days on ranges that are prescribed burned. Deferment periods may be adjusted according to quantity and quality of forage by the **DISTRICT**.

11. The **LESSEE** shall comply with all laws, rules and regulations established for the subject property. Possession of firearms is strictly prohibited.

12. If public hiking path, extends through the leased premises. The **LESSEE** shall take all reasonable measures to protect trail signs, fence stiles, blaze posts and blaze trees in carrying out the grazing operation. Roller chopping, disking and the operation of motor vehicles is prohibited on the trail route (treadway).

13. The **LESSEE** agrees to immediately report any incidence of the following to the **DISTRICT'S** Project Manager:

A. Fire
B. Injury or death
C. Vandalism
D. Theft
E. Poaching and trespassing
F. Any hazard, condition or situation that may become a liability to the **DISTRICT** or may be damaging to the property or improvements on the property of the **DISTRICT**
G. Any violation observed pertaining to rules and regulations promulgated by the **DISTRICT** or the Florida Game and Fresh Water Fish Commission
H. Any violation of applicable State and local laws.

14. **LESSEE** shall not construct fences or other structures on the subject property without prior written approval of the **DISTRICT**. No trailers may be placed on the Premises. Any fence or other structure erected by Permittee shall become the property of the **DISTRICT**.

15. Any additions or construction, portable or permanent, to the existing cattle pens and holding areas (if any) are subject to the prior written permission of the **DISTRICT**.

16. The cattlepens and holding areas shall be free of junk, debris and litter at all times.

17. All prescribed burning on the subject properties shall be done by personnel or agents of the **DISTRICT**. The **LESSEE** specifically agrees that **LESSEE'S** employees will not, at any time, knowingly and deliberately set or cause to be set any fire or fires on the leased property. Failure to comply with the above shall be cause for immediate cancellation of this **LEASE** by the **DISTRICT**.

There will be no fertilizing, plowing, ditching or digging of water holes that is not in compliance with Best Management Practicies established for the area by the **DISTRICT** and the Soil and Conservation Service..

18. There shall be absolutely no alterations of rangelands, swamps or pastures of the subject property without the written consent of the **DISTRICT**.

19. The **LESSEE** shall furnish the **DISTRICT** with a copy of his distinct brand; or other identification which may be registered with the Division of Animal Industry, Florida Department of Agriculture and Consumer Services. All cattle shall carry this mark before being released on the subject property.

20. The **LESSEE** shall not employ or retain in his/her service any person declared by the **DISTRICT** to be objectionable.

21. The **LESSEE** shall not dispose of any contaminants including, but not limited to, hazardous or toxic substances, chemicals, or other agents used or produced in **LESSEE'S** operations on the leased premises or on any adjacent State land or in any manner not permitted by law. Such disposal shall be reported to the **DISTRICT'S** Project Manager, indicating what is being disposed of, and where and how disposal is to take place.

An Environmental Audit will be conducted at the end of this Lease, should the Audit reveal potential environmental liabilities, Seller agrees to assume responsibility and liability for clean-up of the property pursuant to Federal and State regulations and shall indemnify, reimburse, defend and hold the Buyer harmless from and against all demands, claims, actions, or causes of actions, assessments, losses, damages, liabilities, costs, expenses, fees and disbursements asserted directly or indirectly, pursuant to or in connection with the application of any federal, state, local or foreign environmental law to the acts or omissions of the Seller, its agents, officers, employees or assigns, or any third party with respect to the Premises concerning either on-site or off-site disposal of waste, waste waters or pollutants or hazardous substances of any kind which may damage or threaten to damage the environment, caused in whole or part, by the transportation, treatment, storage, or disposal or dumping of any pollutant, contaminant, chemical, or industrial, toxic or hazardous substance or waste, irrespective of whether Seller had any knowledge of the presence of any such substance prior to or at the time of the date of the conveyance hereunder.

22. The Project Manager for the **DISTRICT** is Lee Henderson and all correspondence and communications from the **LESSEE** other than notices shall be directed to him. The Project Manager shall be responsible for overall coordination and oversight relating to the performance of this **LEASE**.

23. All notices to the **LESSEE** under this **LEASE** shall be in writing and sent by certified mail to Otis P. Clemons. All notices to the **DISTRICT** under this **LEASE** shall be in writing and sent by certified mail to:

South Florida Water Management District
Attn: Division of Procurement and Contract Administration
P. O. Box 24680
3301 Gun Club Road
West Palm Beach, FL 33416-4680

The **LESSEE** shall also provide a copy of the notices to the **DISTRICT'S** Project Manager. All notices required by this **LEASE** shall be considered delivered upon receipt. Either party may change its address by providing prior written notice to the other of any change of address.

24. The **LESSEE** is an independent contractor and is not an employee or agent of the **DISTRICT**. Nothing in this **LEASE** shall be interpreted to establish any relationship other than that of an independent contractor, between the **DISTRICT** and the **LESSEE**, its employees, agents, subcontractors, or assigns, during or after the performance of this **LEASE**.

25. The **LESSEE** shall not assign, delegate, or otherwise transfer its rights and obligations as set forth in this **LEASE** or sublease any portion of the subject property without the prior written consent of the **DISTRICT**. All livestock in the grazing operation on the subject property shall be the property of the **LESSEE**.

26. The **LESSEE** shall obtain all necessary federal, state, local, and other governmental approvals, as well as all necessary private authorizations and permits prior to the commencement of performance of this **LEASE**.

27. The **LESSEE** shall defend, indemnify, save, and hold the **DISTRICT** harmless from any and all claims, suits, judgments and liability for death, bodily injury, personal injury, or property damage arising directly or indirectly from the performance of this **LEASE** by **LESSEE**, its employees, subcontractors, or assigns, including legal fees, court costs, or other legal expenses. **LESSEE** acknowledges that it is solely responsible for compliance with the terms of this **LEASE**.

28. If either party initiates legal action, including appeals, to enforce this **LEASE**, the prevailing party shall be entitled to recover a reasonable attorney's fee, based upon the fair market value of the services provided.

29. The **LESSEE** shall procure and maintain, through the term of this **LEASE**, Worker's Compensation insurance written by a financially sound company up to the limits specified by Florida Statute. The **LESSEE** shall provide an insurance certificate demonstrating such coverage prior to the commencement of performance. Notwithstanding the number of employees or any other statutory provisions to the contrary, the Worker's Compensation insurance shall extend to all employees of the **LESSEE** and subcontractors. The Worker's Compensation insurance policy required by this **LEASE** shall also include Employer's Liability.

30. The **LESSEE** shall procure and maintain, through the term of this **LEASE**, general liability insurance. Coverage shall include Premises and Operations; Independent Contractors, Products and Completed Operations and Contractual Liability. Coverage shall be no more restrictive than the latest edition of the Commercial General Liability policies of the Insurance Services Office (ISO). This policy shall be written by a financially sound company and provide coverage for death, bodily injury, personal injury, or property damage that could arise directly or indirectly from the performance of this **LEASE**. The minimum limits of coverage shall be $500,000.00 Per Occurrence, Combined Single Limit for Bodily Injury Liability and Property Damage Liability. The **DISTRICT** shall be included as an Additional Insured under the policy and certificate of insurance.

31. The **LESSEE** shall procure and maintain, through the term of this **LEASE**, Business Automobile Liability insurance. The Business Automobile Liability insurance coverage shall have minimum limits of $500,000.00 per occurrence, Combined Single Limit for Bodily Injury Liability and Property Damage Liability. This shall be an "any-auto" type of policy including owned, hired, non-owned and employee non-ownership coverage.

The **LESSEE** shall provide insurance certificates as proof of insurance prior to the commencement of performance. All such General Liability and Business Automobile Liability insurance shall name the **DISTRICT** as an additional insured and be written by a financially sound company.

The **LESSEE** shall notify the **DISTRICT** at least thirty (30) days prior to cancellation or modification of any insurance policy and certificate required by this **LEASE**.

32. It shall be the responsibility of the **LESSEE** to insure that all subcontractors are adequately insured or covered under its policies.

33. If either party fails to fulfill its obligations under this **LEASE** in a timely and proper manner, the other party shall have the right to terminate this **LEASE** by giving written notice of any deficiency and by allowing the party in default thirty (30) days to correct the deficiency. If the defaulting party fails to correct the deficiency within this time, this **LEASE** shall terminate at the expiration of the thirty (30) day time period and the **LESSEE** will remove all livestock and associated grazing accouterments within ninety (90) days following termination of this **LEASE**.

34. During the term of this **LEASE**, the **DISTRICT** shall determine if the operation is to continue on the subject property after the expiration of the initial 10 year term. If the operation is to continue, a Request for Proposals will be scheduled such that award of a lease occurs at least 180 days prior to the expiration of the **LEASE**. If the **LESSEE** does not wish to continue the operation or is an unsuccessful proposer, all livestock and associated grazing accouterments must be removed from the WMA over the 180 day period prior to the expiration of the **LEASE**.

35. In the event of material breach of any covenant or provision of this Lease by either party, the other party shall be entitled (i) to seek specific performance of the provisions hereof; (ii) to seek termination of the rights, prohibitions and other provisions granted herein.

36. The **LESSEE** shall assure that no person shall, on the grounds of race, color, creed, national origin, handicap, or sex, be excluded from participation in, denied the benefits of, or otherwise subjected to discrimination in any activity under this **LEASE**. The **LESSEE** shall take all measures necessary to effectuate these assurances.

37. Prior to engaging in any discussions with the news media pertaining to this **LEASE**, the **LESSEE** shall notify the DISTRICT'S Office of Communications. This includes news releases, media requests for interviews, feature articles, fact sheets, or similar promotional materials.

38. The **LESSEE**, its employees, subcontractors or assigns, shall comply with all applicable federal, state, and local laws and regulations relating to the performance of this **LEASE**. The **DISTRICT** undertakes no duty to ensure such compliance, but will attempt to advise the LESSEE, upon request, as to any such laws of which it has present knowledge.

39. The **LESSEE**, by its execution of this **LEASE**, acknowledges that it has executed an affidavit (FORM PUR 7068) pursuant to Section 287.133(3)(a), Florida Statutes, either previously or concurrently hereto, affirming that the **LESSEE** is not identified as being barred from entering into this **LEASE** with the **DISTRICT**, and that the **LESSEE** understands that it remains bound by said statute and affidavit, as therein specified. The **LESSEE** further understands and acknowledges by its execution of this **LEASE**, that this **LEASE** shall be null and void, and/or that this **LEASE** is subject to immediate termination by the **DISTRICT**, for any misstatement or lack of compliance with the mandates of said statute. The **DISTRICT**, in the event of such termination, shall not incur any liability to the **LESSEE** for any work or materials furnished.

40. **LESSEE** shall not cut or remove any standing green, dead or fallen timber from the Premises. **LESSEE** shall not, for any purpose, drive nails, spikes or staples into or otherwise deface or mar any tree, either green or dead, on the Premises.

41. The laws of the State of Florida shall govern all aspects of this **LEASE**. In the event it is necessary for either party to initiate legal action regarding this **LEASE**, venue shall be in the Fifteenth Judicial Circuit for claims under state law and the Southern District of Florida for any claims which are justiciable in federal court.

42. This **LEASE** may be amended only with the prior written approval of the **DISTRICT**.

43. Failures or waivers to enforce any covenant, condition, or provision of this **LEASE** by the parties, their successors and assigns shall not operate as a discharge of or invalidate such covenant, condition, or provision, or impair the enforcement rights of the parties, their successors and assigns.

44. Notwithstanding any provisions of this **LEASE** to the contrary, the parties shall not be held liable if failure or delay in the performance of this **LEASE** arises from fires, floods, strikes, embargoes, acts of the public enemy, unusually severe weather, outbreak of war, restraint of Government, riots, civil commotion, force majeure, act of God, or for any other cause of the same character which is unavoidable through the exercise of due care and beyond the control of the parties. This provision shall not apply if the "Statement of Work" of this **LEASE** specifies that performance by the **LESSEE** is specifically required during the occurrence of any of the events herein mentioned.

45. This **LEASE** states the entire understanding between the parties and supersedes any written or oral representations, statements, negotiations, or agreements to the contrary. The **LESSEE** recognizes that any representations, statements or negotiations made by **DISTRICT** staff do not suffice to legally bind the **DISTRICT** in a contractual relationship unless they have been reduced to writing, authorized, and signed by an authorized representative of **DISTRICT**. This **LEASE** shall bind the parties, their assigns, and successors in interest.

The parties or their duly authorized representatives hereby execute this **LEASE** on the date written above.

legal form approved
sfwmd office of counsel

SOUTH FLORIDA WATER MANAGEMENT DISTRICT,
BY ITS GOVERNING BOARD

by:__________

date:________

By:______________________________
Chairman

Signed, sealed and delivered
in the presence of:

____
As to **DISTRICT**

____
As to **DISTRICT**

STATE OF FLORIDA)
) ss:
COUNTY OF __________)

I HEREBY CERTIFY that on this day, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared ____________________________ of the South Florida Water Management District, to me known to be the person described in and who executed the same for the purposes stated therein.

WITNESS my hand and seal this ___ day of ____________, 199__.

____
NOTARY PUBLIC

State of Florida at Large
My commission expires:____________

(NOTARY SEAL)

LESSEE

By: ______________________________
Title:

Signed, sealed and delivered
in the presence of:

____
As to **LESSEE**:

____
As to **LESSEE**:

STATE OF FLORIDA)
) ss:
COUNTY OF __________)

I HEREBY CERTIFY that on this day, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared ___________________________________, to me known to be the person described in and who executed the same for the purposes stated therein.

WITNESS my hand and seal this ____ day of __________, 199__.

____
NOTARY PUBLIC

State of Florida at Large
My commission expires:_________

(NOTARY SEAL)

APPENDIX G

LOCAL COOPERATION AND FINANCIAL ANALYSIS

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

GENERAL PURPOSE FINANCIAL STATEMENTS

FOR THE YEAR ENDED SEPTEMBER 30, 1990

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

GENERAL PURPOSE FINANCIAL STATEMENTS
FOR THE YEAR ENDED SEPTEMBER 30, 1990

TABLE OF CONTENTS

ARTHUR ANDERSEN & CO.
CERTIFIED PUBLIC ACCOUNTANTS
FORT LAUDERDALE, FLORIDA

REPORT OF INDEPENDENT PUBLIC ACCOUNTANTS

To the Governing Board of the
South Florida Water Management District:

We have audited the accompanying general purpose financial statements of the South Florida Water Management District as of and for the year ended September 30, 1990, as listed in the Table of Contents. These financial statements are the responsibility of the South Florida Water Management District's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the general purpose financial statements referred to above present fairly, in all material respects, the financial position of the South Florida Water Management District as of September 30, 1990, and the results of its operations and the cash flows of its proprietary fund type for the year then ended in conformity with generally accepted accounting principles.

As further discussed in Note 3 to the general purpose financial statements, the South Florida Water Management District has given retroactive effect to the change in its method of accounting for monies received from the State of Florida Water Management Land Trust Fund.

As further discussed in Note 19 to the general purpose financial statements, the United States attorney filed action against the South Florida Water Management District alleging violations of Florida statutes and regulations, committing a nuisance and breach of contract, surrounding the pollution of water under the District's jurisdiction. Since the damages being sought are injunctive in nature, no provision for any liability has been recorded in the accompanying financial statements. The action is being contested by the District. In the opinion of management, based on consultation with legal counsel, it is not possible to predict the outcome of this action or the amount of legal costs that the District will incur in its defense.

Arthur Andersen + Co.

Fort Lauderdale, Florida,
December 21, 1990.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

COMBINED BALANCE SHEET - ALL FUND TYPES AND ACCOUNT GROUPS
SEPTEMBER 30, 1990

	GOVERNMENTAL FUND TYPES			
	GENERAL	SPECIAL REVENUE	DEBT SERVICE	CAPITAL PROJECTS
ASSETS				
Cash and Investments	$14,916,198	$102,700,450	$7,581,498	$2,991,866
Accounts Receivable	587,255	22,174,757	187,294	16,904
Due From Other Governments	572,428	1,498,376	-	5,186,920
Due From Other Funds	22,913,233	1,567,101	-	18,580,527
Inventory	997,554	-	-	-
Other Assets	38,292	50,805	-	-
Fixed Assets	-	-	-	-
Amount Available In Other Funds	-	-	-	-
Amount to be Provided for Retirement of Long-Term Liabilities	-	-	-	-
TOTAL ASSETS	$40,024,960	$127,991,489	$7,768,792	$26,776,217
LIABILITIES & FUND EQUITY				
LIABILITIES				
Accounts Payable	$10,345,083	$380,596	$ -	$9,769,043
Due To Other Funds	7,944,546	39,117,752	-	1,776,643
Deferred Revenue	-	29,601,412	-	-
Compensated Absences Payable	-	-	-	-
Bonds Payable	-	-	-	-
TOTAL LIABILITIES	18,289,629	69,099,760		11,545,686
FUND EQUITY				
Fund Balance - Reserved	12,913,728	10,487,155	7,768,792	15,778,372
Fund Balance - Unreserved				
Designated	3,789,987	28,534,659	-	-
Undesignated	5,031,616	19,869,915	-	(547,841)
Total Fund Balance	21,735,331	58,891,729	7,768,792	15,230,531
Retained Earnings	-	-	-	-
Investment In General Fixed Assets	-	-	-	-
TOTAL FUND EQUITY	21,735,331	58,891,729	7,768,792	15,230,531
TOTAL LIABILITIES & FUND EQUITY	$40,024,960	$127,991,489	$7,768,792	$26,776,217

SEE ACCOMPANYING NOTES TO THE FINANCIAL STATEMENTS.

PROPRIETARY FUND TYPE	FIDUCIARY FUND TYPE	ACCOUNT GROUPS		TOTAL (MEMORANDUM ONLY)	
INTERNAL SERVICE	AGENCY	GENERAL FIXED ASSETS	GENERAL LONG-TERM LIABILITIES	1990	1989 (RESTATED)
$ -	$2,059,331	$ -	$ -	$130,249,343	$109,674,941
-	-	-	-	22,966,210	1,056,110
-	-	-	-	7,257,724	1,872,330
3,291,555	2,486,525	-	-	48,838,941	81,426,412
-	-	-	-	997,554	1,231,235
-	-	-	-	89,097	481,355
-	-	628,660,431	-	628,660,431	595,146,307
-	-	-	8,677,987	8,677,987	7,797,134
-	-	-	51,152,183	51,152,183	52,332,444
$3,291,555	$4,545,856	$628,660,431	$59,830,170	$898,889,470	$851,018,268
$1,543,311	$4,545,856	$ -	$ -	$26,583,889	$15,190,781
-	-	-	-	48,838,941	81,426,412
-	-	-	-	29,601,412	742,177
-	-	-	5,455,170	5,455,170	4,994,578
-	-	-	54,375,000	54,375,000	55,135,000
1,543,311	4,545,856	-	59,830,170	164,854,412	157,488,948
-	-	-	-	46,948,047	48,822,425
-	-	-	-	32,324,646	20,639,553
-	-	-	-	24,353,690	26,771,204
-	-	-	-	103,626,383	96,233,182
1,748,244	-	-	-	1,748,244	2,149,831
-	-	628,660,431	-	628,660,431	595,146,307
1,748,244	-	628,660,431	-	734,035,058	693,529,320
$3,291,555	$4,545,856	$628,660,431	$59,830,170	$898,889,470	$851,018,268

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

COMBINED STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE
ALL GOVERNMENTAL FUND TYPES
FOR THE YEAR ENDED SEPTEMBER 30, 1990

	GENERAL	SPECIAL REVENUE	DEBT SERVICE	CAPITAL PROJECTS
REVENUES				
Taxes	$56,248,227	$50,912,292	$ -	$ -
Intergovernmental	706,322	14,832,769	-	5,306,920
Interest	2,320,607	8,247,477	550,549	285,641
Other	3,119,975	2,263,882	-	126,180
Total Revenues	62,395,131	76,256,420	550,549	5,718,741
EXPENDITURES				
Current Operating				
Administrative	19,093,285	4,125,580	-	1,507,489
Commissions	1,735,571	1,602,092	-	-
Land Management	-	4,748,427	-	-
Regulation	6,150,981	63,708	-	-
Operations and Maintenance	-	28,021,816	-	10,727
Construction Management	2,338,938	367,463	-	39,890
Research and Evaluation	9,190,528	3,678,685	-	-
Big Cypress	-	683,702	-	4,200
Planning	9,226,179	1,333,001	-	-
Capital Outlay	2,014,698	1,855,842	-	35,107,604
Debt Service				
Principal Retirement	-	-	760,000	-
Interest	-	-	3,867,234	-
Total Expenditures	49,750,180	46,480,316	4,627,234	36,669,910
Excess (deficiency) of revenues over expenditures	12,644,951	29,776,104	(4,076,685)	(30,951,169)
OTHER FINANCING SOURCES (USES)				
Operating transfers in	1,617	800,465	4,619,617	27,772,620
Operating transfers out	(6,595,756)	(25,273,934)	(571,274)	(753,355)
Total Other Financing Sources (Uses)	(6,594,139)	(24,473,469)	4,048,343	27,019,265
Excess (deficiency) of revenues over expenditures and other sources (uses)	6,050,812	5,302,635	(28,342)	(3,931,904)
FUND BALANCE AT BEGINNING OF YEAR, AS RESTATED	15,806,685	53,589,094	7,797,134	19,040,269
RESIDUAL EQUITY TRANSFERS	(122,166)	-	-	122,166
FUND BALANCE AT END OF YEAR	$21,735,331	$58,891,729	$7,768,792	$15,230,531

SEE ACCOMPANYING NOTES TO THE FINANCIAL STATEMENTS.

TOTAL (MEMORANDUM ONLY)	
1990	1989 (RESTATED)
$107,160,519	$97,357,359
20,846,011	18,744,076
11,404,274	10,341,101
5,510,037	2,496,794
144,920,841	128,939,330
24,726,354	20,862,019
3,337,663	2,297,832
4,748,427	4,663,159
6,214,689	5,363,704
28,032,543	27,562,630
2,746,291	2,444,395
12,869,213	4,754,547
687,902	683,449
10,559,180	17,314,519
38,978,144	28,101,090
760,000	720,000
3,867,234	3,913,103
137,527,640	118,680,447
7,393,201	10,258,883
33,194,319	13,641,688
(33,194,319)	(13,641,688)
-	-
7,393,201	10,258,883
96,233,182	85,974,299
-	-
$103,626,383	$96,233,182

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

COMBINED STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE BUDGET AND ACTUAL (BUDGETARY BASIS) - ALL GOVERNMENTAL FUND TYPES

FOR THE YEAR ENDED SEPTEMBER 30, 1990

	GENERAL FUND		
	BUDGET	ACTUAL	VARIANCE- FAVORABLE (UNFAVORABLE)
REVENUES			
Taxes	$56,082,332	$56,248,227	$165,895
Intergovernmental	749,025	706,322	(42,703)
Interest	2,100,000	2,320,607	220,607
Other	1,049,530	3,119,975	2,070,445
Total Revenues	59,980,887	62,395,131	2,414,244
EXPENDITURES			
Current Operating			
Administrative	20,223,513	19,640,639	582,874
Commissions	1,545,064	1,735,571	(190,507)
Land Management	-	-	-
Regulation	6,863,251	6,512,010	351,241
Operations and Maintenance	75,000	75,000	-
Construction Management	3,220,806	2,790,385	430,421
Research and Evaluation	9,881,637	9,010,331	871,306
Big Cypress	-	-	-
Planning	10,169,632	9,797,766	371,866
Capital Outlay	2,256,184	2,055,861	200,323
Debt Service			
Principal Retirement	-	-	-
Interest	-	-	-
Contingency	234,822	-	234,822
Total Expenditures	54,469,909	51,617,563	2,852,346
Excess (deficiency) of revenues over expenditures	5,510,978	10,777,568	5,266,590
OTHER FINANCING SOURCES (USES):			
Operating transfers in	-	1,617	1,617
Operating transfers out	(8,060,000)	(6,595,756)	1,464,244
Total Other Financing Sources (Uses)	(8,060,000)	(6,594,139)	1,465,861
Excess (deficiency) of revenues over expenditures and other sources (uses)	($2,549,022)	$4,183,429	$6,732,451

SEE ACCOMPANYING NOTES TO THE FINANCIAL STATEMENTS.

SPECIAL REVENUE FUNDS			DEBT SERVICE FUND		
BUDGET	ACTUAL	VARIANCE-FAVORABLE (UNFAVORABLE)	BUDGET	ACTUAL	VARIANCE-FAVORABLE (UNFAVORABLE)
$50,625,685	$50,912,292	$286,607	$ -	$ -	$ -
29,602,844	17,445,689	(12,157,155)	-	-	-
4,975,000	8,247,477	3,272,477	-	-	-
355,000	2,263,882	1,908,882	-	-	-
85,558,529	78,869,340	(6,689,189)	-	-	-
4,435,366	4,401,291	34,075	-	-	-
1,571,407	1,602,092	(30,685)	-	-	-
5,466,405	4,756,969	709,436	-	-	-
499,951	500,250	(299)	-	-	-
30,316,460	28,628,956	1,687,504	-	-	-
735,561	623,584	111,977	-	-	-
2,207,537	2,192,509	15,028	-	-	-
846,404	691,352	155,052	-	-	-
4,221,964	4,018,435	203,529	-	-	-
2,087,153	1,791,904	295,249	-	-	-
-	-	-	760,000	760,000	-
-	-	-	3,867,234	3,867,234	-
4,448,032	-	4,448,032	-	-	-
56,836,240	49,207,342	7,628,898	4,627,234	4,627,234	
28,722,289	29,661,998	939,709	(4,627,234)	(4,627,234)	-
1,905,227	800,465	(1,104,762)	4,627,234	4,619,617	(7,617)
(55,147,478)	(25,273,934)	29,873,544	-	(571,274)	(571,274)
(53,242,251)	(24,473,469)	28,768,782	4,627,234	4,048,343	(578,891)
($24,519,962)	$5,188,529	$29,708,491	$ -	($578,891)	($578,891)

Continued

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

COMBINED STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE BUDGET AND ACTUAL (BUDGETARY BASIS) - ALL GOVERNMENTAL FUND TYPES FOR THE YEAR ENDED SEPTEMBER 30, 1990 (Continued)

	CAPITAL PROJECTS FUNDS		
	BUDGET	ACTUAL	VARIANCE-FAVORABLE (UNFAVORABLE)
REVENUES			
Taxes	$ -	$ -	$ -
Intergovernmental	9,300,000	5,306,920	(3,993,080)
Interest	-	285,641	285,641
Other	-	126,180	126,180
Total Revenues	9,300,000	5,718,741	(3,581,259)
EXPENDITURES			
Current Operating			
Administrative	1,017,000	596,980	420,020
Commissions	-	-	-
Land Management	-	-	-
Regulation	-	-	-
Operations and Maintenance	-	-	-
Construction Management	-	-	-
Research and Evaluation	-	-	-
Big Cypress	-	-	-
Planning	1,849,600	1,774,600	75,000
Capital Outlay	62,424,562	31,112,376	31,312,186
Debt Service			
Principal Retirement	-	-	-
Interest	-	-	-
Contingency	-	-	-
Total Expenditures	65,291,162	33,483,956	31,807,206
Excess (deficiency) of revenues over expenditures	(55,991,162)	(27,765,215)	28,225,947
OTHER FINANCING SOURCES (USES):			
Operating transfers in	55,991,162	27,772,620	(28,218,542)
Operating transfers out	-	(753,355)	(753,355)
Total Other Financing Sources (Uses)	55,991,162	27,019,265	(28,971,897)
Excess (deficiency) of revenues over expenditures and other sources (uses)	$ -	($745,950)	($745,950)

SEE ACCOMPANYING NOTES TO THE FINANCIAL STATEMENTS.

TOTAL (MEMORANDUM ONLY)		
BUDGET	ACTUAL	VARIANCE-FAVORABLE (UNFAVORABLE)
$106,708,017	$107,160,519	$452,502
39,651,869	23,458,931	(16,192,938)
7,075,000	10,853,725	3,778,725
1,404,530	5,510,037	4,105,507
154,839,416	146,983,212	(7,856,204)
25,675,879	24,638,910	1,036,969
3,116,471	3,337,663	(221,192)
5,466,405	4,756,969	709,436
7,363,202	7,012,260	350,942
30,391,460	28,703,956	1,687,504
3,956,367	3,413,969	542,398
12,089,174	11,202,840	886,334
846,404	691,352	155,052
16,241,196	15,590,801	650,395
66,767,899	34,960,141	31,807,758
760,000	760,000	-
3,867,234	3,867,234	-
4,682,854	-	4,682,854
181,224,545	138,936,095	42,288,450
(26,385,129)	8,047,117	34,432,246
62,523,623	33,194,319	(29,329,304)
(63,207,478)	(33,194,319)	30,013,159
(683,855)	-	683,855
($27,068,984)	$8,047,117	$35,116,101

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

STATEMENT OF REVENUES, EXPENSES AND CHANGES IN RETAINED EARNINGS
PROPRIETARY FUND TYPE - INTERNAL SERVICE FUND
FOR THE YEAR ENDED SEPTEMBER 30, 1990

	1990	1989
OPERATING REVENUES		
Charges for Services	$484,062	$616,722
OPERATING EXPENSES		
Claims Expense	885,649	575,011
Net Income (Loss)	(401,587)	41,711
RETAINED EARNINGS AT BEGINNING OF YEAR, AS RESTATED	2,149,831	2,108,120
RETAINED EARNINGS AT END OF YEAR	$1,748,244	$2,149,831

SEE ACCOMPANYING NOTES TO THE FINANCIAL STATEMENTS.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

STATEMENT OF CASH FLOWS
INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS
PROPRIETARY FUND TYPE - INTERNAL SERVICE FUND
FOR THE YEAR ENDED SEPTEMBER 30, 1990

	1990	1989
CASH FLOWS PROVIDED BY OPERATING ACTIVITIES		
Cash received from other funds for insurance premiums	$484,062	$616,722
Cash payments to vendors for insurance	(484,062)	(616,722)
NET CASH PROVIDED BY OPERATING ACTIVITIES	-	-
NET CASH PROVIDED BY NON-CAPITAL FINANCING ACTIVITIES	-	-
NET CASH PROVIDED BY CAPITAL AND RELATED FINANCING ACTIVITIES	-	-
NET CASH PROVIDED BY INVESTING ACTIVITIES	-	-
CASH AND CASH EQUIVALENTS AT BEGINNING OF YEAR	-	-
CASH AND CASH EQUIVALENTS AT END OF YEAR	$ -	$ -

RECONCILIATION OF OPERATING INCOME (LOSS) TO NET CASH PROVIDED BY OPERATING ACTIVITIES

OPERATING INCOME (LOSS)	($401,587)	$41,711
ADJUSTMENTS TO RECONCILE OPERATING INCOME (LOSS) TO NET CASH PROVIDED BY OPERATING ACTIVITIES:		
Change in liability for insurance reserve	401,587	(41,711)
NET CASH PROVIDED BY OPERATING ACTIVITIES	$ -	$ -

SEE ACCOMPANYING NOTES TO THE FINANCIAL STATEMENTS.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

NOTES TO THE FINANCIAL STATEMENTS
SEPTEMBER 30, 1990

(1) DESCRIPTION OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT

The South Florida Water Management District (the District) is a public corporation established by Chapter 25270, Acts of 1949, of the Laws of Florida, and operates within the provisions of Chapter 373 of the Florida Statutes. The District covers all or parts of sixteen counties in central and southern Florida and is controlled by a Governing Board consisting of nine members appointed by the Governor.

The primary objectives of the District are to promote the conservation, development and proper utilization of surface and ground water within the District boundaries, and to prevent damage from floods, soil erosion and excessive drainage. To accomplish these objectives, the District is empowered to manage and regulate the usage and storage of water within the District boundaries and to acquire properties and construct facilities as necessary.

(2) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The accompanying financial statements conform with generally accepted accounting principles (GAAP) for governmental units as prescribed by the Governmental Accounting Standards Board (GASB) and other recognized authoritative sources. The more significant accounting policies are summarized in the following paragraphs.

(a) Reporting Entity

The financial statements include all operations over which significant oversight responsibilities are exercised by the District. Control by or dependence on the District is determined on the basis of oversight responsibilities, scope of public service, budgetary authority, taxing authority, obligations to finance any deficits that may occur and/or provide significant subsidies. Accordingly, the District's two subdistricts or basins, the Okeechobee Basin and the Big Cypress Basin, are included in the accompanying financial statements since the District's Governing Board must approve the budgets for each basin, plus the fact that the District and the two basins are financially interdependent.

There are no additional component units required for inclusion in the financial statements. The District did not invest or participate in any joint venture.

(b) Basis of Presentation: Fund Accounting

The accounts and financial statements are organized on the basis of funds and account groups, each of which is considered a separate accounting entity. The operations of each fund are accounted for with a separate set of self-balancing accounts that comprise its assets, liabilities, fund equity, revenues and expenditures. The following fund types and account groups are used and summarized in the financial statements.

GOVERNMENTAL FUND TYPES:

The following governmental fund types are used to account for the acquisition and use of expendable financial resources:

The <u>General Fund</u> accounts for all financial resources, except those requiring an accounting in another fund.

(2) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Special Revenue Funds account for revenue sources that are legally restricted to expenditures for specific purposes.

The Debt Service Fund accounts for the accumulation of resources for, and the payment of, general long-term debt principal, interest and related costs.

Capital Projects Funds account for financial resources used to acquire or construct major capital facilities and properties.

PROPRIETARY FUND TYPE:

Proprietary funds account for activities which are similar to those often found in the private sector.

The Internal Service Fund accounts for the District's self-insured risks related to general, automobile, and workers' compensation liabilities.

FIDUCIARY FUND TYPE:

Fiduciary funds account for assets held by the District in a trustee capacity or as an agent for others.

Agency Funds account for deferred compensation and payroll related liabilities. Agency funds are custodial in nature (assets equal liabilities) and do not measure the results of operations.

ACCOUNT GROUPS:

The following are the District's account groups:

The General Fixed Assets Account Group is used to establish accounting control for general fixed assets.

The General Long-Term Liability Account Group is used to establish accounting control for all outstanding long-term debt and other obligations of governmental fund types which will not be paid with current resources.

(c) Measurement Focus

Governmental fund types are accounted for on a flow of current financial resources measurement focus. Their operating statements represent increases and decreases in net current assets. The resulting fund balance is considered a measure of available spendable financial resources.

Proprietary fund types are accounted for on a flow of economic resources measurement focus. Their operating statements represent capital maintenance which measures increases and decreases in net total assets.

(2) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

(d) Basis of Accounting

The modified accrual basis of accounting is followed by the governmental fund types. Revenues are recognized when susceptible to accrual, i.e., both measurable and available. Available means collectible within the current period or soon enough thereafter to pay liabilities of the current period. Revenues susceptible to accrual are ad valorem property taxes, interest on investments, and intergovernmental revenues.

Property taxes are recorded as revenues in the fiscal year for which they are levied, provided they are collected in the current period or within sixty days thereafter. Interest on invested funds is recognized when earned. Intergovernmental revenues which are received as reimbursement for specific purposes or projects are recognized in the period in which the expenditures are recorded.

Expenditures, other than interest on long-term debt, are recorded when the liability is incurred, if measurable.

The accrual basis of accounting is used by the proprietary fund. Revenues are recognized when they are earned and measurable. Expenses are recognized at the time the liabilities are incurred.

(e) Budgets and Budgetary Accounting

Budgets are adopted on a basis consistent with generally accepted accounting principles except that encumbrances are reported as expenditures for budgetary purposes.

Prior to July 31 each year, the Budget Director submits to the Budget Committee of the Governing Board a proposed operating budget for all funds for the fiscal year commencing the following October 1. The operating budget includes proposed expenditures and the means of financing them. Public hearings are conducted at District headquarters during September to obtain taxpayer comments. Prior to October 1, the budget is legally enacted and the millage rate set through adoption of a resolution. The reported budgetary data represents the final approved budget after amendments approved by the Governing Board.

The level of control at which expenditures may not exceed the budget is at the departmental level. Department directors can approve line item overruns within departments as long as the total department budget is not exceeded. The Governing Board can approve budget transfers among departments as long as the transfers do not cause the expenditures to exceed the budget within a department.

The Surface Water Improvement and Management Fund's actual expenditures, on a budgetary basis, exceed budget by $9,376 for 1990.

(f) Encumbrances

The District utilizes the encumbrance method of accounting. Under this system, commitments for the expenditure of resources are recorded in order to reserve that portion of the applicable appropriation. All unencumbered appropriations lapse at year end. Encumbrances representing uncompleted contracts are recorded as a reservation of fund balance at year end and reappropriated in the ensuing year's budget.

(2) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

(g) Cash and Investments

Cash includes currency on hand and demand deposits. Investments accounted for in the governmental funds are stated at amortized cost which approximates market. Investments of the Deferred Compensation Plan accounted for in the Agency Fund are reported at market.

Florida statutes authorize investments in (1) United States bonds and obligations, (2) guaranteed United States agency issues, (3) Florida county, municipal and district general, excise and revenue obligations, and (4) Florida bank certificates of deposit. The District is also authorized to invest in the Local Government Surplus Trust Fund administered by the State Board of Administration.

(h) Inventory

Inventory is stated at average cost and consists of expendable supplies held for consumption. The cost is recorded as an expenditure at the time individual inventory items are consumed.

(i) General Fixed Assets

General fixed assets are those acquired for general governmental purposes. Assets purchased are recorded as expenditures in the governmental funds and capitalized at historical cost in the General Fixed Assets Account Group. No depreciation is provided on general fixed assets, nor has interest been capitalized.

The acquisition of land and construction projects utilizing resources received from Federal and State agencies are capitalized in the General Fixed Assets Account Group when the related expenditure is incurred. Amounts expended by Federal agencies on projects related to District activities are not included in revenue and expenditures because the District has no control over the projects or the expenditures of the Federal funds. Donated assets are recorded at their estimated fair market value at the time received.

Public domain ("infrastructure") general fixed assets consisting of certain improvements other than buildings, including bridges, water control structures, canals and levees are capitalized along with other general fixed assets. Maintenance, repairs and minor renovations are charged to operations when incurred. Expenditures which materially increase values, change capacities or extend useful lives are capitalized. Upon sale or retirement, the cost is eliminated from the respective accounts.

(j) Self-insurance

The District is self-insured for general, automobile, and workers' compensation liability claims. A separate Internal Service Fund accounts for the payment of general and automobile liability, workers' compensation claims and judgments against the District. The accrued liability for outstanding claims represents an estimate based upon an actuarial study of the eventual loss on claims received prior to year end plus a determination of claims incurred but not reported at year end. No administrative costs are allocated to this Fund.

(2) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

(k) Compensated Absences

District employees are granted a specific number of vacation and sick leave days with pay. Employees are permitted to accumulate a maximum of 360 hours (45 days) of vacation as of the final payroll ending in December of each year. Excess time is forfeited if not used within 30 days after the final payroll. Employees are reimbursed upon termination for a percentage of unused sick leave after at least 10 years of service. Employees are also reimbursed for a maximum of 40 hours of unused sick leave each year if they qualify for sick leave incentive.

The cost of vacation and sick leave benefits (compensated absences) are budgeted and expended when payments are made to employees. However, the liability for all accrued and vested vacation and sick pay benefits is recorded in the General Long-Term Liability Account Group. Currently, the Governmental Accounting Standards Board is considering alternative methods of recording this liability in the future. One of these methods includes recording the liability in the appropriate operating fund which potentially could result in a charge against the fund balance. If such a change occurs, it is planned to take place in the fiscal year ended September 30, 1995. Accordingly, the District is designating an increasing share of the fund balance each year ($909,195 at September 30, 1990) which could absorb this future charge in full without impairing the fund balance in fiscal year 1995.

(l) Fund Balances

Reserves are reported to indicate that a portion of fund balance is not available for additional appropriation or is legally segregated for a future use. Designations of fund balance identifies tentative plans for the future use of financial resources. The balance is available for future appropriation.

(m) Redefinition of Fund Structure and Other Accounting Changes

In 1990, District management redefined its fund structure to retroactively exclude the Big Cypress Basin and Okeechobee Basin subfunds from the General Fund. These subfunds are now included as Special Revenue Funds. The District has also retroactively excluded payroll-related liabilities from the General Fund and now includes these liabilities in an Agency Fund.

Also, the District has changed its method of accounting for compensated absences. Prior to restatement, an amount representing the estimated current liability for compensated absences, was accrued as a liability in the General Fund. In 1990, the total liability is shown in the General Long-Term Liabilities Account Group plus an increasing portion of the fund balance is designated for compensated absences as described in Note (2)(k).

As discussed in Note 3, the District changed its method of accounting for monies received through the Water Management Lands Trust Fund (the Trust Fund).

(2) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

The General Fund and Special Revenue Funds fund balances as of September 30, 1989, have been restated to reflect this redefinition as follows:

	General Fund	Special Revenue Funds
Fund Balance at beginning of year, as previously stated	$ 44,764,053	$ 1,547,034
Adjustment for redefinition of funds structure	(29,327,368)	29,327,368
Adjustment for compensated absences	370,000	
Adjustment for the Trust Fund	-	22,714,692
Fund Balance at beginning of year, as restated	$ 15,806,685	$ 53,589,094

(n) Redesignation of Contributed Capital

District management redesignated the September 30, 1989, Internal Service Fund contributed capital balance to retained deficit effective October 1, 1988. This had the following impact on the October 1, 1988 retained deficit balance.

Retained deficit, as previously stated	$ (1,183,435)
Redesignation of contributed capital	3,291,555
Retained Earnings, as restated, October 1, 1988	$ 2,108,120

(o) Reporting Cash Flows - Internal Service Fund

The District has adopted the provisions of GASB Statement No. 9 for reporting cash flows of its Proprietary Fund. Accordingly, a statement of cash flows is presented for the District's Internal Service Fund. For purposes of the statement of cash flows, all highly liquid investments with a maturity of three months or less when purchased are considered as cash equivalents.

(p) Total Columns on Combined Statements

Comparative total data for 1989 are presented in the accompanying combined financial statements in order to provide an understanding of changes in the District's financial position and operations. Certain amounts included in prior period financial statements have been reclassified to conform with the current year presentation. Total columns on the combined statements are captioned "Memorandum Only" to indicate that they are presented only to facilitate comparative financial analysis. Data in these columns do not present financial position or results of operations in conformity with generally accepted accounting principles. Such data are not comparable to a consolidation and interfund eliminations have not been made in the aggregation of these data.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

NOTES TO THE FINANCIAL STATEMENTS
SEPTEMBER 30, 1990

(3) WATER MANAGEMENT LANDS TRUST FUND

The District changed its method of accounting for monies received through the Water Management Lands Trust Fund (the Trust Fund) effective October 1, 1989. These monies are now recognized as revenues (versus deferred revenue) at the time the documentary stamp excise taxes are collected by the State rather than when the District purchases land and withdraws monies from the Trust Fund. The new method of accounting was adopted to better reflect the District's legal right to receive these monies. The 1989 financial statements have been restated to apply the new method retroactively. The effect of the change in method of accounting was to increase unreserved fund balance in the Special Revenue Fund by $19,380,873 as of October 1, 1988. The effect of the change was to increase revenues and other sources in excess of expenditures and other uses by $6,645,062 and $3,333,818 for fiscal year ended September 30, 1990 and 1989, respectively.

(4) COMPARISON OF BUDGET TO ACTUAL RESULTS

The District prepares its budget on the budgetary basis of accounting which differs from generally accepted accounting principles (GAAP). The primary difference is that the budgetary basis includes current year encumbrances as expenditures. Revenues are accrued related to encumbrances included on a budgetary basis to the extent State funding is available once the expenditure is incurred. The Combined Statement of Revenues, Expenditures and Changes in Fund Balance - Budget and Actual (Budgetary Basis) - All Governmental Funds present actual results on the budgetary basis of accounting to provide a meaningful comparison of actual results with the budget. Differences between the budget basis and GAAP basis are reconciled as follows:

	General	Special Revenue	Capital Projects	Total
Revenues - GAAP Basis	$62,395,131	$76,256,420	$ 5,718,741	$144,370,292
Accruals related to encumbrances:				
Less prior year	-	(2,033,047)	-	(2,033,047)
Add current year	-	4,645,967	-	4,645,967
Revenues - Budgetary Basis	$62,395,131	$78,869,340	$ 5,718,741	$146,983,212
Expenditures - GAAP Basis	$49,750,180	$46,480,316	$36,669,910	$132,900,406
Outstanding encumbrances:				
Less prior year	(6,341,018)	(4,342,153)	(13,412,681)	(24,095,852)
Add current year	8,208,401	7,069,179	10,226,727	25,504,307
Expenditures - Budgetary Basis	$51,617,563	$49,207,342	$33,483,956	$134,308,861

(5) CASH AND INVESTMENTS

At September 30, 1990, District cash and deposits totaled $22,858. Of this total, petty cash is $8,990. The remaining $13,868 represents the carrying amount of bank deposits. The corresponding bank balance is $2,625,384. The entire bank balance is covered by Federal depository insurance or by collateral pledged through the State of Florida public depository collateral pool.

Investments are categorized to give an indication of the level of risk assumed by the District at year end based on various investment categories as to how securities are registered, insured or where held. These categories are:

(1) Insured or registered or securities held by the District or held by the District's agent in the District's name.

(2) Uninsured or unregistered investments for which the securities are held by the counterparty's trust department or agent in the District's name.

(3) Uninsured and unregistered investments for which the securities are held by the counterparty, or by its trust department or agent, but not in the District's name.

The carrying value and market value of cash and investments as of September 30, 1990, are summarized as follows:

	Investment Category			Carrying Value	Bank or Market Value
	(1)	(2)	(3)		
Money market accounts	$ -	$ -	$10,738,485	$10,738,485	$10,738,485
Repurchase agreements	-	6,132,000	-	6,132,000	6,110,176
U.S. Treasury Notes	-	9,699,130	-	9,699,130	9,832,378
	$ -	$15,831,130	$10,738,485	26,569,615	26,681,039
Local Government Surplus Trust Fund				72,814,214	72,814,214
Investments held by trustees:					
Water Management Lands Trust Fund				28,783,325	28,783,325
Deferred Compensation Trust Funds				2,059,331	2,059,331
				130,226,485	130,337,909
Petty Cash				8,990	8,990
Cash deposited in bank				13,868	2,625,384
Total Cash and Investments				$130,249,343	$132,972,283

Cash deposited with the Local Government Surplus Trust Fund and the Water Management Lands Trust Fund are both administered by the State Board of Administration.

(6) ACCOUNTS RECEIVABLE

Accounts receivable at September 30, 1990, consist of the following:

	General Fund	Special Revenue Funds	Debt Service Fund	Capital Projects Funds	Total
Property Taxes	$ 317,048	$ 311,353	$ -	$ -	$ 628,401
Interest	8,471	134,219	187,294	16,904	346,888
Property Appraiser Fees	240,445	212,823	-	-	453,268
Florida Power & Light Co.	-	21,500,000	-	-	21,500,000
Other	21,291	16,362	-	-	37,653
	$ 587,255	$22,174,757	$ 187,294	$ 16,904	$22,966,210

Property appraiser fees represent refunds of fees charged in advance by the various county property appraisers. These fees are required by State law to be refunded to the various local governments if they are not expended. The receivable from Florida Power & Light Co. represents amounts owed by the electric utility per contract with the District. This contract provides funding to respond to any water quality or other environmental effects that may occur when the utility constructs a power line through water conservation areas under the control of the District. Funding is also included for the eradication of flora that threatens the indigenous plant life in South Florida.

(7) INTERFUND RECEIVABLES AND PAYABLES

Interfund receivables and payables as of September 30, 1990, are as follows:

Fund	Interfund Receivable	Interfund Payable
General	$22,913,233	$ 7,944,546
Special Revenue	1,567,101	39,117,752
Capital Projects	18,580,527	1,776,643
Internal Service	3,291,555	-
Agency	2,486,525	-
	$48,838,941	$48,838,941

(8) PROPERTY TAXES

Property taxes are levied each November 1 on the assessed value listed as of the prior January 1 for real and personal property located within the District. The assessed value at January 1, 1989, upon which the fiscal year 1990 levy was based, was approximately $206 billion. The District is permitted by Florida statutes to levy taxes up to .80 mills of the assessed valuation. The rate for the District for fiscal year 1990 was .284 mills. In addition to the District rate, rates for the Big Cypress Basin and Okeechobee Basin of .138 mills and .263 mills, respectively, are applied to approximately 5% and 95%, respectively, of the assessed valuation.

All property is appraised and the resulting taxes are collected by each county the District serves. Expenditures representing fees or commissions for property appraisal and tax collection services provided by the counties are recorded separately.

Property owners remitting tax payments by November 30, December 31, January 31 or February 28 receive discounts of 4%, 3%, 2% or 1%, respectively. Property taxes are payable through March 31, after which time they become delinquent. Delinquent property tax certificates are sold to the public beginning June 1, at which time a lien attaches to the property. By fiscal year end virtually all property taxes are collected either directly or through tax certificate sales. Property tax revenues are recorded by the District based on the amount of receipts reported by the county tax collectors.

(9) INTERGOVERNMENTAL TRANSACTIONS

Amounts due from other governments at September 30, 1990, and intergovernmental revenues for 1990 consist of the following:

	September 30, 1990 Due From Other Governments	1990 Intergovernmental Revenues
Florida Department of Environmental Regulation	$ 4,846,452	$16,824,849
Florida Keys Aqueduct Authority	349,700	23,190
Florida Department of Natural Resources	1,802,113	2,581,712
Florida Freshwater Game & Fish Commission	-	600,000
U.S. Army Corps of Engineers	172,217	519,117
U.S. Agricultural Soil Conservation Service	37,242	145,943
Other	527,512	151,200
Less Allowance for Doubtful Accounts	(477,512)	-
	$ 7,257,724	$20,846,011

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

NOTES TO THE FINANCIAL STATEMENTS
SEPTEMBER 30, 1990

(10) GENERAL FIXED ASSETS

A summary of changes in general fixed assets follows:

	Balance at October 1, 1989	Additions	Retirement and Deletions	Balance at September 30, 1990
Land	$155,696,920	$ 3,568,138	$ (672,800)	$158,592,258
Buildings	15,794,898	418,141	-	16,213,039
Equipment	47,223,065	4,138,661	(3,251,105)	48,110,621
Leasehold Improvements	15,798	-	-	15,798
Water Control Structures	376,415,626	2,396,625	-	378,812,251
In Process:				
Construction	-	16,630,553	(51,688)	16,578,865
Land Acquisition	-	10,337,599	-	10,337,599
	$595.146.307	$37.489.717	$(3.975.593)	$628.660.431

(11) DEFERRED REVENUES

Special Revenue Fund deferred revenue represents advances received from the Florida Department of Environmental Regulation which were not expended plus resources received and to be received from Florida Power & Light Co., which are subject to refund pending completion of certain contractual events.

(12) GENERAL LONG-TERM LIABILITIES

The following is a summary of changes in general long-term liabilities for the year ended September 30, 1990:

Bonds Payable	Balance at October 1, 1989	Additions	Retirements	Balance at September 30, 1990
Land Acquisition Bonds:				
Series 1985	$ 2,285.000	$ -	$ (515,000)	$ 1,770,000
Series 1986	52.850.000	-	(245.000)	52,605.000
	55.135.000	-	(760,000)	54,375,000
Other Liabilities				
Compensated Absences	4.994.578	460.592	-	5.455.170
	$60.129.578	$ 460.592	$(760.000)	$59.830.170

(12) LONG-TERM LIABILITIES (continued)

Principal and interest on the Land Acquisition Bonds, Series 1985 and 1986, are secured by a lien on documentary stamp excise taxes collected statewide by the State of Florida and allocated to the State's five water management districts through the Water Management Lands Trust Fund. In addition, a reserve account for debt service is required for the maximum principal and interest amount due in any year.

Annual requirements to amortize debt outstanding as of September 30, 1990, are as follows:

	Principal	Interest	Total
1991	$ 810,000	$ 3,816,432	$ 4,626,432
1992	865,000	3,760,118	4,625,118
1993	920,000	3,698,282	4,618,282
1994	985,000	3,635,669	4,620,669
1995	1,045,000	3,571,940	4,616,940
1996-2000	6,350,000	16,694,197	23,044,197
2001-2005	8,860,000	14,081,365	22,941,365
2006-2010	12,500,000	10,306,158	22,806,158
2011-2015	17,700,000	4,925,520	22,625,520
2016	4,340,000	156,240	4,496,240
	$54,375,000	$64,645,921	$119,020,921

In October 1985, the District arranged for an in-substance defeasance of the remaining outstanding balance of its Special Obligation Land Acquisition Notes, Series 1983, and, in April 1986, the District arranged for an in-substance defeasance of a portion of its Series 1985 Bonds. The non-defeased portion of the Series 1985 Bonds is included in the foregoing presentation. The District irrevocably deposited cash and U.S. Treasury securities in escrow solely for satisfying scheduled payments of both principal and interest on the defeased notes and bonds. The defeased notes and bonds, and related investments are not reflected on the District's balance sheet. The outstanding principal balances of the defeased Series 1983 Notes and the Series 1985 Bonds at September 30, 1990, were $4,000,000 and $46,345,000, respectively.

Amounts reserved and designated in other funds for the retirement of general long-term liabilities at September 30, 1990, are summarized as follows:

	Reserved for Debt Service	Designated for Compensated Absences	Total
General Fund	$ -	$ 398,866	$ 398,866
Special Revenue Funds	-	510,329	510,329
Debt Service Fund	7,768,792	-	7,768,792
	$ 7,768,792	$ 909,195	$ 8,677,987

(13) OPERATING LEASES

The District is committed under various operating leases for building, office space and data processing equipment. Lease expenditures for the year ended September 30, 1990, amounted to $380,652. Future minimum lease payments for these leases are as follows:

Fiscal Year Ending September 30	Minimum Lease Payments
1991	$ 443,800
1992	193,735
1993	129,207
1994	108,075
1995	105,823
	$ 980,640

(14) RESERVED AND UNRESERVED FUND BALANCES

Reserved Fund Balances - Reservations of fund balance at September 30, 1990, consist of the following:

	General Fund	Special Revenue Funds	Debt Service Fund	Capital Projects Funds
Land acquisition	$ -	$ -	$ -	$ 3,662,952
Encumbrances	12,564,028	10,487,155	-	12,115,420
Amounts due from other governments	349,700	-	-	-
Debt service	-	-	7,768,792	-
	$ 12,913,728	$ 10,487,155	$ 7,768,792	$ 15,778,372

Unreserved Fund Balances - Designations of fund balance at September 30, 1990, consist of the following:

	General Fund	Special Revenue Funds
Subsequent year's expenditures	$3,391,121	$28,024,330
Compensated absences	398,866	510,329
	$3,789,987	$28,534,659

A deficit undesignated fund balance in the Capital Projects Fund results from the encumbrance of funds without accruing intergovernmental revenues for expected expenditure reimbursements which occur after year end.

(15) DEFINED BENEFIT PENSION PLAN

The District participates in the Florida Retirement System (the "System"), a cost-sharing multiple-employer, public employee retirement plan, which covers substantially all of the District's full-time and part-time employees. The System was created in 1970 by consolidating several employee retirement systems. All eligible employees are defined by the State as those who were hired after 1970, and those employed prior to 1970 who elected to enroll are covered by the System. Benefits under the plan vest after ten years of service.

Employees who retire at or after age 62, with ten years of credited service, are entitled to an annual retirement benefit, payable monthly for life. The System also provides for early retirement at reduced benefits plus death and disability benefits. These benefit provisions and all other requirements are established by State statute.

The payroll for employees covered by the System for the year ended September 30, 1990, was $39,980,430. The total payroll of the District was $41,386,745. The System is non-contributory and is administered by the State of Florida. The District is required to contribute amounts necessary to pay benefits when due as defined by State statute. Such contribution requirements ranged between 14.38% and 15.14% of gross salaries during fiscal year 1990. District contributions totaled $5,968,494 for the year ended September 30, 1990, which approximates 15% of covered payroll ($5,384,610 in 1989 or 14% of payroll). District contributions comprise approximately 0.3% of the total contributions made to the System.

The "pension benefit obligation" is a standardized disclosure measure of the present value of pension benefits, adjusted for the effects of projected salary increases and step rate benefits, estimated to be payable in the future as a result of employee service to date. The measure, which is the actuarial present value of credited projected benefits, is intended to indicate the System's funding status on a going-concern basis, assess progress made in accumulating sufficient assets to pay benefits when due, and make comparisons among public employee retirement systems and employers. The System does not make separate measurements of assets and pension benefit obligations for participating employers.

The estimated pension benefit obligation as of June 30, 1990, for the System is approximately $31 billion. As of June 30, 1990, net assets available for benefits (valued at market) were $22.8 billion, leaving an unfunded pension benefit obligation of $8.2 billion. The most recent actuarial study indicates that, if certain actuarial assumptions are realized and certain increases to the contribution rates are made, this unfunded past service liability will be funded within 30 years.

Ten-year historical trend information showing the System's ability to accumulate sufficient assets to pay benefits when due is presented in the System's June 30, 1990, annual report.

(16) OTHER POSTEMPLOYMENT BENEFITS

During fiscal year 1990, the District offered an early retirement incentive to eligible employees on a one-time basis. To be eligible for participation, an employee's age plus years of District service had to total at least 72 by March 31, 1990. Under the retirement incentive, the District agreed to pay three years of medical insurance premiums for the retiring employees and between 50 and 100% of the dependents' premiums (depending on the years of service of the retirees).

The District recorded medical insurance expenditures of approximately $40,000 for 28 employees who participated in the early retirement incentive program during fiscal year 1990. Premium payments in future years will be budgeted and expended based on the number of eligible employees and their dependents. Future estimated expenditures are:

Fiscal Year Ending September 30	Estimated Expenditures
1991	$112,000
1992	134,400
1993	121,280
	$367,680

(17) DEFERRED COMPENSATION PLAN

The District offers its employees a deferred compensation plan created in accordance with Internal Revenue Code Section 457. All activities of the plan are accounted for in an Agency Fund. The plan, available to all District employees, is administered by third-party agents and permits employees to defer a portion of their salary until future years. The deferred compensation proceeds are not available to employees until termination, retirement, death or certain emergencies.

All amounts of compensation deferred under the plan, all property and rights purchased with those amounts, and all income attributable to those amounts, are (until paid or made available to the employee or other beneficiary) solely the property and rights of the District (without being restricted to the provision of benefits under the plan), subject to the claims of the District's general creditors. The District has the duty of due care that would be required of an ordinary prudent investor. Participants' rights under the plan are equal to those of general creditors of the District in an amount equal to the fair market value of the deferred account for each participant. The District believes that it is unlikely that it will use the assets to satisfy the claims of general creditors in the future.

(18) CONDEMNATION PROCEEDINGS

The District is party to a number of lengthy condemnation proceedings (as plaintiff) and inverse condemnation proceedings (as defendant) regarding the taking of private lands for public use. In such cases, the court determines the value of the land acquired by the District and payment of the liability owed to the owner is made upon transfer of title to the District. Subsequent to September 30, 1990, the court has ruled on various proceedings for which the value and title transfer date is yet undetermined. The District's future liability for the purchase price of these lands, including attorneys' fees, could range from $10-25 million. The related assets and liabilities are not reflected in the financial statements of September 30, 1990, but the District will appropriate the resources in the period in which the land value is determined and acquired. In some (quick take) condemnation cases, the District usually has appropriated the resources in the period in which the order of taking has been granted by the court.

(19) COMMITMENTS AND CONTINGENCIES

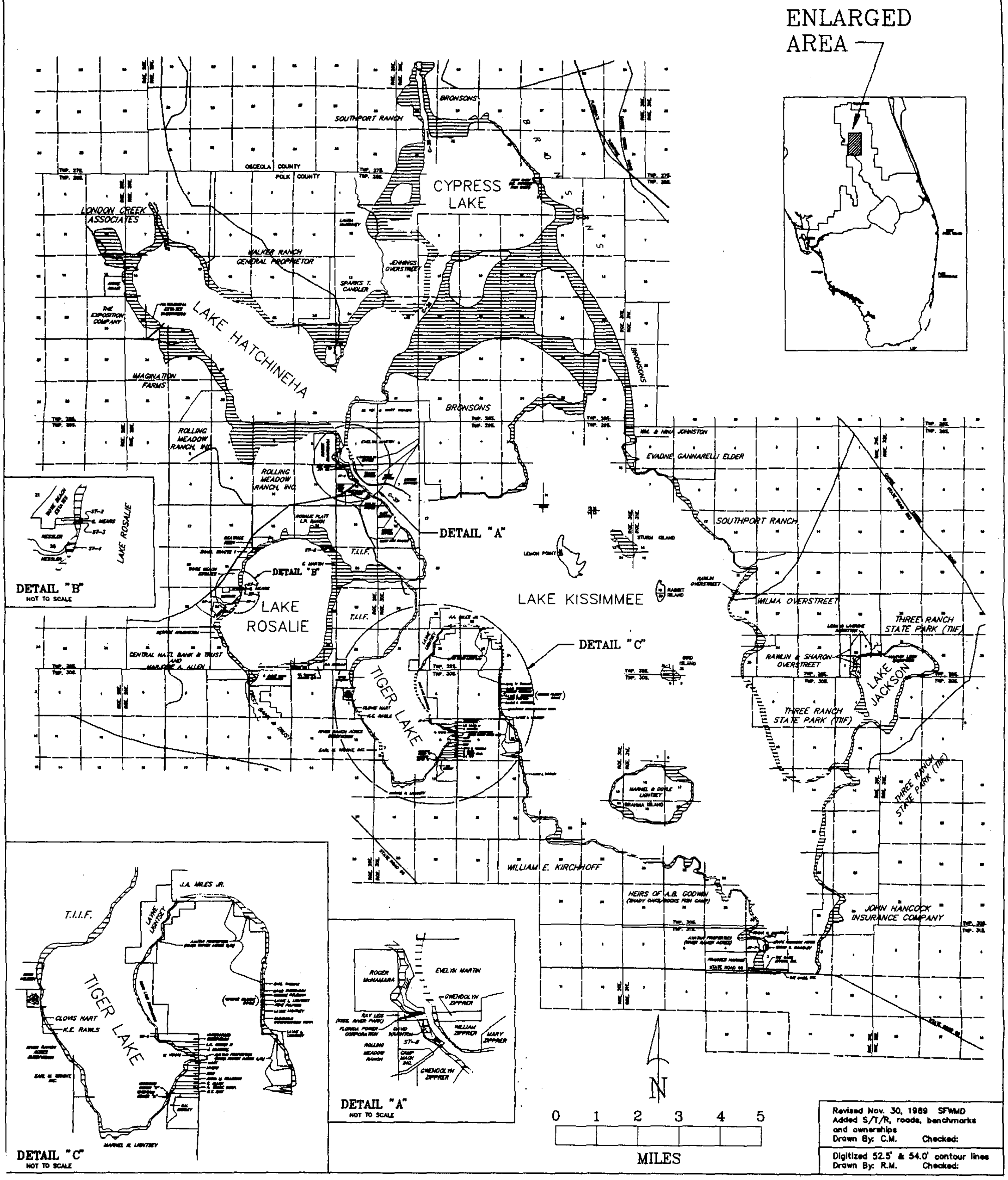
The District is a defendant in legal proceedings arising in the normal course of business. In the opinion of management, based on advice of legal counsel, with the exception of the following, the ultimate resolution of these matters will not have a material adverse effect on the District's operations.

The United States attorney filed action against the District alleging that the District has violated Florida statutes and regulations, has committed a nuisance, and has breached two contracts by allowing polluted water to pass through the Central and Southern Florida Flood Control Project of which the District is the local sponsor pursuant to the Federal Flood Control Acts and Florida law, to the detriment of flora and fauna located in Arthur R. Marshall Loxahatchee National Wildlife Refuge and Everglades National Park. Since the damages being sought are injunctive in nature, no provision for any liability has been recorded in the accompanying financial statements. The action is being contested by the District. In the opinion of management, based on consultation with legal counsel, it is not possible to predict the outcome of this action or the amount of legal costs that the District will incur in its defense.

EXHIBIT A

CONSERVATION EASEMENT

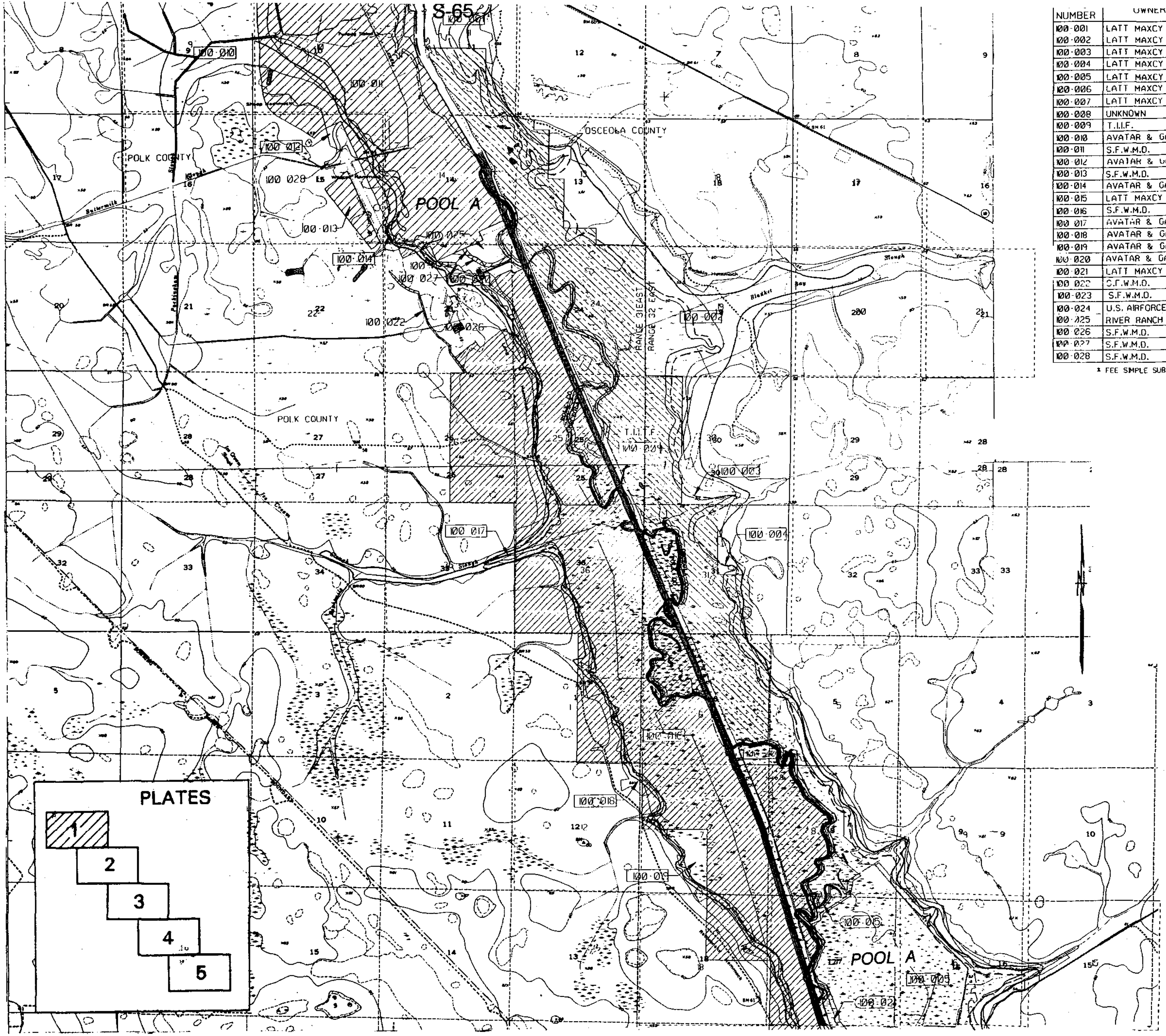
LAKES KISSIMMEE, HATCHINEHA, AND CYPRESS BASIN
ESTIMATED SURFACE AREA BETWEEN 52.5 AND 54.0 FEET (NGVD, 1927)



* Source: Estimated from USGS 7.5 minute Quadrangles listed below.
Lake Hatchineha 1953, Cypress Lake 1953, Hesperides 1952, Lake Weohyakapka NE 1952, Lake Marian NW 1953
Lake Weohyakapka SE 1952, Lake Marian SW 1953

UPPER BASIN
REAL ESTATE
ACQUISITIONS
PLATE F1

Plate F-2



NUMBER	OWNER	ACREAGE	INTEREST	NUMBER
100·001	LATT MAXCY CORP.			
100·002	LATT MAXCY CORP.			
100·003	LATT MAXCY CORP.			
100·004	LATT MAXCY CORP.			
100·005	LATT MAXCY CORP.			
100·006	LATT MAXCY CORP.			
100·007	LATT MAXCY CORP.			3645
100·008	UNKNOWN			
100·009	T.I.I.F.			
100·010	AVATAR & GAC TRUST			
100·011	S.F.W.M.D.			4060 40614062
100·012	AVATAR & GAC TRUST			
100·013	S.F.W.M.D.			4062
100·014	AVATAR & GAC TRUST			
100·015	LATT MAXCY CORP.			3645
100·016	S.F.W.M.D.			
100 017	AVATAR & GAC TRUST			
100·018	AVATAR & GAC TRUST			
100·019	AVATAR & GAC TRUST			
100·020	AVATAR & GAC TRUST			
100·021	LATT MAXCY CORP.			3645
100 022	S.F.W.M.D.			
100·023	S.F.W.M.D.			
100·024	U.S. AIRFORCE			
100·025	RIVER RANCH			
100·026	S.F.W.M.D.			
100·027	S.F.W.M.D.			
100·028	S.F.W.M.D.			4057

* FEE SIMPLE SUBJECT TO PERMANENT EASEMENT

Plate F3

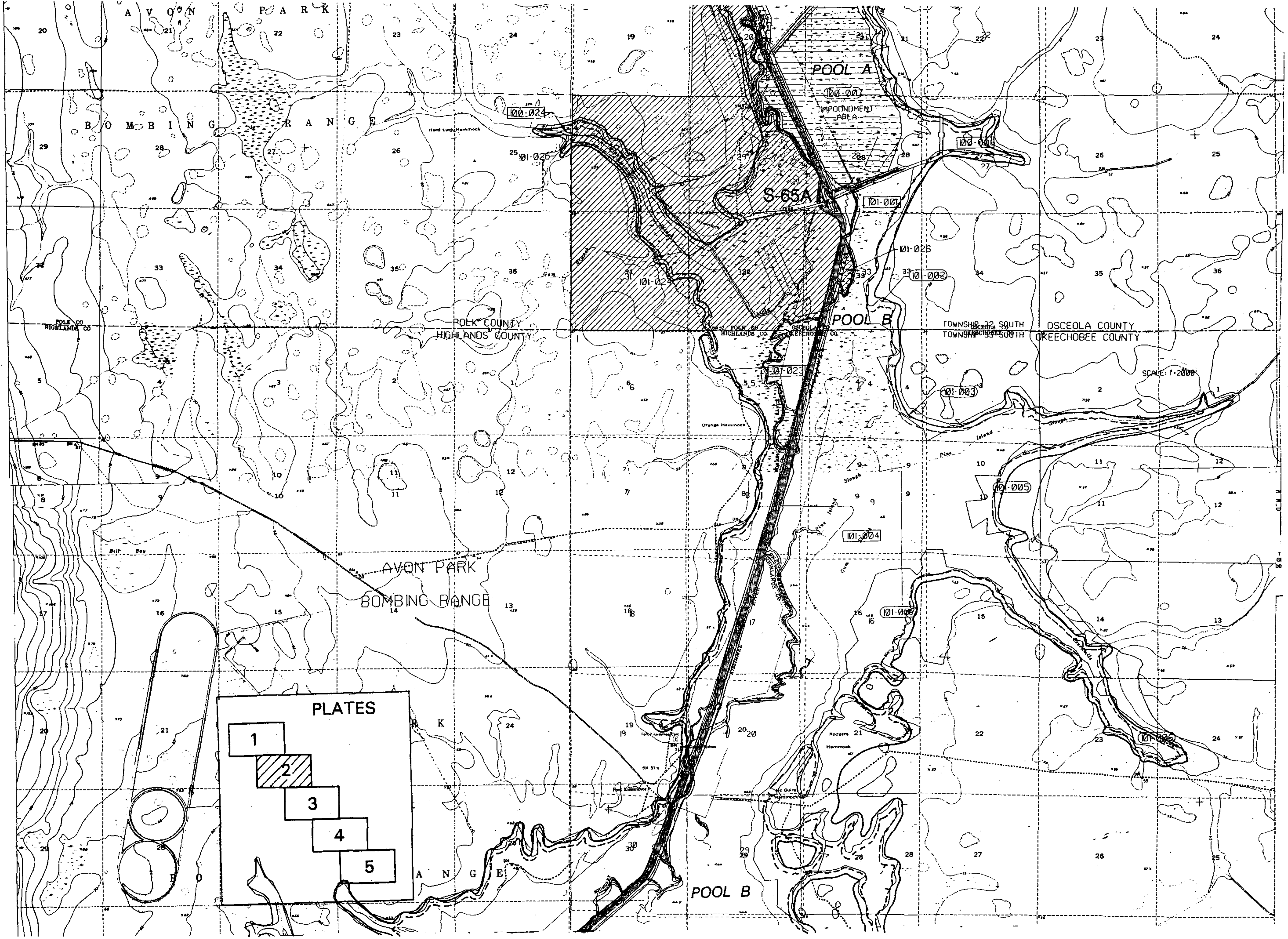
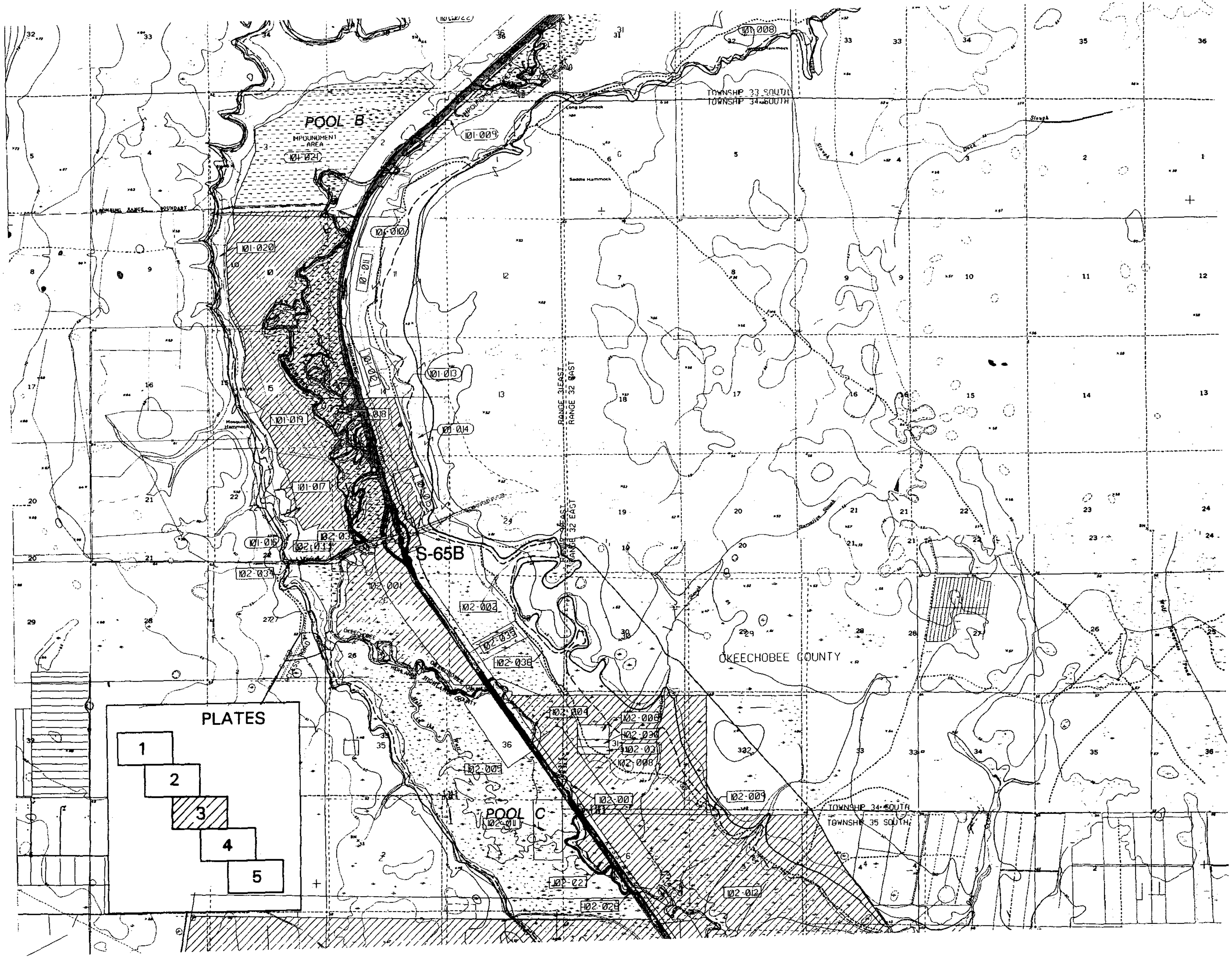

AVON PARK
BOMBING RANGE
POOL A
100-007
IMPOUNDMENT AREA
100-024
101-026
100-008
S-65A
101-001
101-025
101-002
101-024
POOL B
POLK COUNTY
HIGHLANDS COUNTY
TOWNSHIP 32 SOUTH
TOWNSHIP 33 SOUTH
OSCEOLA COUNTY
OKEECHOBEE COUNTY
101-023
101-003
SCALE: 1"=2000'
Hard Luck Hammock
Orange Hammock
Pine Island Slough
101-005
101-004
AVON PARK
BOMBING RANGE
101-006
Rodgers Hammock
McGuire Hammock
101-006
PLATES
1
2
3
4
5
POOL B

Plate F-4


POOL B
IMPOUNDMENT AREA
POOL C
S-65B
PLATES
1
2
3
4
5
TOWNSHIP 33 SOUTH
TOWNSHIP 34 SOUTH
TOWNSHIP 35 SOUTH
RANGE 31 EAST
RANGE 32 EAST
OKEECHOBEE COUNTY
HIGHLANDS COUNTY
Long Hammock
Saddle Hammock
Mosquito Hammock
Duck Slough
101-008
101-009
101-010
101-011
101-012
101-013
101-014
101-016
101-017
101-018
101-019
101-020
101-021
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102-036

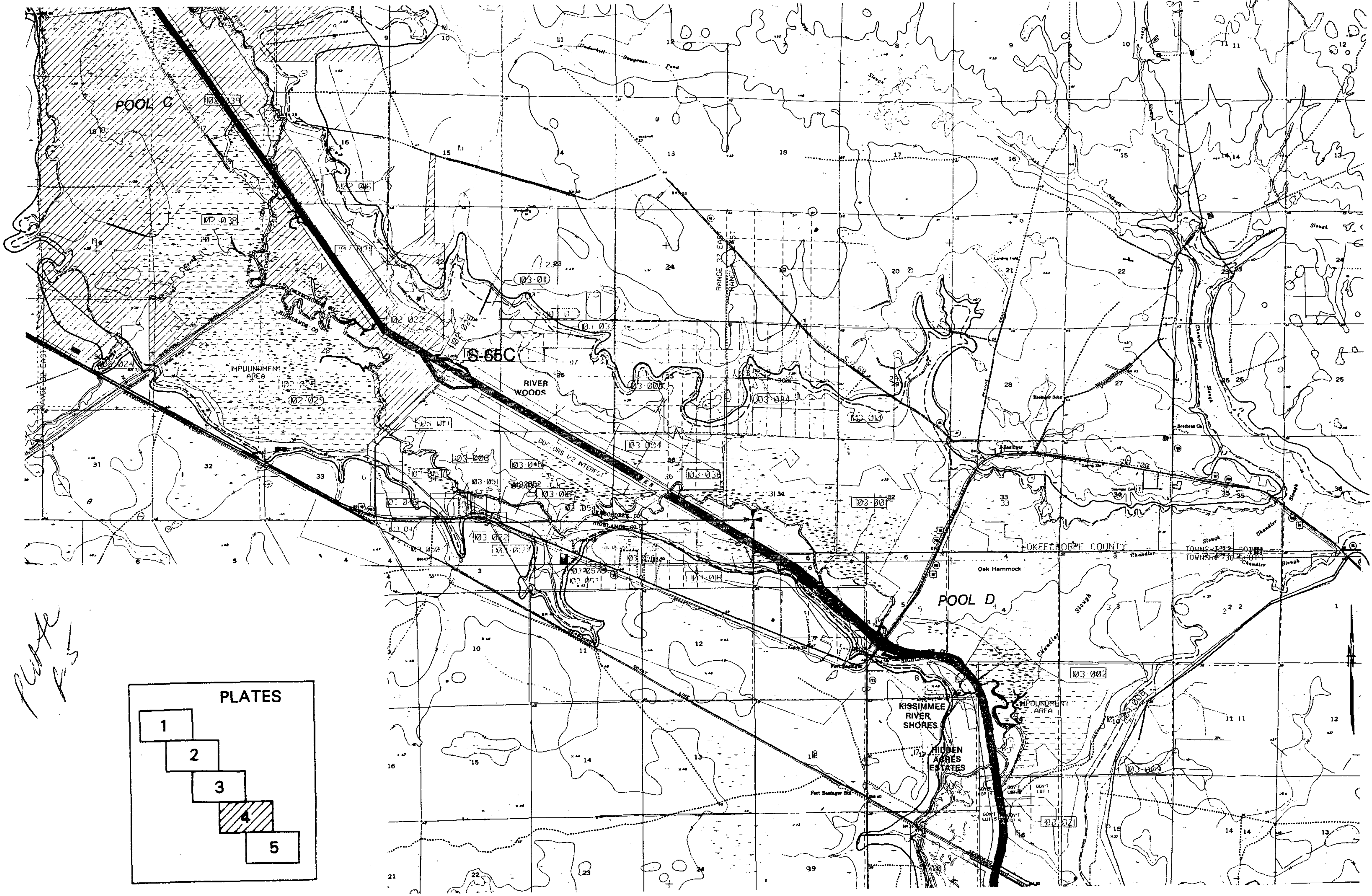
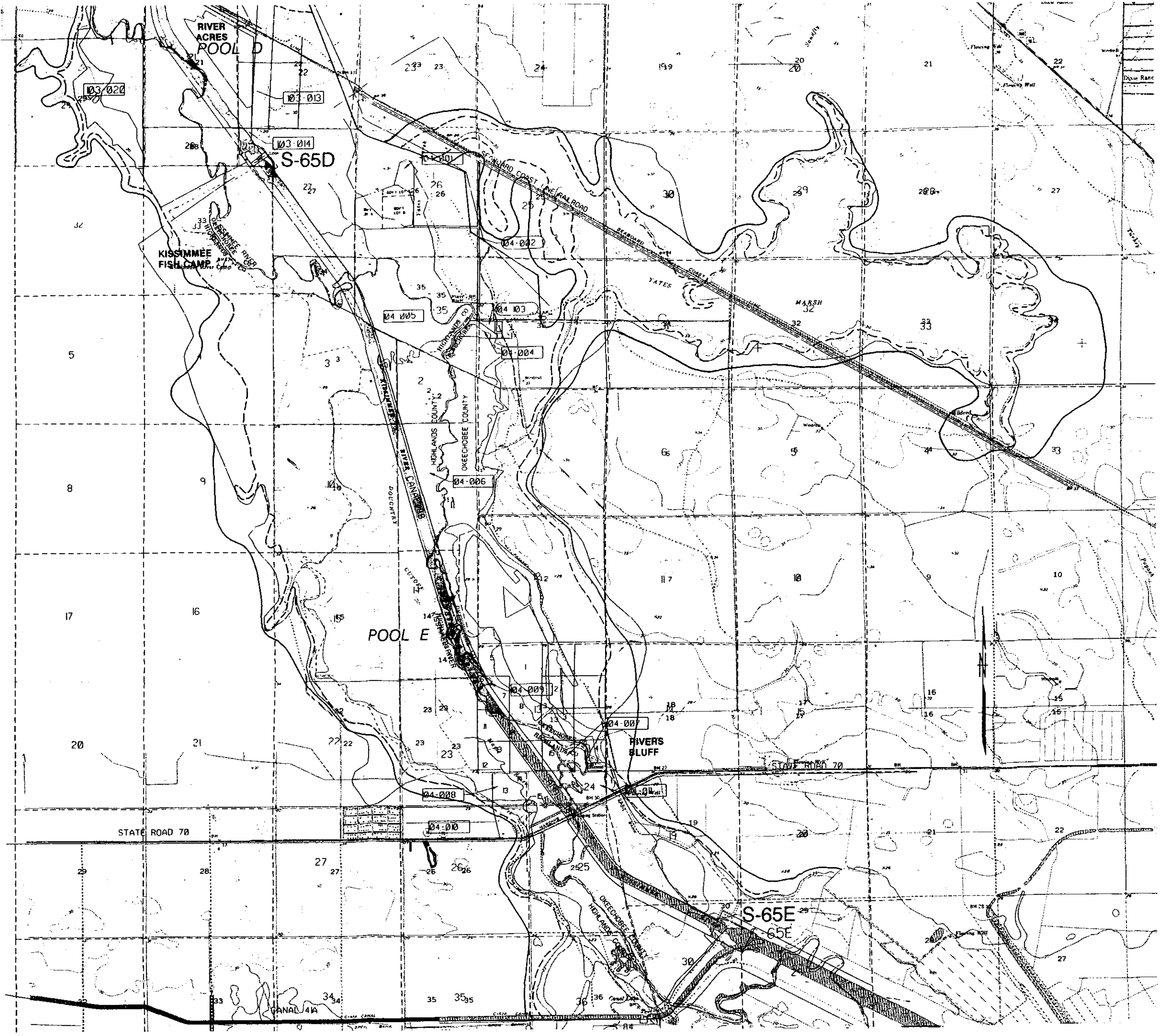

POOL C
IMPOUNDMENT AREA
S-65C
RIVER WOODS
DOCTORS 1/2 INTEREST
OKEECHOBEE CO
HIGHLANDS CO
RANGE 32 EAST
OKEECHOBEE COUNTY
TOWNSHIP 35 SOUTH
TOWNSHIP 36 SOUTH
Oak Hammock
POOL D
KISSIMMEE RIVER SHORES
HIDDEN ACRES ESTATES
IMPOUNDMENT AREA
Fort Basinger
Fort Basinger Sta
Chandler Slough
Underhill Sawgrass Pond
PLATES
1
2
3
4
5

Plate
P.3



S

1

5

TRACT NUMBER	OWNER	ACREAGE	INTER
104-001	FLORIDA BAPTIST CHILDREN'S HOME		
104-002	FLORIDA BAPTIST CHILDREN'S HOME		
104-003	GACHE		
104-004	GACHE		
104-005	TELEX, INC.		
104-006	MEREDITH		
104-007	PARADISE LAND COMPANY		
104-008	SMITH OKEECHOBEE FARMS		
104-009	PARADISE LAND COMPANY		
104-010	SMITH OKEECHOBEE FARMS		

PROJECT

- - - - 5 YEAR FL

—— 100 YEAR

plate
F-6

SCALE 1:24000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS 12½ FEET

LOWER BASIN
REAL ESTATE ACQUISIT

PL