

TECHNICAL SUPPORT/COW PEN SLOUGH WATER MANAGEMENT PROJECT

WORK ORDER: MANA-7/79-2/J.V.

on

COW PEN SLOUGH AND PHILLIPPI CREEK BASINS

for

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

by

SMALLY, WELLFORD & NALVEN, INC.

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RUSSELL & AXON, INCORPORATED

October 1979

Project No. 1241-26

Smally, Wellford & Nalven, Inc.

CONSULTING ENGINEERS



Russell & Axon, Incorporated

CONSULTING ENGINEERS

P. O. BOX 2411 SARASOTA, FLORIDA 33578

October 25, 1979

Southwest Florida Water Management District
5060 U.S. Highway 41 South
Brooksville, FL 33512

Attn: Mr. R. V. McLean
Project Manager
Project Development Section

Subject: Cow Pen Slough and Phillippi Creek Basins

Your Ref: Technical Support/Cow Pen Slough Water Management Project
Work Order: Mana-7/79-2/J.V.

Our Ref: 1241-26

Gentlemen:

Your letter dated August 31, 1979 authorized a review of pertinent features of the Cow Pen Slough and Phillippi Creek Basins, characterized by a number of specific questions in the letter. The explicit intent is to limit our analysis to "answers general in nature" relying on existing information without detailed evaluations.

We concur with the wisdom of an updated review like this in order for everyone concerned to get a clearer understanding of where matters stand today. In this way you may put a better handle on the direction to be considered for tomorrow.

The review distills our investigation of the available information. It consists of two parts. The first part is a general outline and the second part is addressed to your enumerated questions. A brief conclusion is included.

General Background

Valuable information goes back over fifty years, in bits and pieces, especially as to the Phillippi Creek Basin. It has been helpful for a review of this kind that for many years Smally, Wellford & Nalven represented the old Sarasota-Fruitville Drainage District which later was absorbed by Sarasota County, and for a long period thereafter we continued to be drainage consultants to the County. In addition to studies and projects directly for these public agencies and other services for private clients, we reviewed innumerable plans and studies prepared by other engineering agencies and firms relative to both public works

and private projects. This aspect is pertinent in that the knowledge and experience we have accumulated by being at the crossroads, so to speak, have been brought to bear on the specific reports and key points that will be discussed below.

For a graphical picture of the basins and their relationship, we have prepared three exhibits which are bound in the report.

Exhibit A - This exhibit has been adapted from our prior report covering the coastal basins of Sarasota County. It shows the juxtaposition of Cow Pen Slough and Phillippi Creek Basins.

Exhibit B - This exhibit shows Phillippi Creek basin and was adapted from another prior report.

Exhibit C - This exhibit shows the Cow Pen Slough project as originally presented in 1961, prior to construction.

The most significant reports covering the two basins over the last twenty-odd years have been freshly reviewed and are briefly summarized below. It should be kept in mind that with the number of different investigators involved at various time frames, the parameters and hydrological projections are not always consistent and opinions tend to differ along with evaluations of the effectiveness of such construction as occurred.

Prior Reports

Watershed Work Plan, Sarasota West Coast Watershed (Cow Pen Slough Water Management Project) Prepared with the assistance of the Soil Conservation Service of the U.S. Department of Agriculture, 1961. The stated objectives of the project described in the report are:

- A. "to reduce flood damage frequency in the vegetable producing area to about once in 10 years."
- B. "to provide adequate drainage and flood protection in the pasture lands to permit the production of improved pastures in the lower lying areas along the stream channels."

The Cow Pen Slough project was established by the U.S. Department of Agriculture for the benefit of agricultural lands, the requirements of which are not identical to those of more urban areas. It was to have a beneficial effect on Phillippi Creek in that it was intended to divert 735 cubic feet per second of storm water from the upper portion of that basin, which at that time was devoted to agricultural uses, to Cow Pen Slough. This was to be accomplished by the use of the pumping station to be constructed on Bee Ridge Road.

Commentary

The canal system has never been completed. The plan called for 21 miles of main channel and two laterals, of which 13 miles of the main channel have

been dug with three control structures. The laterals have not been excavated. The pumping station was completed, but the pumps have never operated because the connecting canals were not acquired or constructed.

While the design parameters were based on agricultural land use and run-off, which tolerates submergence for limited periods of time, Sarasota County acquired the right-of-way for the project in a configuration that would provide for the inevitable urbanization of the area. There are many areas that are now developed that were agricultural at the time the project was planned and constructed.

Steep canal banks at 45 degrees (1:1 slope) are scoured by runoff, aggravated by cattle movement. This is probably a heavy contributor to downstream silting.

There are additional comments in response to questions.

Survey Report on Phillippi Creek Basin, U.S. Army Engineer District, Jacksonville, Corps of Engineers, 1963. This report was prepared by the Corps after severe flooding in the Phillippi Creek Basin in 1957, 1958, 1960 and 1962. The analysis and design parameters for the proposed construction were based on an urbanized land use in contrast to the agricultural Cow Pen Slough project. Indicating that peak storm discharge was about 10,500 cubic feet per second at the mouth of Phillippi Creek, the Corps planned to accommodate a 30-year storm return interval which they computed at 60 percent of the peak. Based on the report, an improvement project was recommended that was to be financed by about \$6,000,000 in federal grants and about \$2,000,000 in local funds.

Commentary

The project was never implemented. The report remains a useful reference, although subsequent contact with the Corps indicates that the flood computations may be somewhat on the low side.

Report on the Phillippi Creek Basin, prepared by Smally, Wellford & Nalven, Inc., 1958, 1961 and 1968. This series of intensive water management studies including over 100 plans were conducted for Sarasota County in order to establish criteria for right-of-way acquisition, minimum safe building elevations and area planning. We concluded that a 25-year internal discharge of 10,000 cubic feet per second could be expected, based on future urbanization rather than existing conditions.

Commentary

Certain floodwork elements have been selected for implementation (notably a new channel and bridge at U.S. 41) but the major proposals have not, and subsequent policies would require a complete update. On the other hand, controls of development and especially building construction have been highly successful, for which the standards established by these reports have been applied for almost two decades. The first HUD insurance program adopted the plans involved.

Exploratory Engineering Report on the Engineering Feasibility and Costs of a Pumped Impoundment System for the Phillippi Creek Basin, Smally, Wellford & Nalven, Inc., 1966. This study explored the possibility of intercepting peak flood flows upstream and pumping to diked impoundment areas, from which stored water could be discharged at a controlled rate after the storm. The concept was to alleviate flooding by providing an alternative to widening and channelizing Phillippi Creek. In order to reduce otherwise excessive costs of pumping and impoundment, the conclusion was that the carrying capacity of Phillippi Creek should be increased regardless, but by deepening within the existing banks and retaining the natural alignment for the most part.

Commentary

The concept was not carried further than this exploratory study. However, insights provided by the report are useful for reference to this day.

Dona Bay Study, Bernard E. Ross, Ph.D., 1973. This study and report described remedies for flooding conditions and deteriorating water quality conditions in the Dona Bay-Shakett Creek area of Sarasota County. One feature examined was the effect upon Dona Bay of the installation of the Cow Pen Slough drainage project. Digital modeling and mathematical simulation were utilized. The study concluded, among other things, that the Cow Pen Slough project has doubled the rate of peak storm water run-off to Dona Bay under flood conditions.

The immediate recommendation was to excavate an improved channel the length of Dona Bay, in order to allow passage of flood flows descending Cow Pen Slough. Dr. Ross also suggests a possible long-range plan to intercept runoff upstream and inject the water into recharge wells.

Commentary

There has been no implementation.

Final Report on the Flood Relief Study of Phillippi Creek at the Tamiami Trail, J. E. Greiner Company, 1961. Although this study was directed to Sarasota County, it was instigated by the State Road Department (now FDOT) to corroborate the need for a new channel and bridge at U.S. 41 as previously outlined by Smally, Wellford & Nalven, Inc. A discharge of 9,200 cubic feet per second was computed for a 50-year return interval, but for design purposes the project was based on a 25-year storm for which Greiner allowed 8,000 CFS.

Commentary

Having satisfied the State Road Department as to the need, the channel and bridge were constructed. Prior flooding immediately upstream has been alleviated.

The Ecological Status of Dona and Roberts Bays and Its Relationship to Cow Pen Slough and Other Possible Perturbations, Mote Marine Laboratory, 1975. This is an impressively intensive ecological review of Dona Bay and Roberts Bay, with an

attempt to relate the findings to runoff aspects and storm flows produced by Cow Pen Slough. The team was comprised of specialized ecological scientists and accordingly is heavier on environmental matters than engineering. The findings are clearly engineering-related and this is a valuable contribution toward future conclusions that could embrace all of the complex matters and lead to reasonably satisfactory solutions. The studies identify locally generated adverse effects on the bays from seawalls and septic tanks, but conclude that the greatest contributor is heavy flood flows from Cow Pen Slough, which also carry fresh water weeds and sediments. Flora and fauna have been seriously affected.

The report cautions against further channelizing, including re-routing of any flood water from the Phillippi Creek Basin. In this connection, evidence is adduced of pollutants arising from agricultural operations. The report recommends reduction of siltation, especially from eroding banks, control of weeds and other measures. Tighter regulation of urban development and practices is also advised. Of particular interest to this review are suggestions for what may be summarized as attenuation and impoundment measures along the slough.

Commentary

There has been no implementation of the recommendations in the report, but they include significant findings which should be incorporated in further steps.

Other Water Management Material. As noted in the opening remarks, we have an accumulation of other materials related to this subject, together with corresponding general knowledge and experience. Specifically as to the Cow Pen Slough project, we performed surveys and prepared right-of-way maps. As to the Phillippi Creek Basin, our work for Sarasota County remains the main guideline even though it needs updating in some respects.

Responses to Questions in Letter of August 31, 1979

In responding to your letter dated August 31, 1979, we have attempted to answer the enumerated questions in a manner which we believe will be helpful in planning future steps. For a review like this it is necessary to generalize to a degree. Definitive analysis would require an intensive study well beyond the scope of this one.

1. "How has the flood flow hydroperiod changed from preconstruction to post-construction of the completed works?"

The "time of concentration" for a flood has been cut approximately in half by the construction of the project, meaning that storm water arrives at Dona Bay from the upper reaches of the basin in about half the time. This has changed the ratio of fresh to salt water in Dona Bay.

2. A. *"To what extent would flooding be reduced in Phillippi Creek if the existing pumping station were made operational as planned? Use the storm the system was designed for as a reference."*

The pumping station was intended to relieve (but not prevent) flooding of agricultural areas in the upper portion of the basin, in keeping with statutory limitations upon the U.S. Department of Agriculture. The greatest effect is in this upstream location, and diminishes downstream through the urbanized areas.

Flooding occurred throughout the Phillippi Basin in the late Fifties and early Sixties. The worst damage occurred in the Oak Shores area at the head of Phillippi Creek itself, where many houses were under five to six feet of water. We have indicated four points on Exhibit B and have estimated a reduction in flow which would relate to flooding for these points. The computation is based on the criteria used in our work prepared for Sarasota County. The percent reductions would be approximately as follows:

<u>Point</u>	<u>Percent Reduction in Flow</u>
Farm Area	27
Cattlemen Road	9
McIntosh Road	8
Oak Shores	7

2. B. *"To significantly reduce flooding in the Phillippi Creek Basin, what size pumping station would be required?"*

Any major flow reduction would provide significant flood relief within the context of the disastrous 1962 storm, but to really alleviate the threat as much of a reduction as 5,000 cubic feet per second might be required. Directing this large flow (or anything like it) to Cow Pen Slough would greatly aggravate the problems in that basin and ultimately in Dona Bay. A pumping station to handle 5,000 CFS would be very costly to build and operate, with a capacity of about seven times the existing unused one.

In the light of existing conditions, any pumping plans should be considered only within the context of impoundment to attenuate the channel flow rate. The Mote report emphasizes the pollutant problem attendant to flood water from agricultural areas, and impoundment might provide an opportunity for simultaneous pollution abatement.

3. A. *"Discuss a possible operation plan that could be established with the existing structures (if all three were in working order) to reduce storm water impacts to Dona Bay."*

Putting the existing structures in good working order would be a constructive step which probably should be undertaken. However, in order to reduce storm water impacts on Dona Bay, far more storage than the channel affords would be needed. Such storage might be provided by allowing temporary flooding of low-lying adjacent lands. The original project plan called for "no-spoil" openings in the dikes for the purpose, based on the principle that agricultural lands usually can stand submergence for short periods. It is our understanding that the system has not been operating in this manner.

Impacts due to silting need other measures, especially stabilizing of channel cross sections. It has been clearly established that pollution and floating weed materials must also be considered.

3. B. *"Discuss possible additional protection that could be obtained if some optimum number of structures were added to the system. (Optimum number based on your knowledge of the subject.)"*

Additional structures would add some wedge storage between structures, but the corresponding reduction in storm runoff rates would probably not justify the cost of construction and the operation and maintenance program. Storage capacity within the channel is just too limited to begin with and the relief potential of the project would lie in allowing adjacent low-lying lands to flood temporarily, as noted above. An "optimum number of structures" cannot be determined under present conditions and is probably academic under the circumstances.

Conclusions

The questions posed by your August 31, 1979 letter are a logical outgrowth of the underlying concerns that have developed over the years. Phillippi Creek's flooding problem has made itself painfully evident in the past, and with few measures for relief, large flood-prone areas will be facing disaster when the weather cycle returns to seasons of heavy rainfall. The basin drained by Cow Pen Slough, on the other hand, is suffering from problems at the Dona Bay outlet, which have worsened due to incomplete project construction. During the years that have elapsed there have been changes not only in the landscape by development and other factors, but perceptions of environmental effects have led to public policy changes involving modified or new approaches.

Having had the opportunity to make this overview under the stimulus of your questions, we have developed the following conclusions which we think are pertinent to the concerns behind them.

- I. Past information and reports are so outdated that they cannot be applied quantitatively to decisions that need to be made for solving the complex and inter-related problems that have been inherited. There exist a lot of sound material

and elements of some of the measures to be taken, which would be helpful for an update. For example, the intensive studies of Phillippi Creek (which remain useful in many ways) allowed for future accelerated runoff resulting from full urbanization. However, subsequent public policy has required attenuation of the rate from new subdivisions.

- II. The flooding of one basin cannot properly be alleviated by transferring excess water to a contiguous basin, if that transfer will aggravate an already overburdened condition in the receiving basin. Activating the existing pumping station in the upper Phillippi Creek Basin would be of insufficient help to the flooding downstream and would add pollutants as well as more water to Cow Pen Slough. Conceivably impoundment in the upper basin of Cow Pen Slough might be used for both aspects, but this concept would need detailed study as only one possibility among a number deserving investigation.
- III. We believe that an updated review of the Phillippi Creek Basin will confirm that its carrying capacity must be increased to the maximum allowed by environmental limitations, for a solution to flooding within economic reason. Essentially, this would mean deepening the channel within its banks and not altering the natural alignment, except possibly in localized situations.
- IV. Impoundment and modifying basin features are not new ideas. The original work for the Sarasota-Fruitville Drainage District incorporated impoundment areas, and the natural boundary of the basin was further to the east, the present "ridge" being a dike that was built half a century ago. Impoundment of low-lying lands was intended to alleviate downstream flooding by Cow Pen Slough. In fact, the main new concern is for environmental effects arising from pollution, siltation and aquatic growths. The leaders of the past were not faced with the population concentrations and other problems brought about in recent times. Impoundment-related measures are the most fruitful, economical approaches to the environmental considerations.

Open land in the lower reaches of Phillippi Creek is not available for impoundment. Impoundment opportunities should be considered elsewhere in the basin, including a fresh look at the concepts covered by our 1966 report on a "Pumped Impoundment System", which would be hampered by subsequent development and higher costs.

The Cow Pen Slough Basin appears to have good potential for impoundment, both upstream and downstream. Transfer of some flood water from the Phillippi Creek Basin could be considered if upstream impoundment were particularly favorable.

- V. A comprehensive study should cover both basins simultaneously, because of their existing interrelationship and potential changes. The areas affected are both overdue for solutions, or at least a rational plan of action for orderly implementation.

Compartmentalized outlooks should be avoided. Because of federal statutes and policies, the Corps of Engineers could not address itself to agricultural aspects, and the Soil Conservation Service had to focus almost exclusively on agricultural aspects.

October 25, 1979

Prior reports revealed the disadvantages of this division. This is not to say that the same criteria should apply to urban and agricultural areas. On the contrary, the differences should be recognized. The point is that there are effects of one on the other that need to be accounted for in an overall program.

- VI. Although we have observed that the Cow Pen Slough project structures are not the answer to the current problems, we believe that the project is due for a careful, updated analysis. Improvements are needed. Beyond the structures themselves, an example is a crying need to stabilize banks to greatly reduce siltation. Furthermore, the operating processes of the project need to be looked into carefully. If the originally planned relief by impoundment has been found to be impracticable, it should be recognized, especially in the light of the impoundment study suggested above.
- VII. Whatever other measures are ultimately employed, it should be economically feasible to provide sand traps in the channels so that siltation would be controlled where it can be readily removed. For example, this step could be readily taken in Main A (above the head of Phillippi Creek) and above Dona Bay. Possibly aquatic weed trapping could also be incorporated.
- VIII. Any studies should be in collaboration with qualified environmental specialists. Affordable programs undoubtedly will require some compromises which can best be pointed to by mutual input from the start. Dona Bay would not only be affected by opening the channel but by what happens all the way upstream, including the impoundment features.

We trust that this report will serve your present purpose. We should be pleased to discuss it further if you should so desire.

Yours very truly,

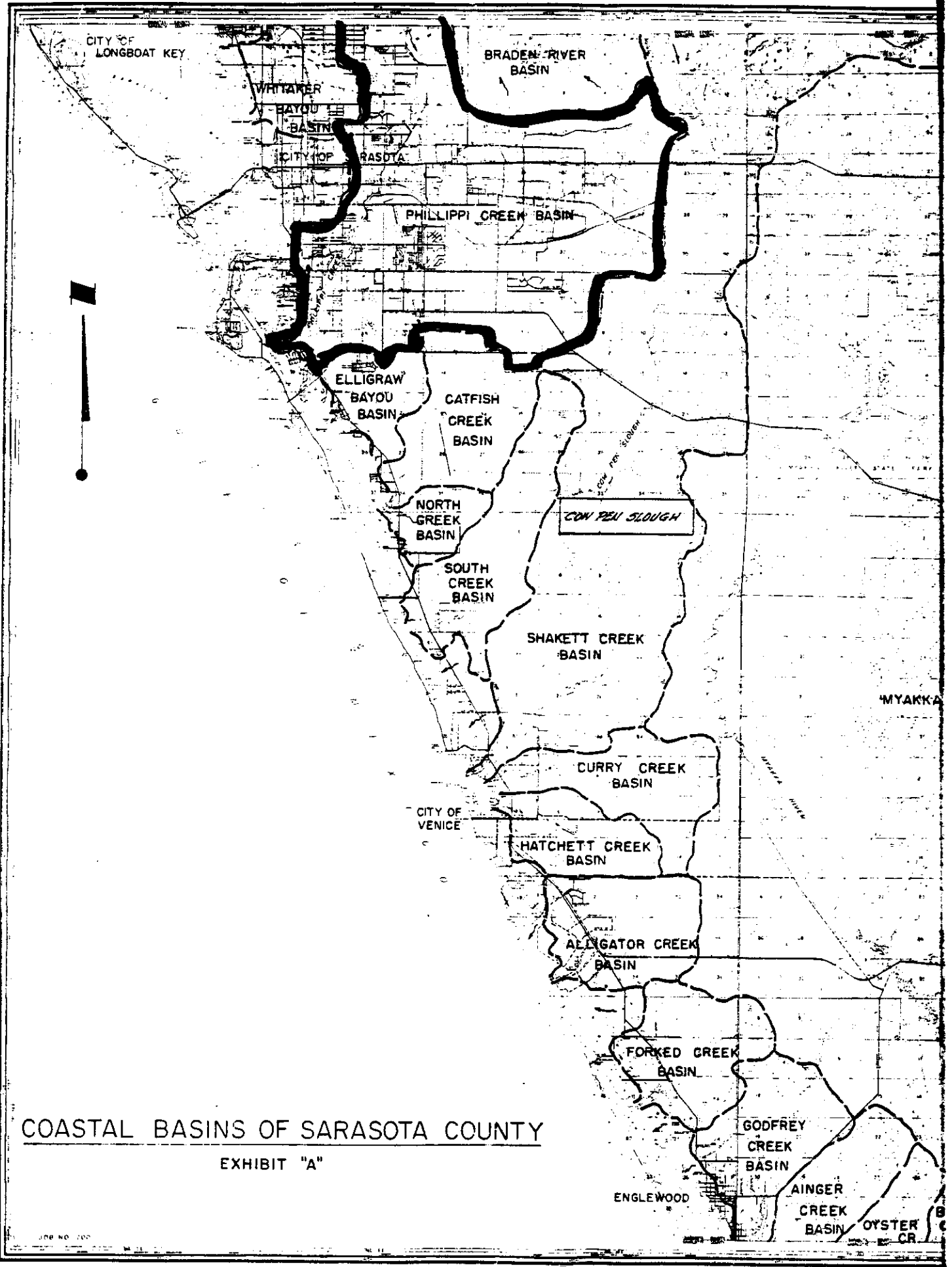


Donald J. Smally, P.E.

For: THE JOINT VENTURE ENGINEERS

DJS:ba

Attachments



COASTAL BASINS OF SARASOTA COUNTY
EXHIBIT "A"







MANATEE COUNTY
SARASOTA COUNTY

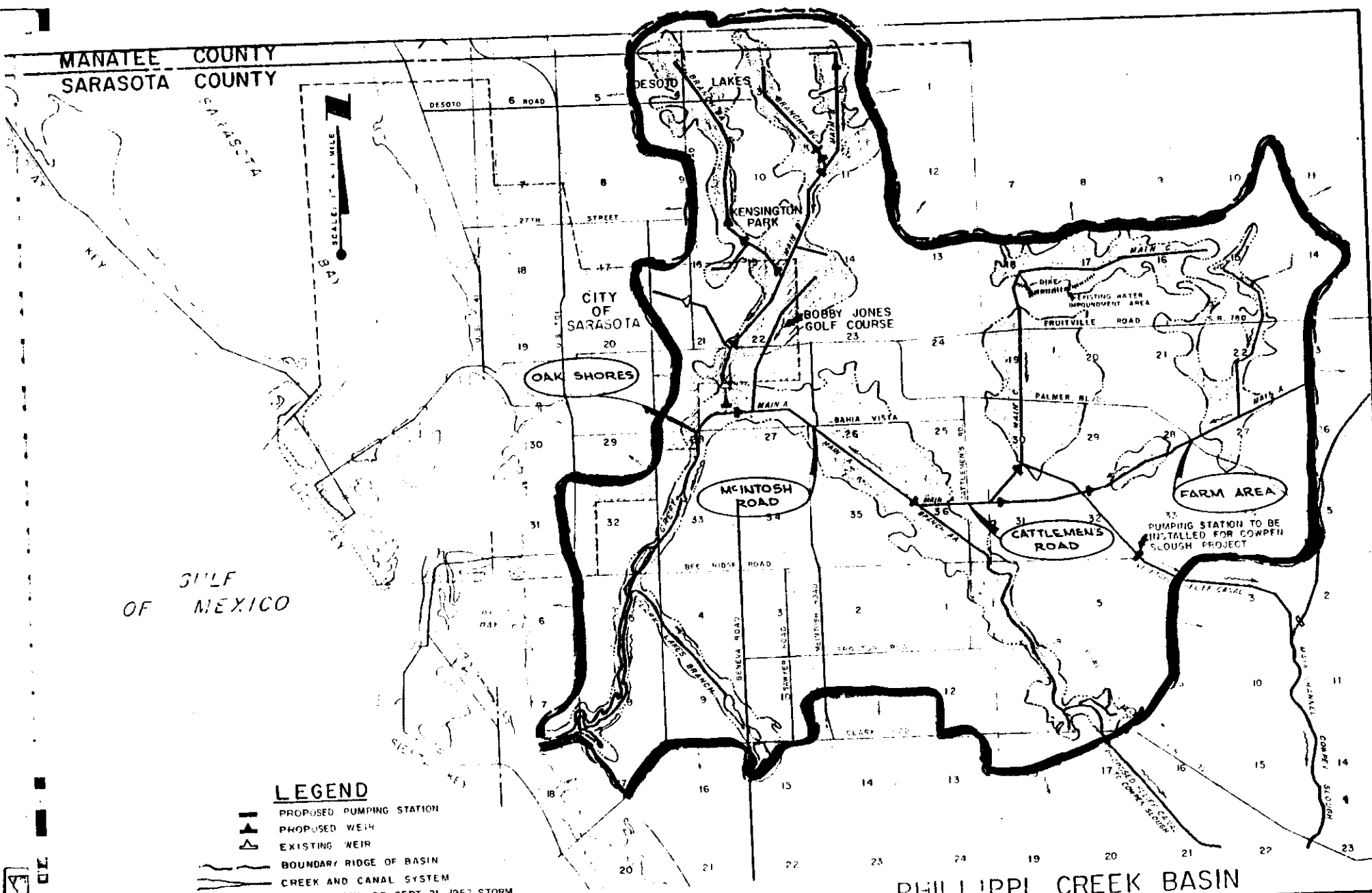
SARASOTA

SCALE: 1" = 1 MILE

S'LF
OF MEXICO

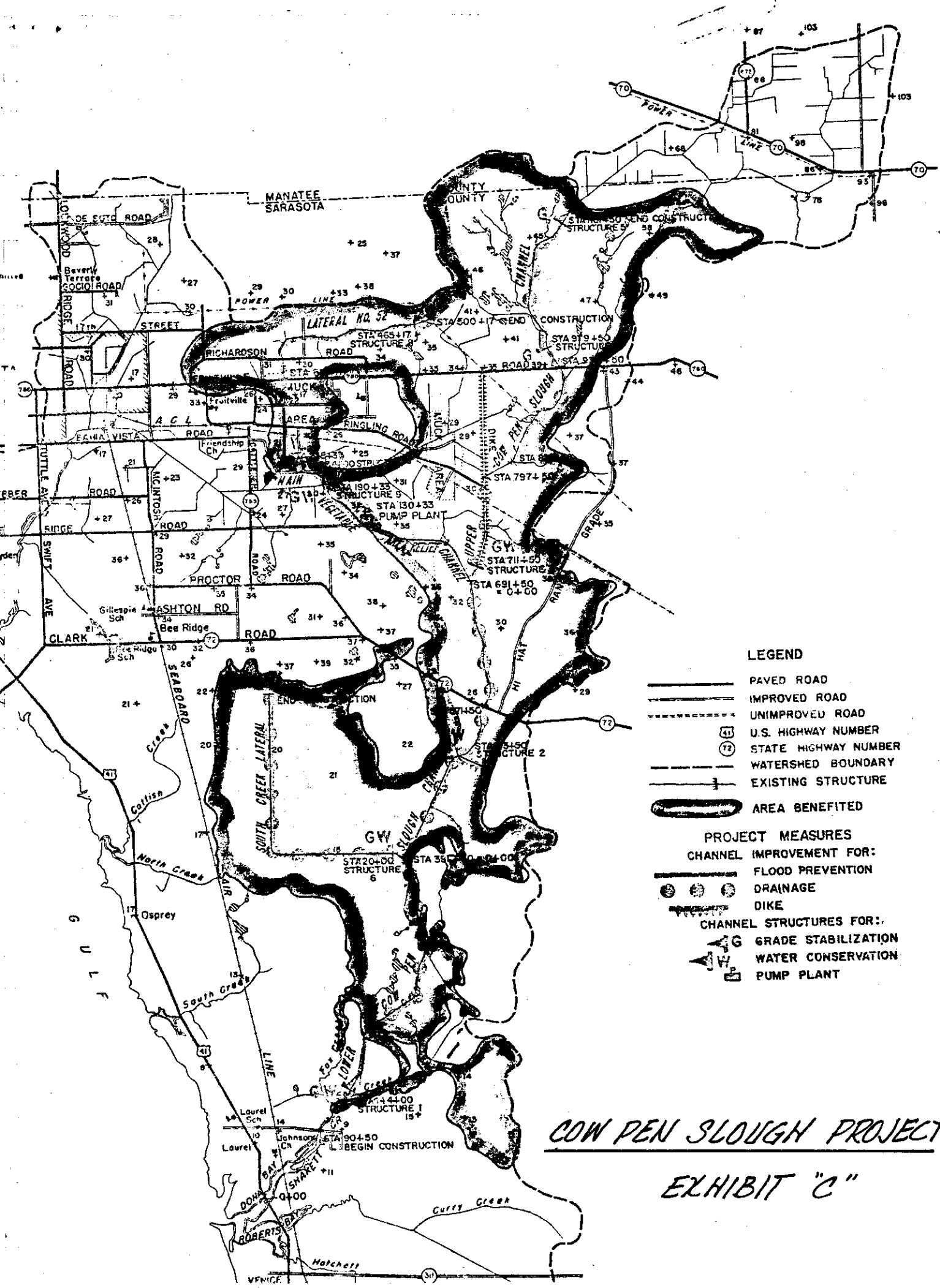
LEGEND

-  PROPOSED PUMPING STATION
-  PROPOSED WEIR
-  EXISTING WEIR
-  BOUNDARY RIDGE OF BASIN
-  CREEK AND CANAL SYSTEM
-  FLOOD PLAIN OF SEPT 21, 1962 STORM (MAJOR AREAS)



PHILIPPI CREEK BASIN

EXHIBIT "B"



LEGEND

- PAVED ROAD
 - IMPROVED ROAD
 - - - - - UNIMPROVED ROAD
 - (41) U.S. HIGHWAY NUMBER
 - (72) STATE HIGHWAY NUMBER
 - - - - - WATERSHED BOUNDARY
 - +— EXISTING STRUCTURE
 - AREA BENEFITED
- PROJECT MEASURES**
- CHANNEL IMPROVEMENT FOR:
- FLOOD PREVENTION
 - ○ ○ DRAINAGE
 - ▬ DIKE
- CHANNEL STRUCTURES FOR:
- G GRADE STABILIZATION
 - W WATER CONSERVATION
 - P PUMP PLANT

COW PEN SLOUGH PROJECT
 EXHIBIT "C"