METROPOLITAN DADE COUNTY · FLORIDA

EIGHTH FLOOR – JUSTICE BUILDING
1351 NW 12TH STREET
MIAMI, FLORIDA 33125
TEL. 377-7901

PUBLIC WORKS DEPARTMENT

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EFFECTS OF C-111 ON SALT WATER ENCROACHMENT
INCLUDING COMMENTS ON USGS REPORT OF JULY 65

By F. D. R. Park
Water Control Engineer

The USGS report does not indicate how much additional salt water encroachment may result or how far the effects would extend upstream--it is not even clear from the report whether any appreciable part of the National Park would be seriously affected even though the report was prepared at the request of the National Park.

The statement at the bottom of Page 7 concerning the setting of the Salt Barrier Line and the participation by County officials in this matter indicates that we assumed that storm inundations would contaminate underlying sections of the aquifer regardless of other control measures. This presumption is only partially correct because we also definitely felt at the time that there was fresh water near the surface in much of the area and that there would continue to be fresh water in such areas after construction of C-111. It was also felt that the increased drainage below the proposed salt structure would make the area somewhat saltier and that there would be some worsening of salt in the soil in that area. However, the primary intent then was to avoid worsening water supply

conditions in the vicinity of the Key West well field rather than to prevent any deterioration of the soil conditions in an area which we felt could not be feasibly developed in any reasonable future time. This area is not a part of the National Park; it is not useable land today; and the benefits to be provided for lands to the north and west warrant a possible deterioration of some of these lands from an economic standpoint. These facts, together with the thought that the new channel would bring additional fresh water through the area during the summer and fall months of heavy rains thereby flush out surface salt and help restore the balance of fresh versus salt water and offset to a considerable extent the overdrainage which may occur in drier times, were given full consideration at the time we set the Salt Barrier Line and when we agreed to the present alignment of the south part of the so-called L-31.

The USGS in 1961-63 apparently found the salt front (1000 ppm at depth) about four miles farther bayward than indicated by the data furnished us when we set the Salt Barrier Line, the difference being indicated on their Plates 1 and 4. Actually, the older salt front designated in 1951 on their Plate was published by USGS as late as 1957 in their Information Circular No. 9 and perhaps elsewhere. Their latest line, of course, indicates <u>improvement</u> in that the line appears to have moved a considerable distance bayward in the last 5-10 years; and this applies northeast from U. S. Highway 1 and Card Sound Road as well as westward of U. S. Highway 1.

It is difficult to understand the major fast change indicated in the salt front, but the County's Salt Barrier Line was established

in cooperation with the USGS at a distance relative to the 1951-57 salt front line that was considered adequate to prevent any appreciable westward movement of that front--actually we were still using the '51 salt front as late as 1960. This principle, of course, would provide adequate protection for the Key West well field which is some three miles west of the old salt front. It is true, of course, that if the old salt front west of U. S. Highway 1 had been projected only tentatively and was considerably in error, and data for establishing the new line had been available at the time, we would have set the salt front farther bayward; but, nevertheless, the Key West well field and water supply areas given prime consideration at the time are not endangered by the present Salt Barrier Line, because the salt front now lying bayward of the Barrier Line would have to move 4 or 5 miles inland before it would be at the position of the old salt front on which the Barrier Line was based. Such condition would not happen, of course, with S-18C holding fresh water in C-111 within one mile of the new salt front; therefore, we do not feel that the Key West water supply is an item of real concern in this situation, but rather the concern is entirely one expressed for the National Park.

It is not proposed by the County to construct any secondary canal running west from the point in C-111 in the general vicinity of S-18C. Whether Aerojet constructs such canal is entirely up to them as owners and developers of the land, and their proposed channel would not be prohibited by the County because it would lie outside of the legal Barrier Line. Such canal may or may not be built.

The present Salt Barrier Line and line of dams proposed by the Corps of Engineers is the best line (farthest south) that we could obtain from our earlier discussions and arguments with the Corps of Engineers and Flood Control District. In this connection we had originally established the south line of L-31 along the National Park boundary; the Corps of Engineers had proposed a line 2½ miles north of the present line of dams known as L-31; and it was only after considerable efforts on the part of the County that we were able to obtain the final line as a compromise, whereby the Corps of Engineers moved their line of dams 2½ miles south. In view of these facts we feel that the County has: (1) provided for the best possible compromise arrangement in providing for drainage of lands to the north and west despite some deterioration of lands outside the Barrier Line, (2) provided adequate safeguard for the Key West water supply, and (3) assisted in planning to provide additional fresh water for the National Park and to sufficiently safeguard against actual salt water encroachment up the new channels.

In this last connection it should be pointed out that the additional fresh water to be delivered directly into the Park is an offsetting factor to any added salt water encroachment because the fresh water would filter down into the Park area northward of the Salt Barrier Line (extension) and actually would help combat salt water encroachment along and south of the Barrier Line simply because more fresh water would be delivered into that area than previously; also the additional flood waters conveyed through C-111 even downstream of S-18C are going to flood the land south of the Salt Barrier Line frequently, therefore, combating and offsetting salt water encroachment during drier periods. It is possible that

for periods of several years this would be adequate to offset any additional salt water encroachment. The USGS report fails to show that any effective means can be taken to actually prevent salt water encroachment other than adding a supply of fresh water; and to some extent this is being done.

Both from the standpoint of the National Park's concern, and from the standpoint of the possible future use of the land south of the Salt Barrier Line, we feel that even if the situation should deteriorate, means could be then be taken to improve it; that is, additional conservation measures could be added if and when found necessary. In the meantime the program has developed too far to provide any drastic alteration of the present plan to let C-111 flow freely south of the Salt Barrier Line, because of the resulting inability of the channel to drain lands north and west which depend on westward flow in tributary Canals C-102, 103 and so forth. In fact as we understand the design of C-111, the lower end of the channel is already inadequate in the amount of about 1200 cfs for peak runoff.

The present and future land use maps show the need for draining these lands as far north as the Black Creek basin, especially the existing land use map makes clear the agricultural use of areas drained by the west ends of Canals 102 and 103. In view of the above considerations it would seem that the only provisions which could prevent any appreciable amount of salt water encroachment between the bay and S-18C would be an extremely expensive structure which would have to provide a lock for navigation because the bascule bridge is being built for navigation and because provisions

have been made all along for this canal to serve navigation needs. It does not seem possible that anyone could justify expenditures of that kind; and it would seem extremely doubtful that any kind of structure such as a submerged weir or a fabridam could be justified because such structures would be only partially effective at best and would cost considerable sums of money. There would be time enough to consider such structures once it could be proved that appreciable damage was occurring because of lack of them.

Salt water encroachment, of course, may affect an area in two ways: (1) by contaminating the topsoil, and (2) by gradually increasing the salt content of water supplies in the water table. It would seem logical that the ecology of the Everglades would be affected most by conditions in the topsoil and in the shallow area near the surface. If this be true, then a considerable portion of the argument concerning contamination of the water table under the surface is of little value in considering the "ecology problems". Unless the soil becomes contaminated repeatedly, and the rainfall or incoming fresh water flow is inadequate to leach out the topsoil contamination, there should be no new soil problems created by drainage canals. In fact, if contamination occurs, drainage is necessary to provide a better leaching action.

The experience in agricultural lands, according to M. H. Gallatin in a report to the Corps of Engineers of 1958, is as follows: "On the whole, normal rainfall occurring during the spring and summer would leach out the concentration, provided runoff and drainage were adequate."...."So far as the amount of water that would

leach out the salts,....on normal contaminated farm land 8-10,000 ppm, 10 to 12 inches of rain occurring in heavy rains would leach out the concentration. Where the concentration approached that of sea water, it would take a good bit more."...."If it can be so-worked out during the summer months, flooding of the low-lying areas should help leach out the concentration that might build up during the drier portion of the year."

In Mr. Gallatin's report it is further emphatically stated that the land can be farmed down to within one foot of mean sea level in areas where there is drainage and leaching out of salt water during normal to heavy rains. In view of this fact the Park lands which lie a considerable distance to the west and south of C-111 may hardly be affected by C-111 insofar as the upper soil conditions are concerned.

The canal does not lie within the Park area and it is only the lands adjacent to the canal that would feel the major effect from overflow of salt water, and even in those areas the salt would leach out by rainfall and damage may not be permanent or lasting--depending, of course, on the timing and amount of rainfall. It is felt that very careful attention must be given to basic assumptions when attempts are made to evaluate the effects of C-111 on the topsoil in the Everglades National Park, because agricultural experience indicates that it may have little effect. Considerable work has been done by John Campbell, Agricultural Agent, and his staff in efforts to show the recovery from effects of inundation by Hurricane Betsy, Sept. 1965, (see map of salt front and soil before and after hurricane--the 1000 ppm line following generally the line of L-31) on the East Glades farm lands. I do not know

now the exact story or final results, but it seems that they should be studied closely before conclusions are drawn that the ecology of the Everglades Park would be ruined by leaving C-111 open at U. S. Highway 1. The farm lands, incidentally, have the additional adverse effects of fertilizer accumulations of salts, a factor which, of course, does not apply to the soils of the Everglades Park. Some discussion on salt in the soil seems necessary because we feel that probably too much attention is being given to accumulation of higher salinities underground which actually may never affect the ecology of the Everglades.