

SUMMARY OF CONCLUSIONS

of Report on

Hydrogeology and Effects of  
Pumping from Castle Hayne Aquifer System  
Beaufort County, North Carolina

Prepared for

North Carolina Board of Water and Air Resources

Texas Gulf Sulphur Company

North Carolina Phosphate Corporation

By

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September 1971

This Summary Prepared by  
North Carolina Department of Water and Air Resources

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## FOREWORD

During the period August 1970-September 1971, an investigation was conducted and a report prepared on the Castle Hayne aquifer system and the effects of pumping Castle Hayne wells in Beaufort County. The need for the study was brought about by the pumping at the Texas Gulf Sulphur Company Lee Creek Mine which began in 1965, and the prospect of additional pumping by North Carolina Phosphate Corporation and others in the foreseeable future.

The purpose of the study was to determine the effects of pumping to date on the availability and quality of the ground water in the area and to project the effects of possible future pumping of varying amounts.

The study included (1) compilation of all available facts on the ground-water geology and hydrology of the area; (2) evaluation, plotting, and analysis of these data; (3) determination of the effects of TGS pumping between 1965 and 1970 on water levels in wells and water quality; and (4) projection of the effects of three different possible systems of pumping in the future.

The organizations which sponsored this investigation and report are the North Carolina Board of Water and Air Resources, the Texas Gulf Sulphur Company, and the North Carolina Phosphate Corporation. Persons who represented them are:

North Carolina Board of Water and Air Resources

Ground Water Division, North Carolina Department of Water  
and Air Resources

Harry M. Peek, Chief  
Perry F. Nelson, Assistant Chief

William F. Guyton & Associates, Consulting Ground-Water  
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Harshbarger and Associates, Consultants in Hydrogeology,  
Tucson, Arizona

John W. Harshbarger  
William J. Gamus

William C. Walton, Consulting Ground-Water Hydrologist,  
Minneapolis, Minnesota

These persons were authorized to make as thorough and factual a technical investigation as practicable based on presently available information, and to present the results and conclusions in a report. No other instructions were given, and no effort was made by the management of any of the sponsoring organizations to influence the scope of the study or the conclusions reached.

The report which has been submitted by the authors consists of 52 pages of text and 69 illustrations. The illustrations are approximately 34 by 36 inches in size. In addition, supplemental material has been submitted, consisting of well records, geologic data and well-location maps.

The full report and all the supplemental material are on file in the office of North Carolina Department of Water and Air Resources at Raleigh and are available for public inspection. The report has not been printed for widespread distribution because of its size; however, the Summary of Principal Conclusions is presented here along with reduced and generalized copies of the pertinent illustrations. In addition, a map showing known locations of Castle Hayne water-supply wells and a map and cross-section showing the position and thickness of the Castle Hayne aquifer are included for reference (Figs. 23, 14, and 3).



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George E. Pickett, Director  
North Carolina Department of  
Water and Air Resources  
September 1971

SUMMARY OF PRINCIPAL CONCLUSIONS

The principal conclusions of this report are given by Figures 27, 31, 40, 41, and 52 to 68.

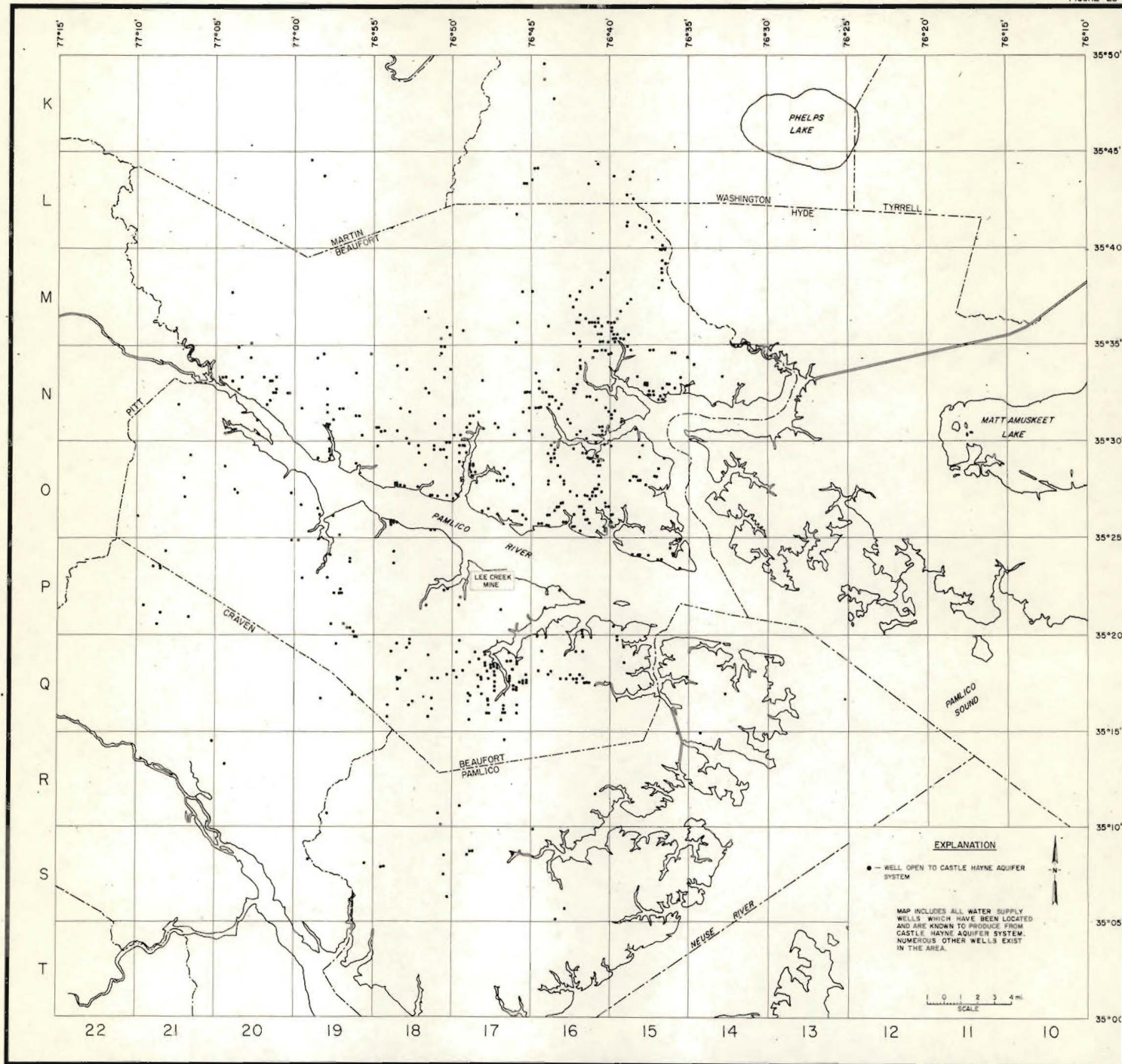
Figure 27 shows the position of the piezometric surface for the Castle Hayne aquifer in 1965 prior to pumping by TGS. Figure 31 shows the position of the piezometric surface in mid-1970. The difference between these two positions represents the effect of the TGS pumping to date and essentially all the effect it will ever have on the piezometric surface if pumping is continued at the present rate.

Figure 40 gives the chloride content in the water of the upper Castle Hayne prior to TGS pumping, and Figure 41 shows the chloride content in 1970. Figures 52, 53, 54, 55 and 56 show the projected chloride content for the next 20 to 100 years if pumping is continued at the present rate. The changes indicated by these illustrations represent the effects of continuing to pump the TGS wells.

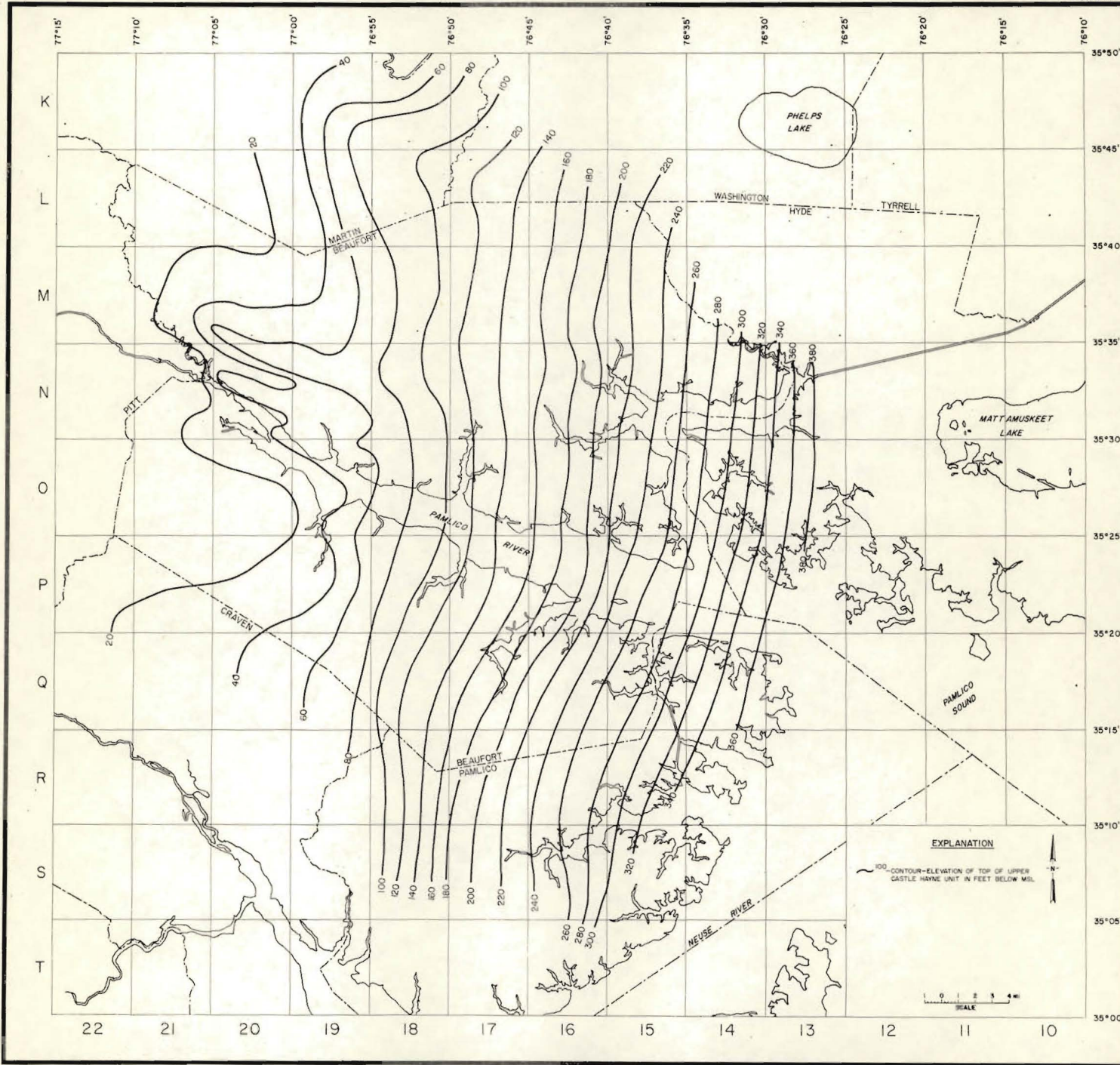
Figures 57, 58, 59, 60, 61 and 62 show the projections of the piezometric surface and chloride content in the water of the upper Castle Hayne if the present operation at Lee Creek is continued and a new development is made by NCP.

Figures 63, 64, 65, 66, 67 and 68 show the projections of the piezometric surface and the chloride content in the water of the upper Castle Hayne if a third center of pumping is developed.

Total pumpage considered in these three sets of projections are 52 mgd, 80 mgd, and 107 mgd.

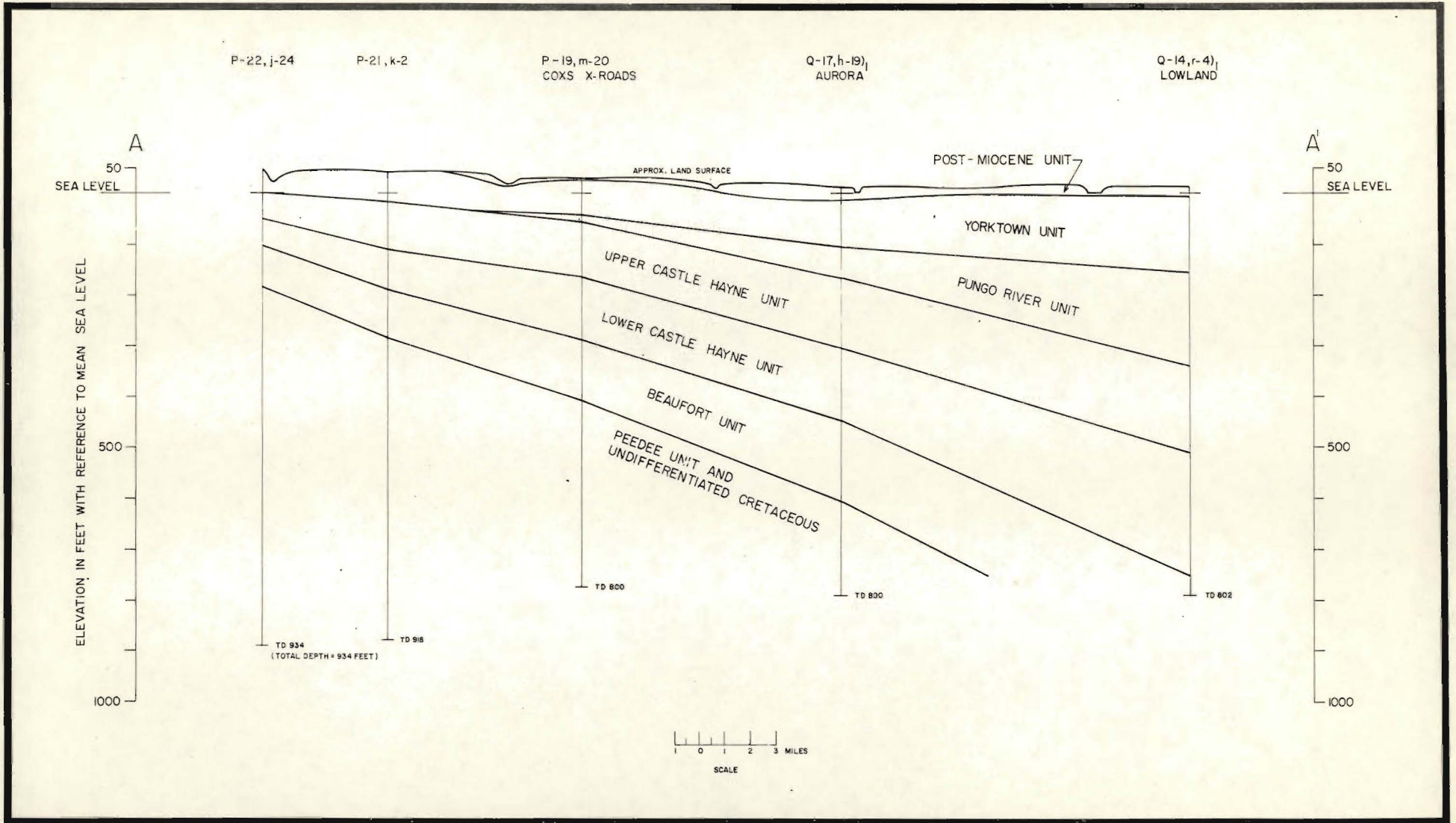


WATER USE MAP, CASTLE HAYNE AQUIFER SYSTEM

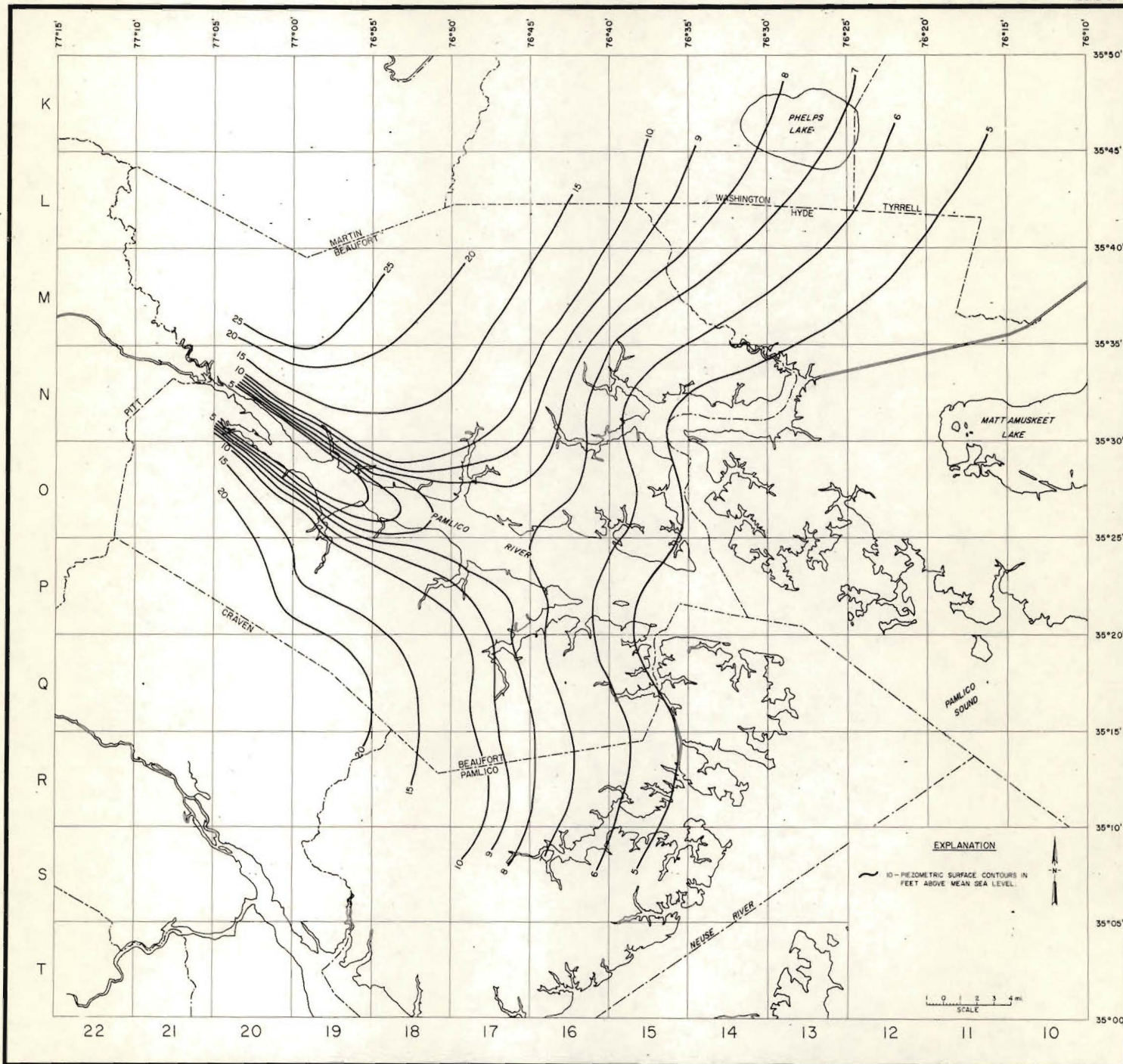


TOP OF UPPER CASTLE HAYNE UNIT

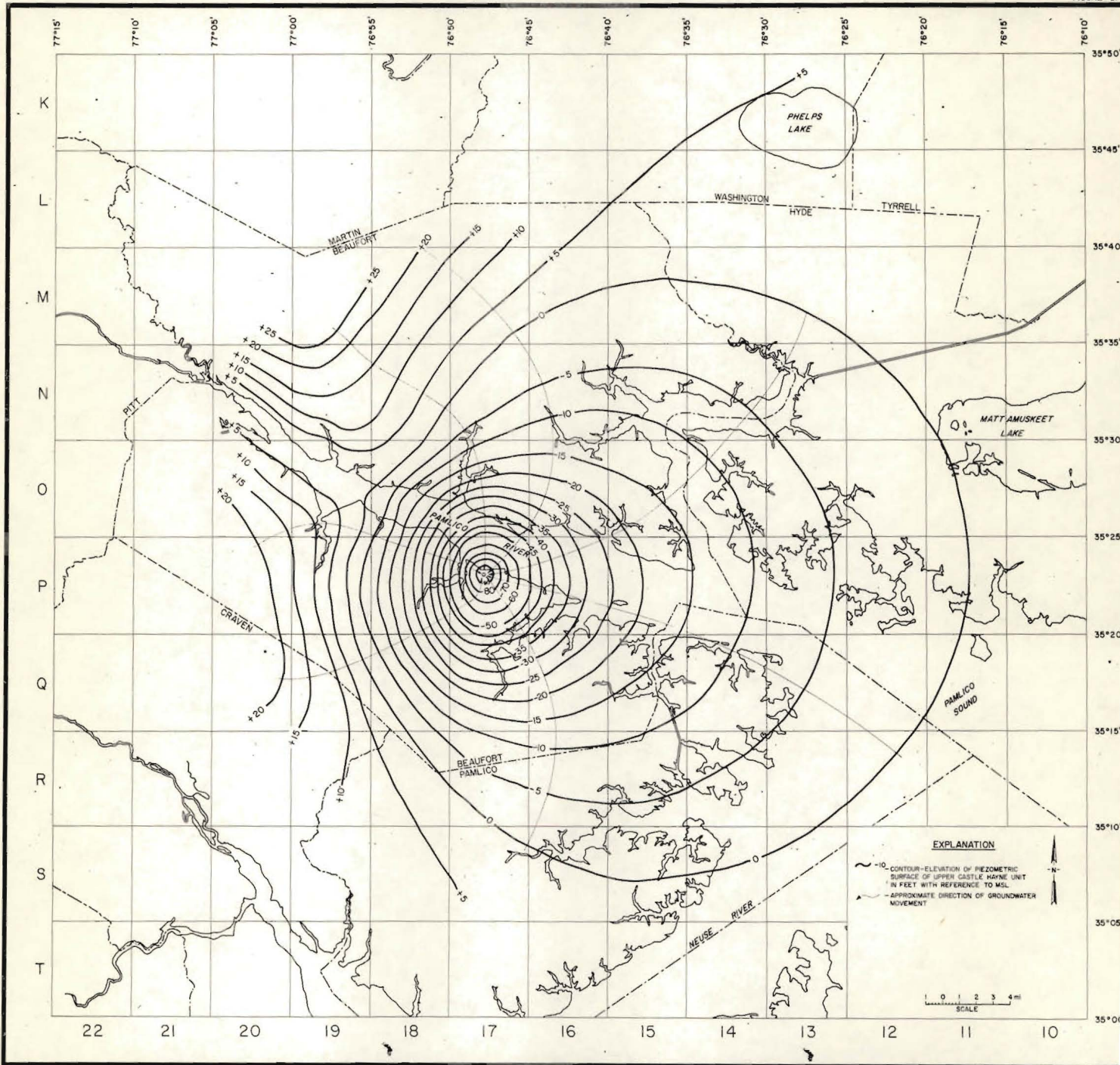




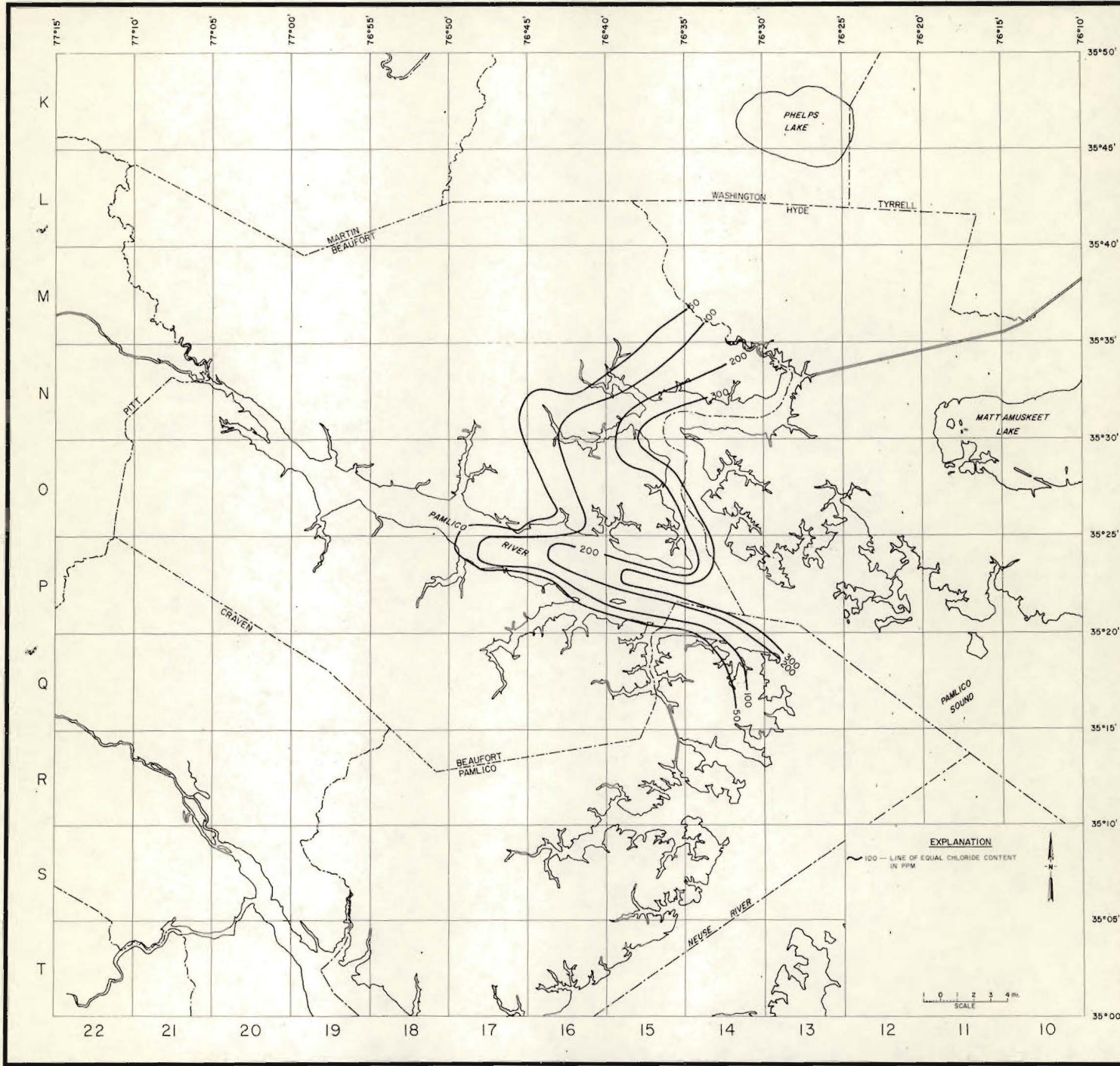
CROSS-SECTION A-A'



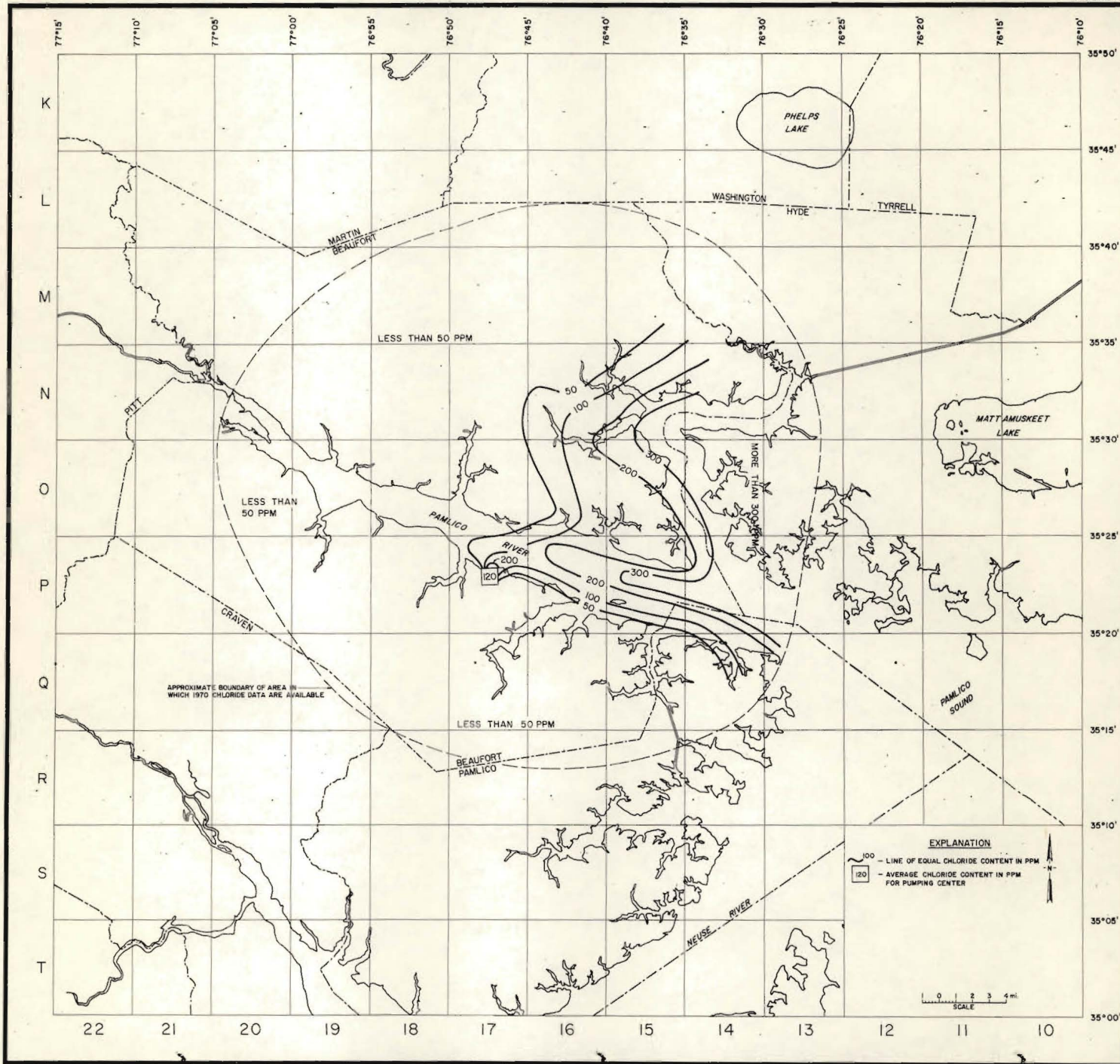
UPPER CASTLE HAYNE UNIT PIEZOMETRIC SURFACE PRIOR TO JUNE 16, 1965



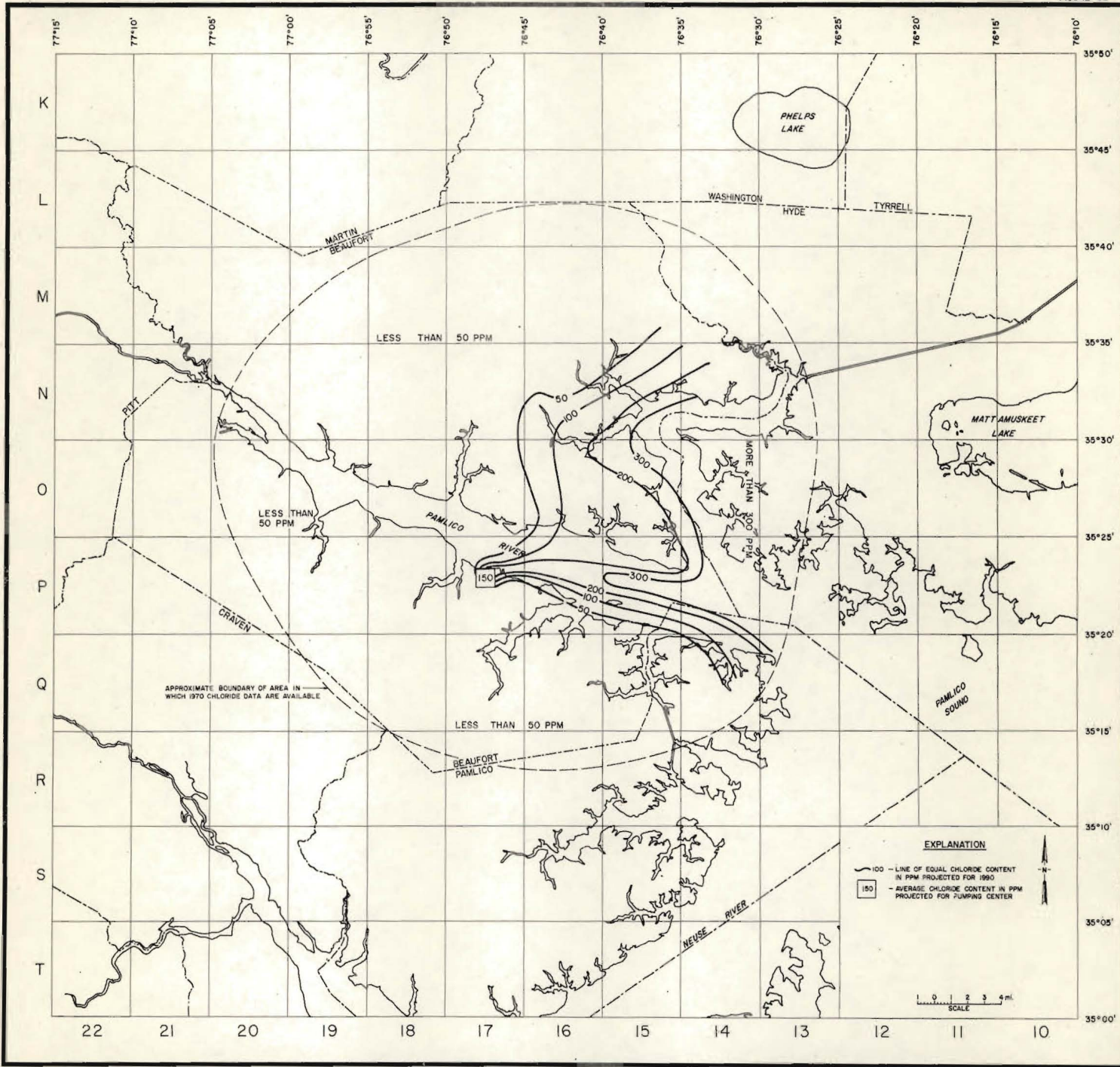
UPPER CASTLE HAYNE UNIT PIEZOMETRIC SURFACE JULY, 1970



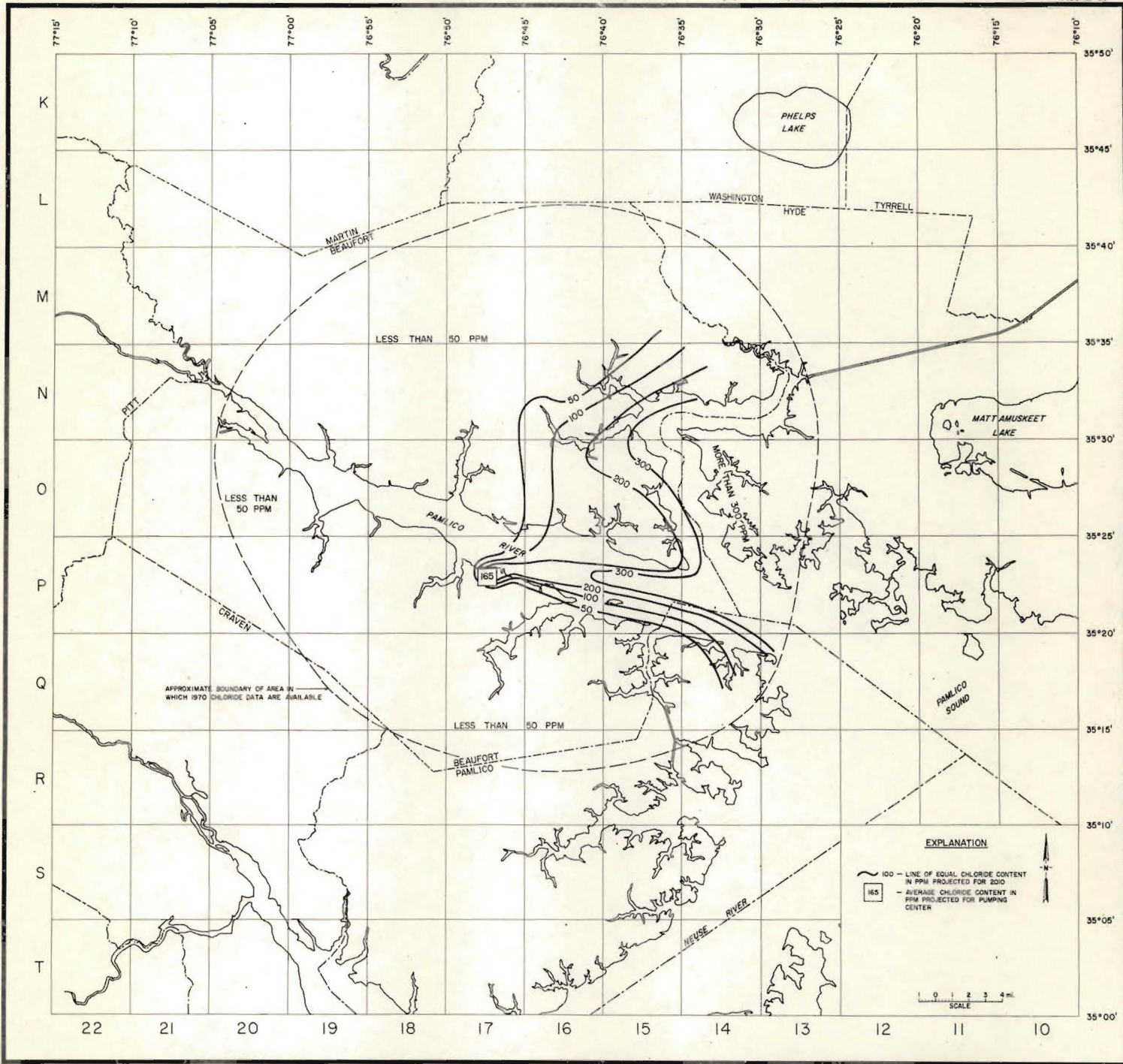
UPPER CASTLE HAYNE UNIT CHLORIDE CONTENT PRIOR TO 1967



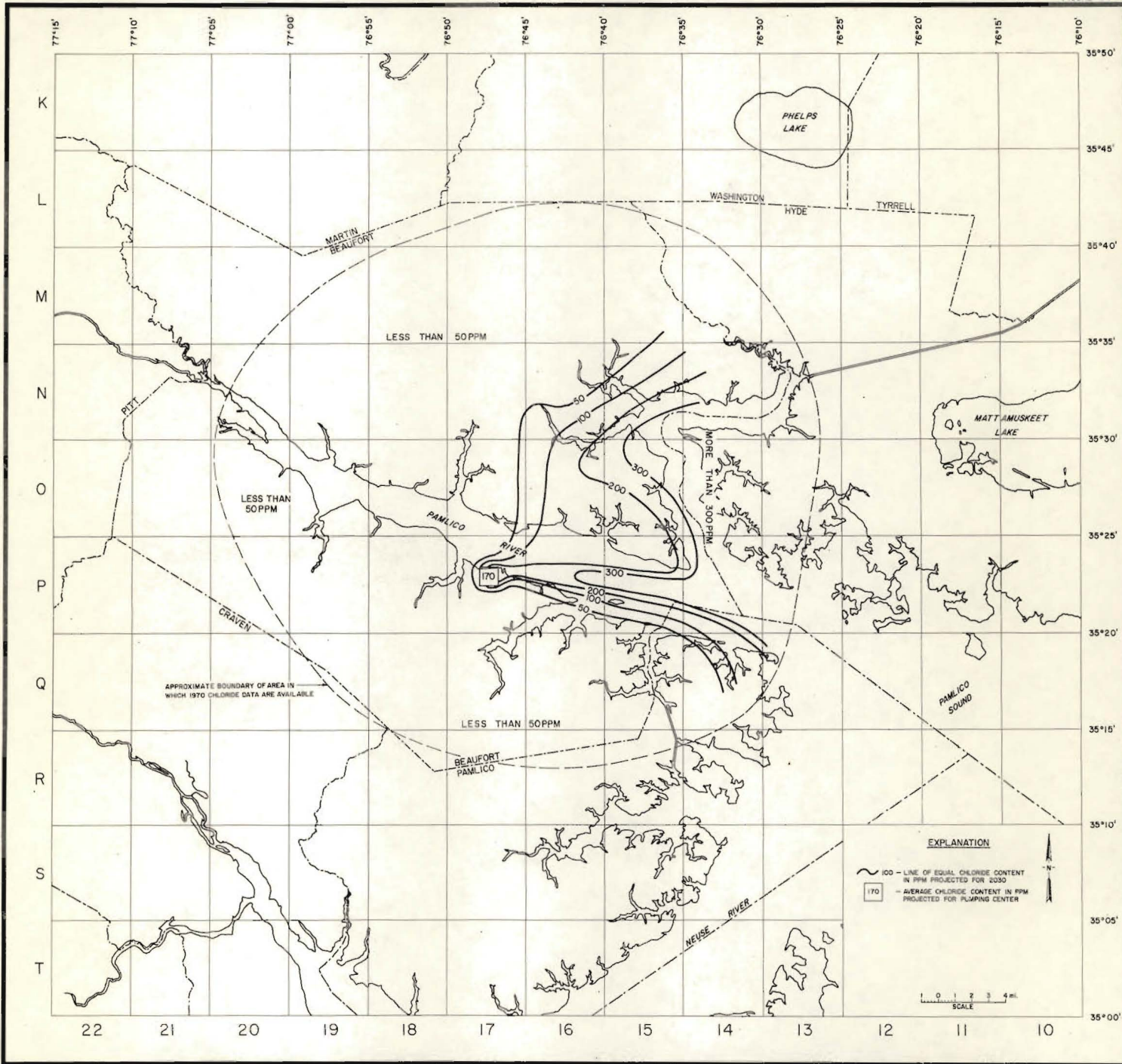
UPPER CASTLE HAYNE UNIT CHLORIDE CONTENT IN 1970



PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR ONE PUMPING CENTER FOR 1990

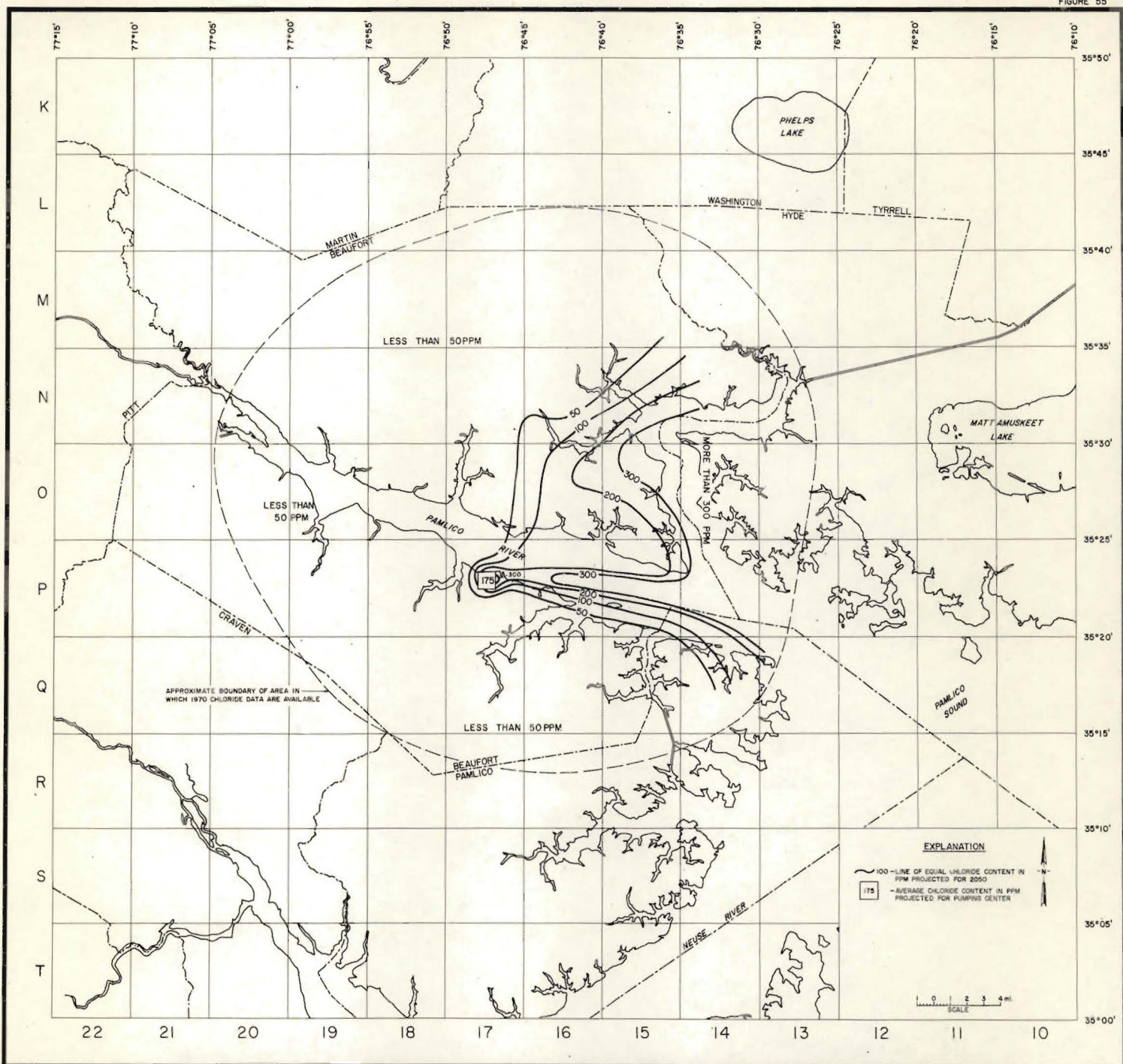


PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR ONE PUMPING CENTER FOR 2010

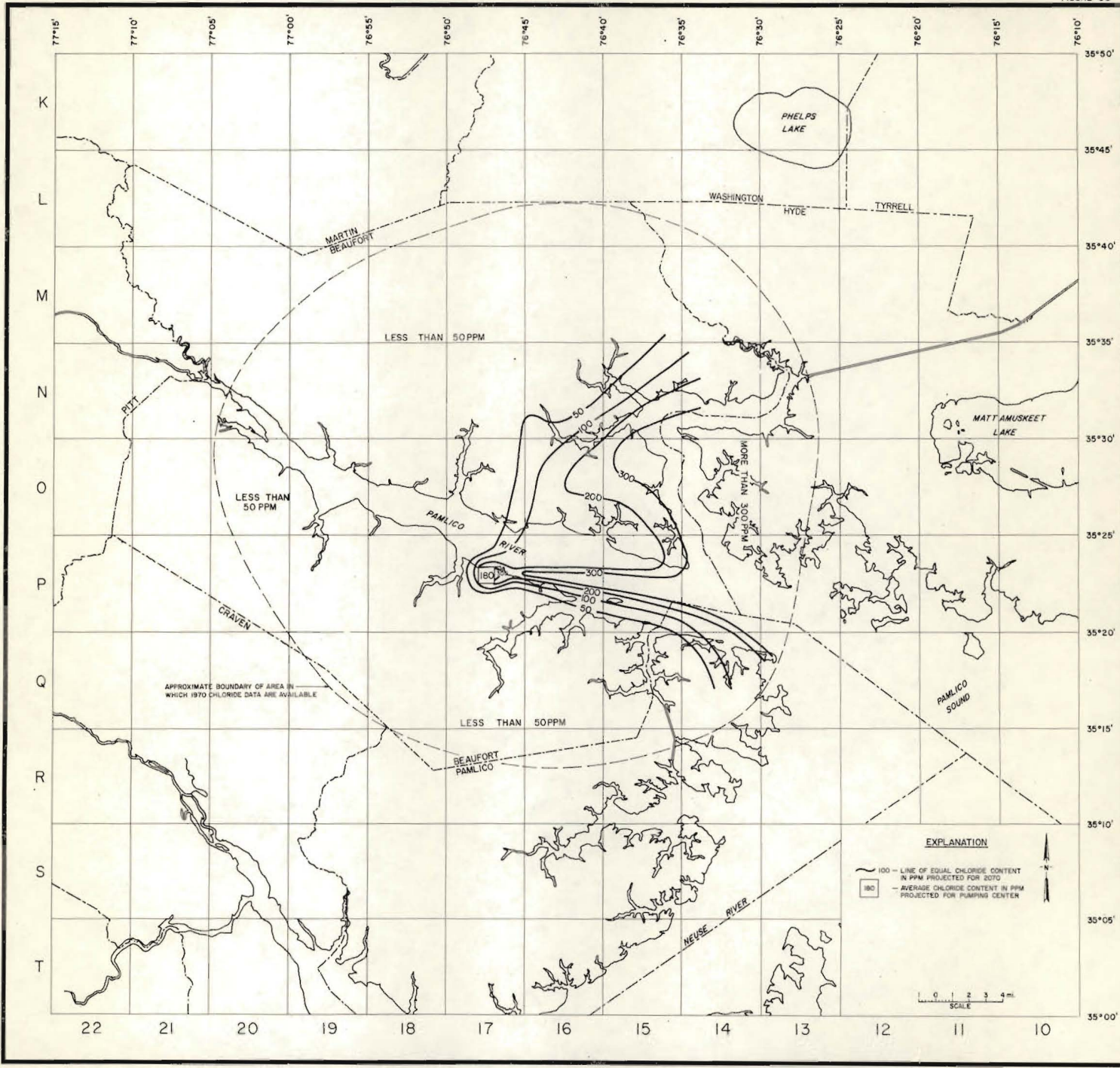


PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR ONE PUMPING CENTER FOR 2030

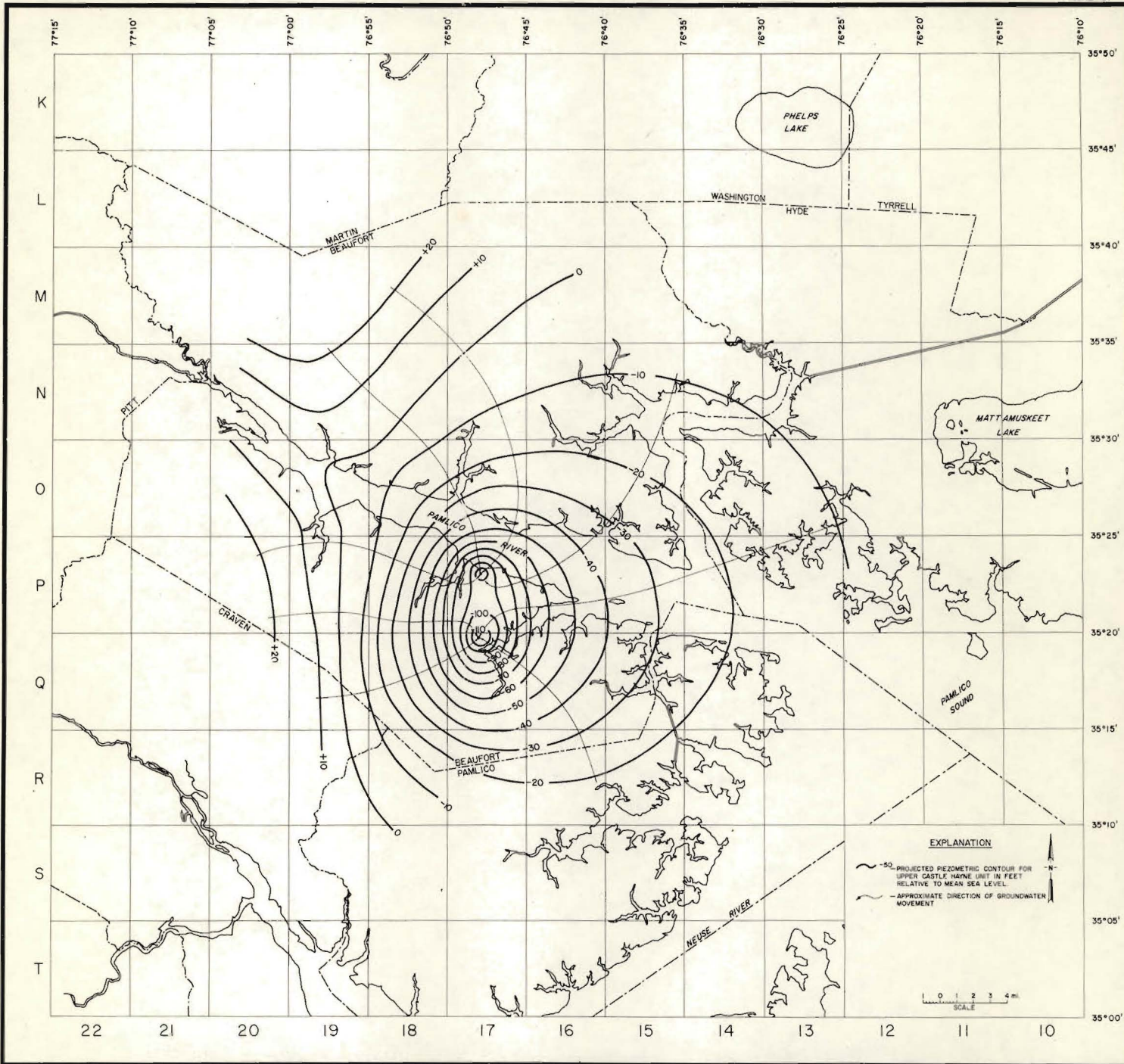




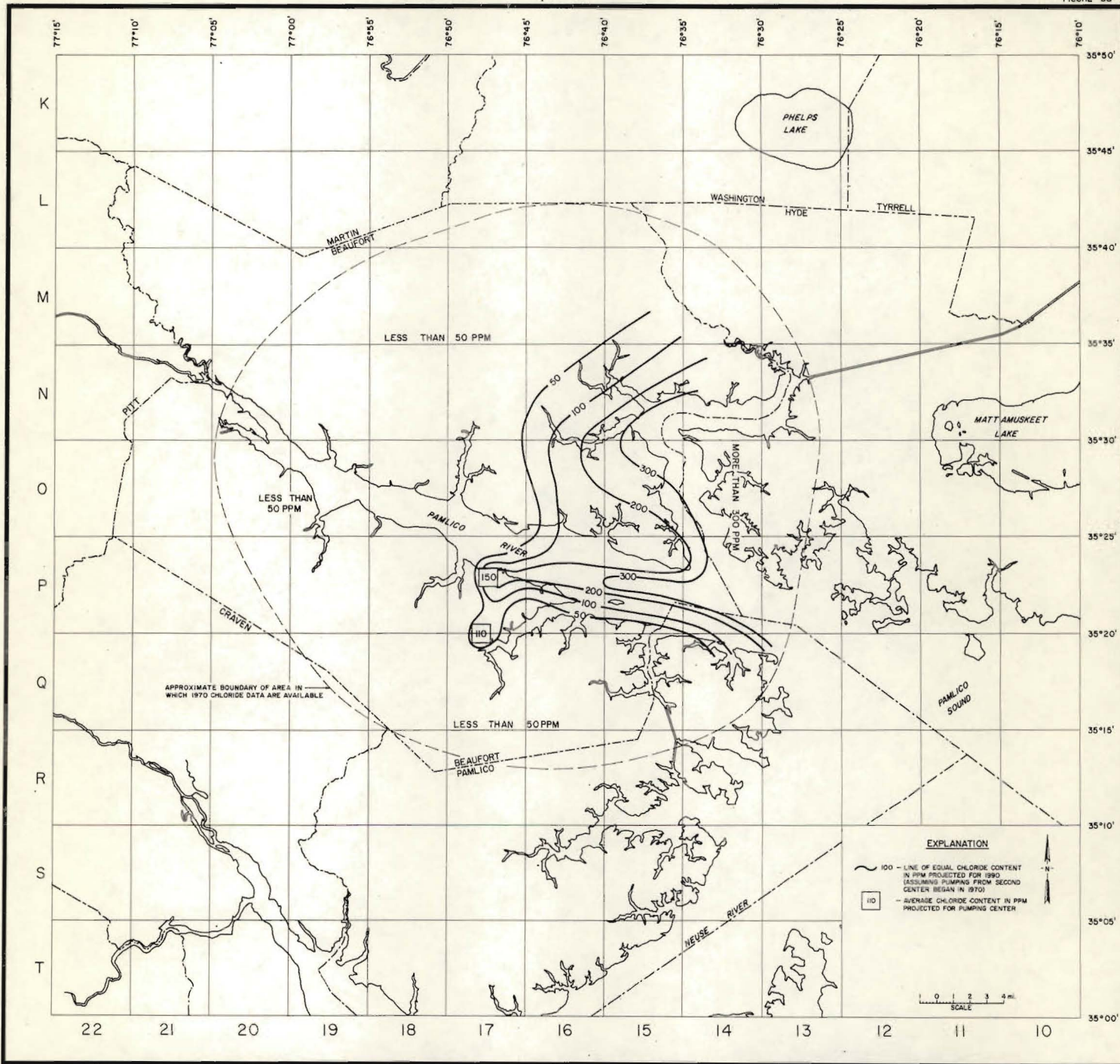
PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR ONE PUMPING CENTER FOR 2050



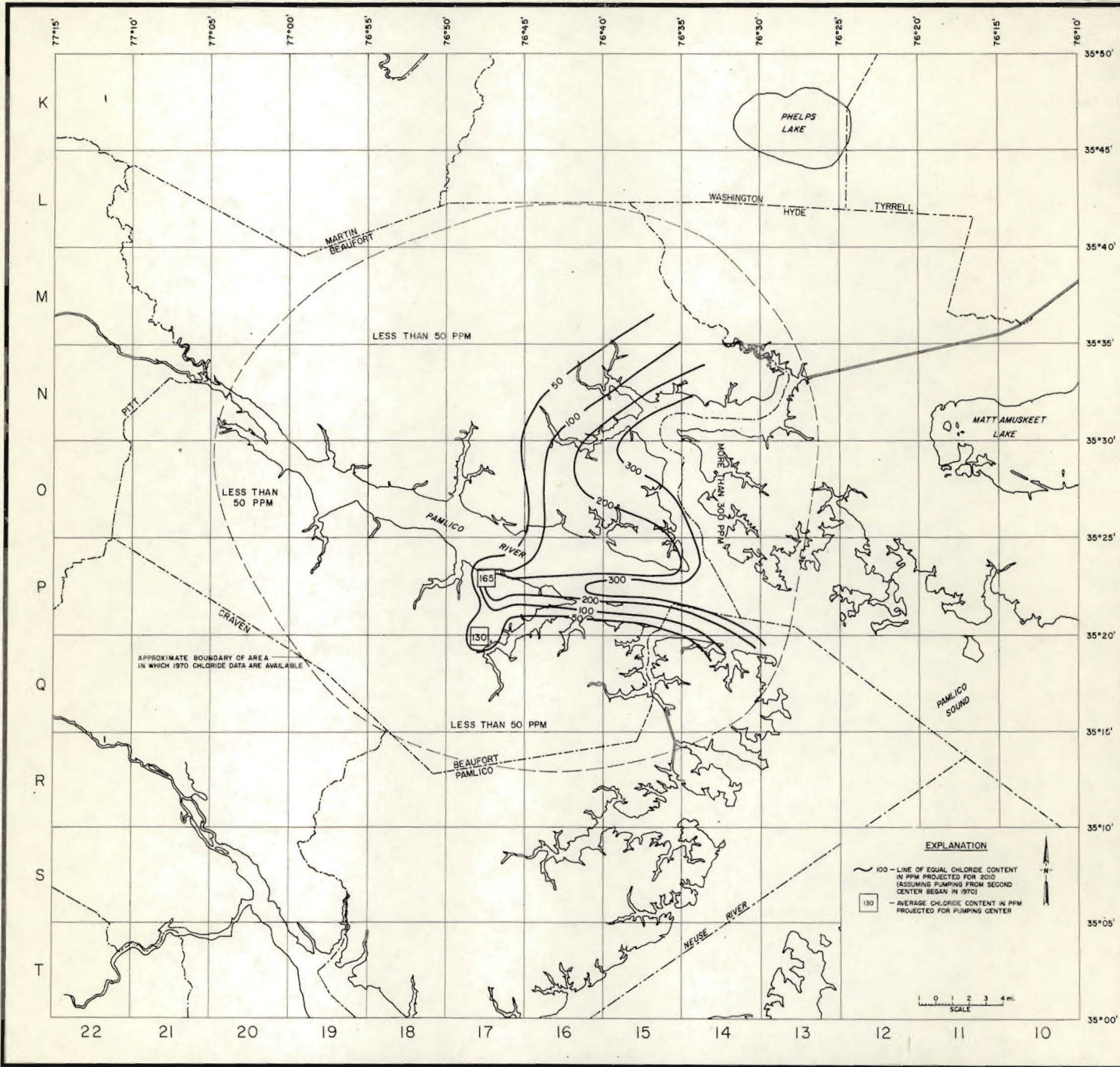
PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR ONE PUMPING CENTER FOR 2070



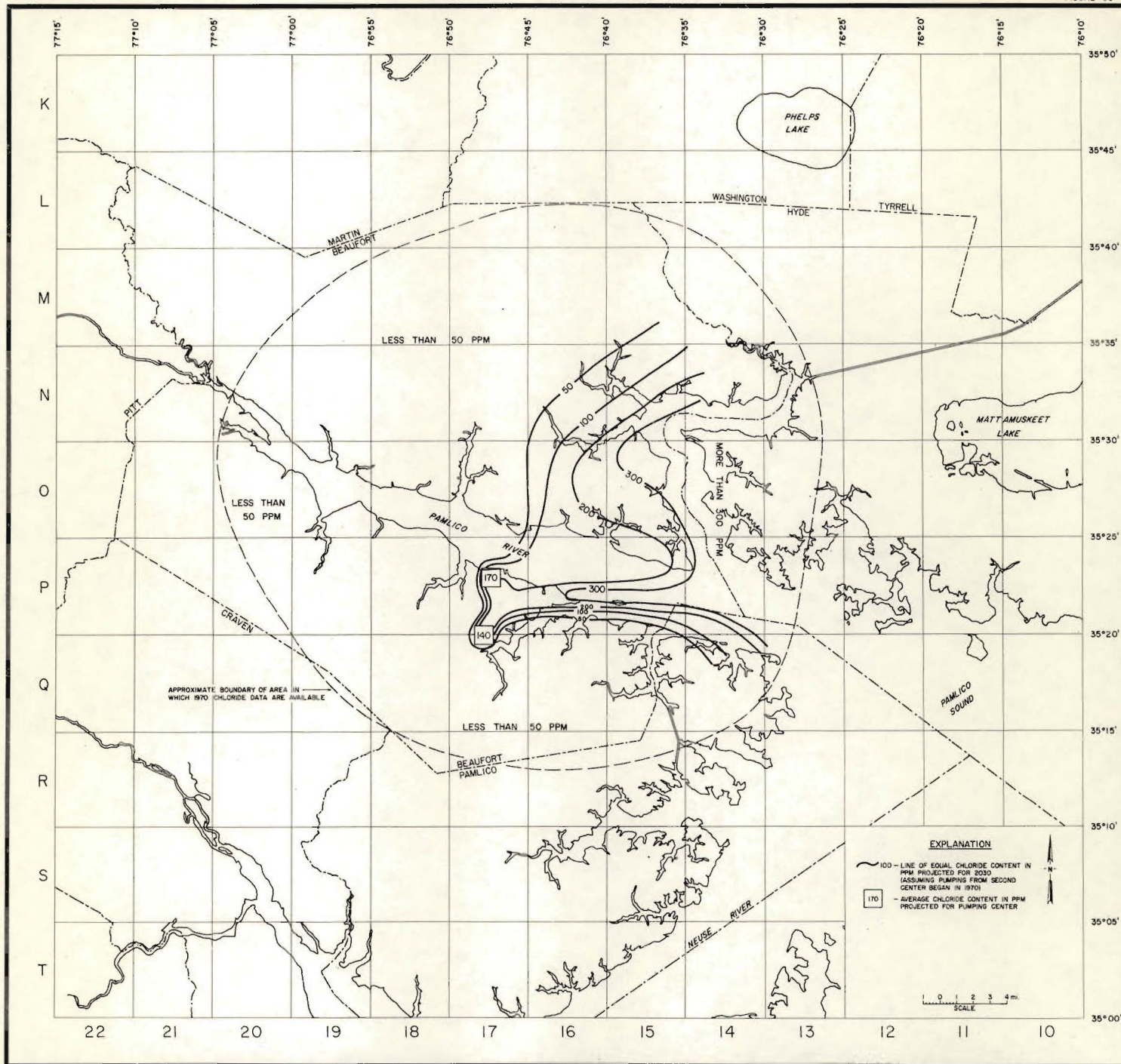
PROJECTED UPPER CASTLE HAYNE PIEZOMETRIC SURFACE FOR TWO POTENTIAL PUMPING CENTERS



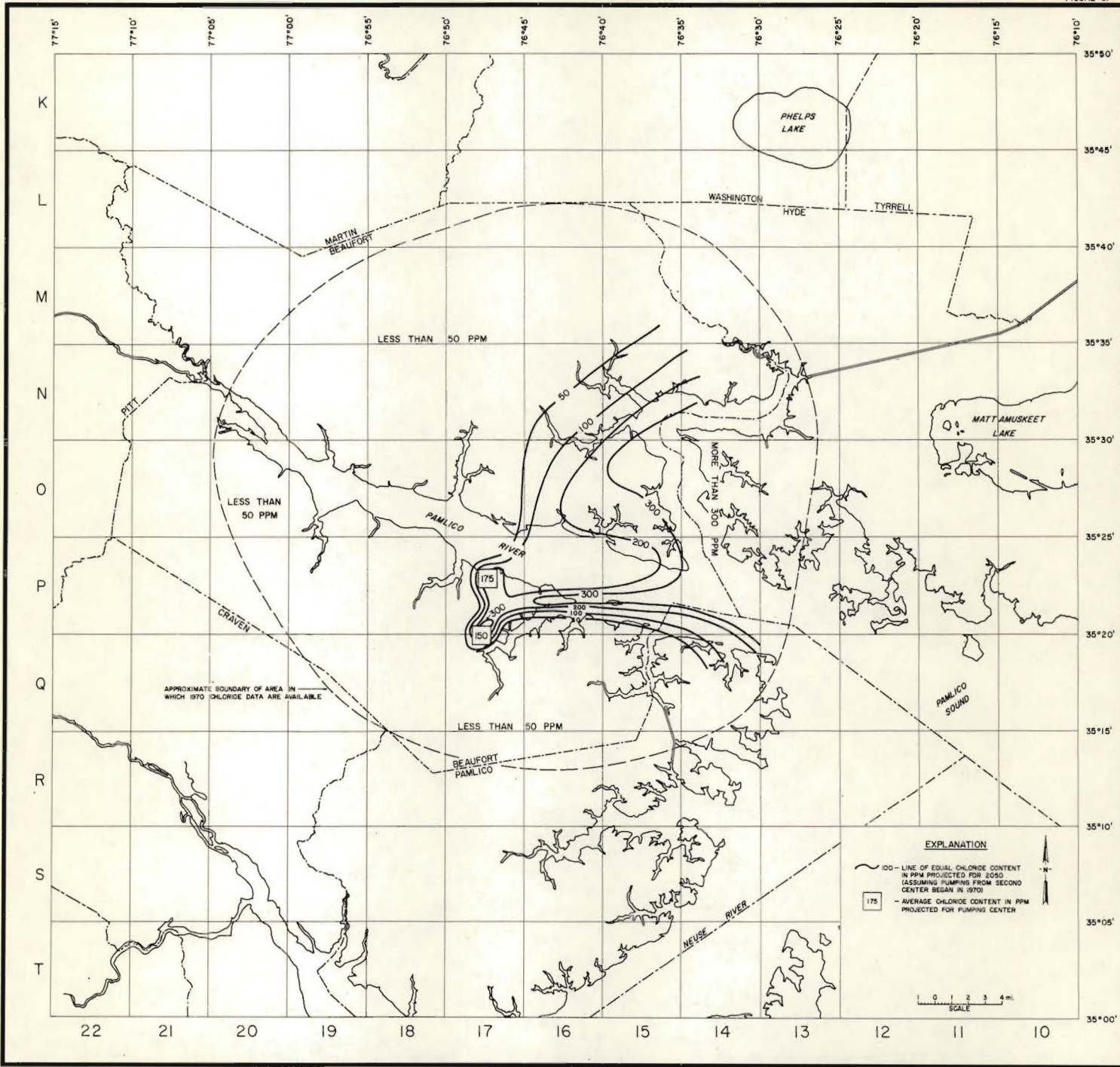
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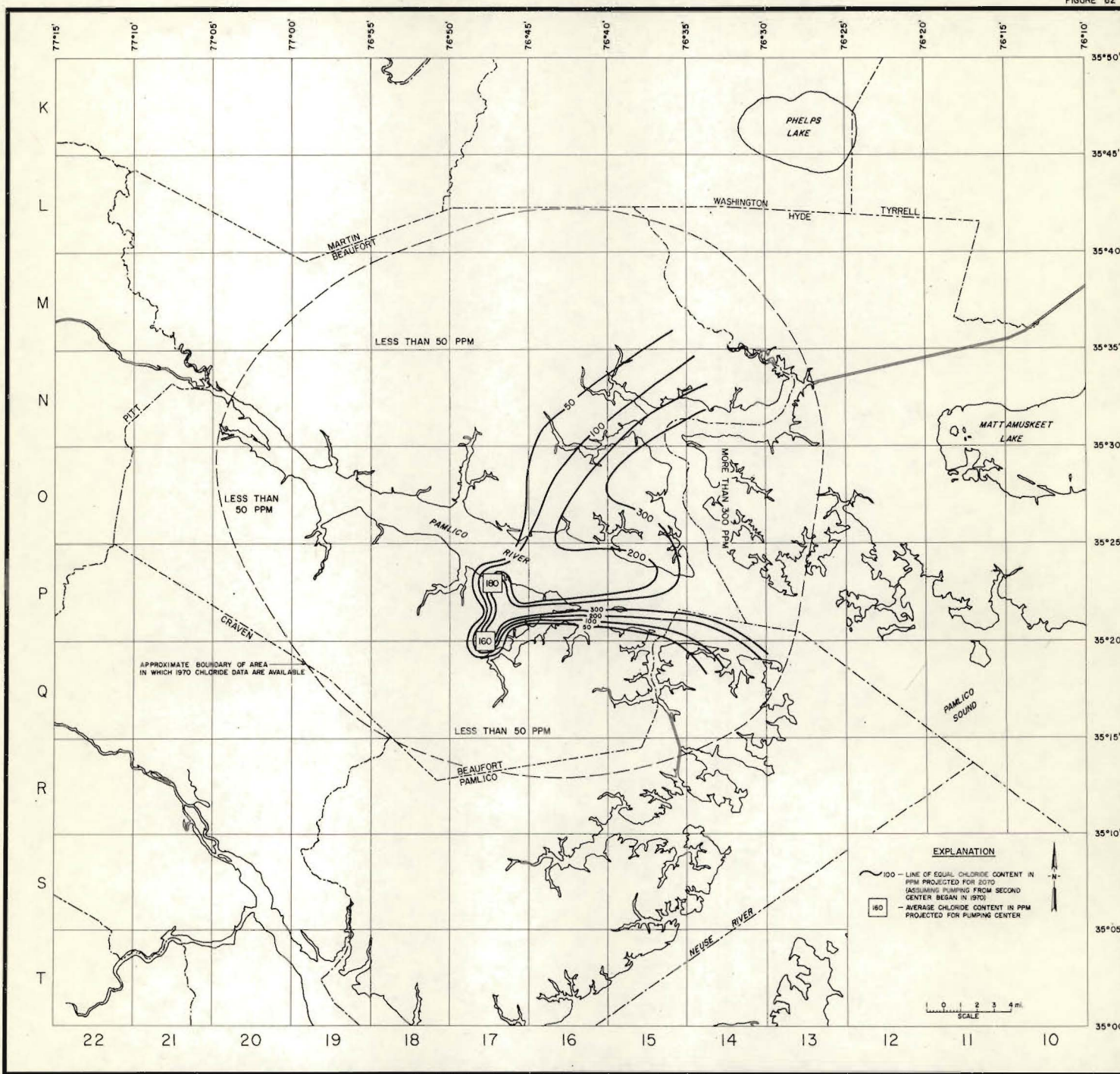
PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE FOR TWO PUMPING CENTERS FOR 2010



PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR TWO PUMPING CENTERS FOR 2030

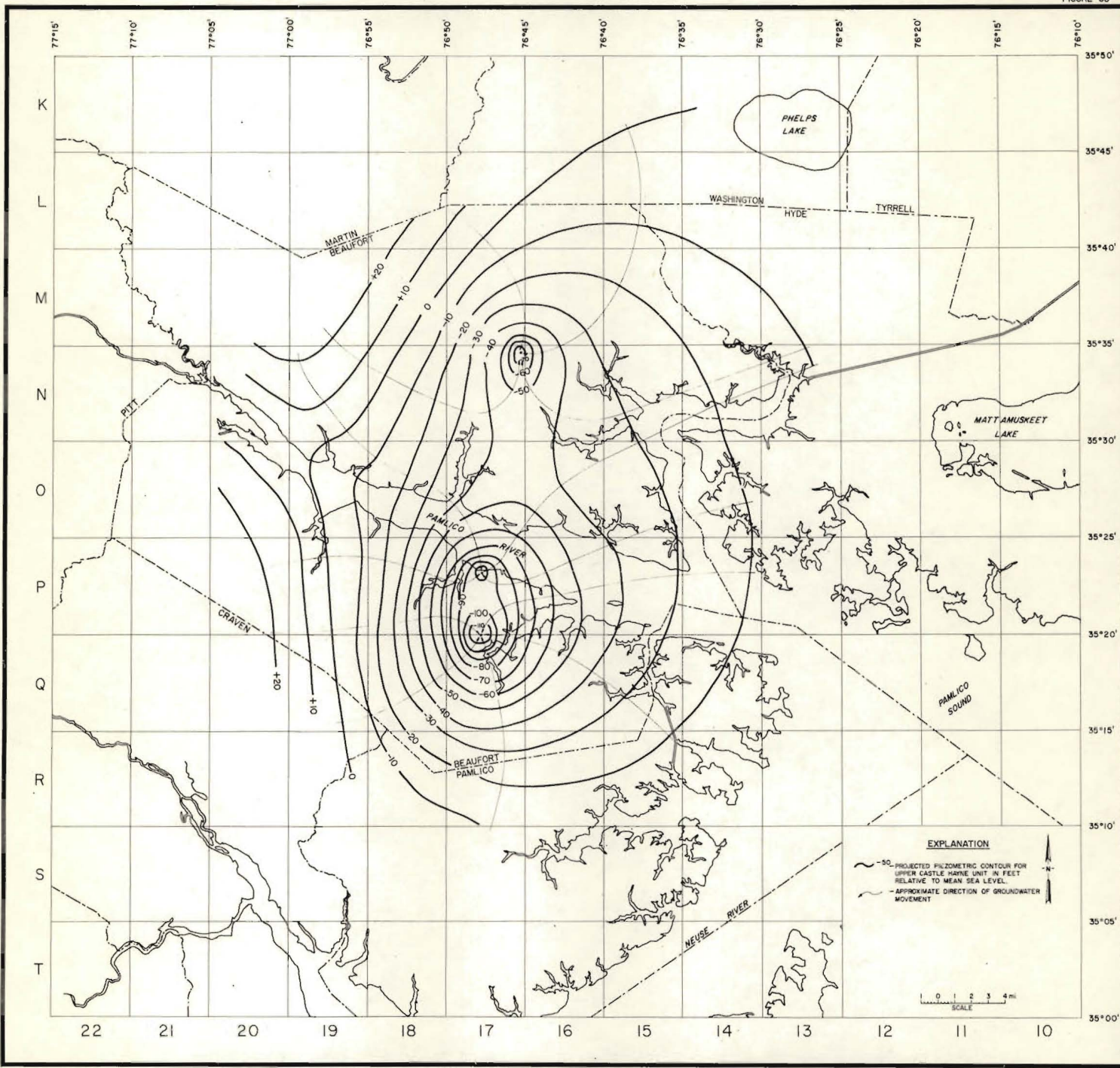


PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR TWO PUMPING CENTERS FOR 2050

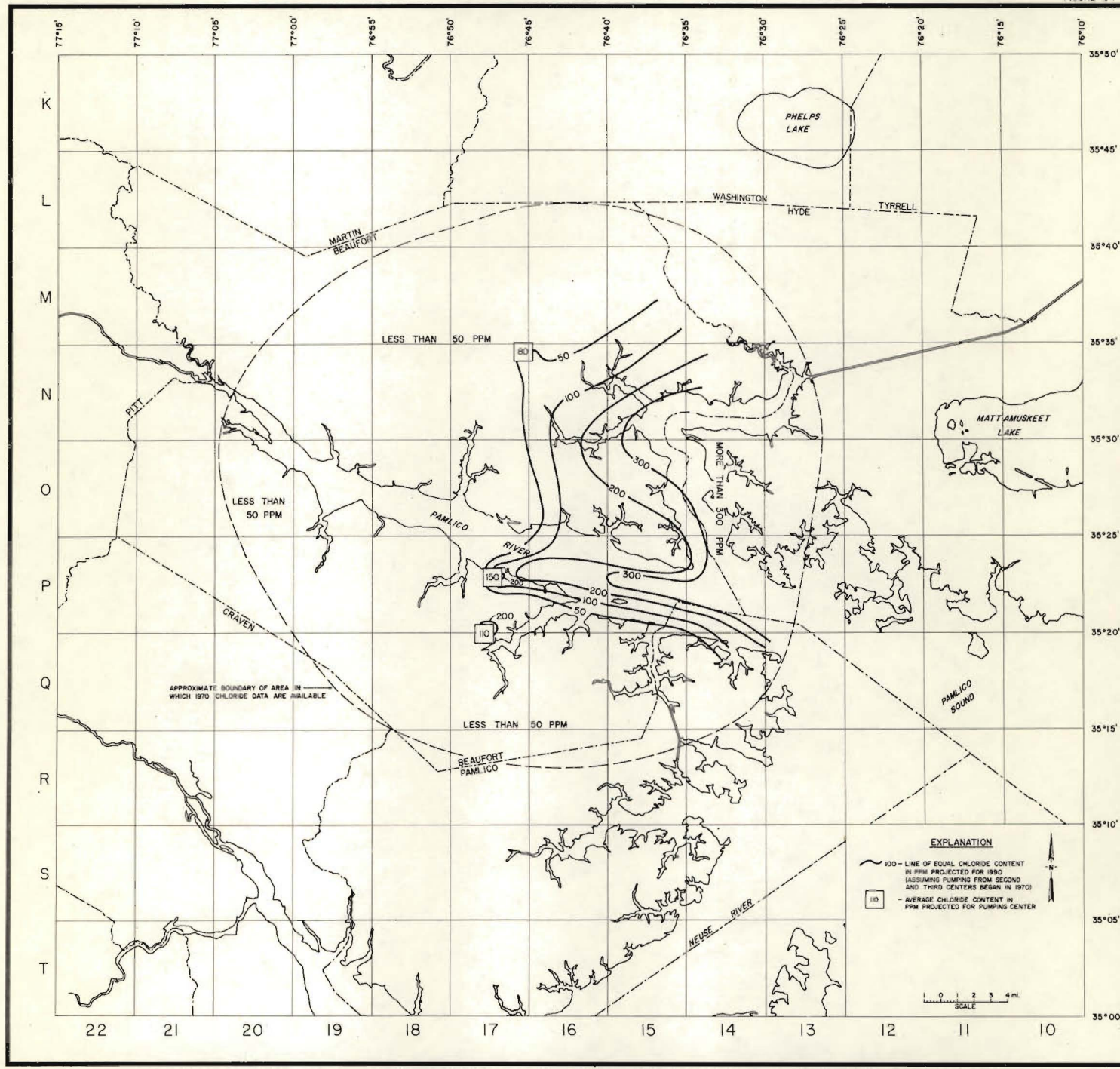


PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR TWO PUMPING CENTERS FOR 2070

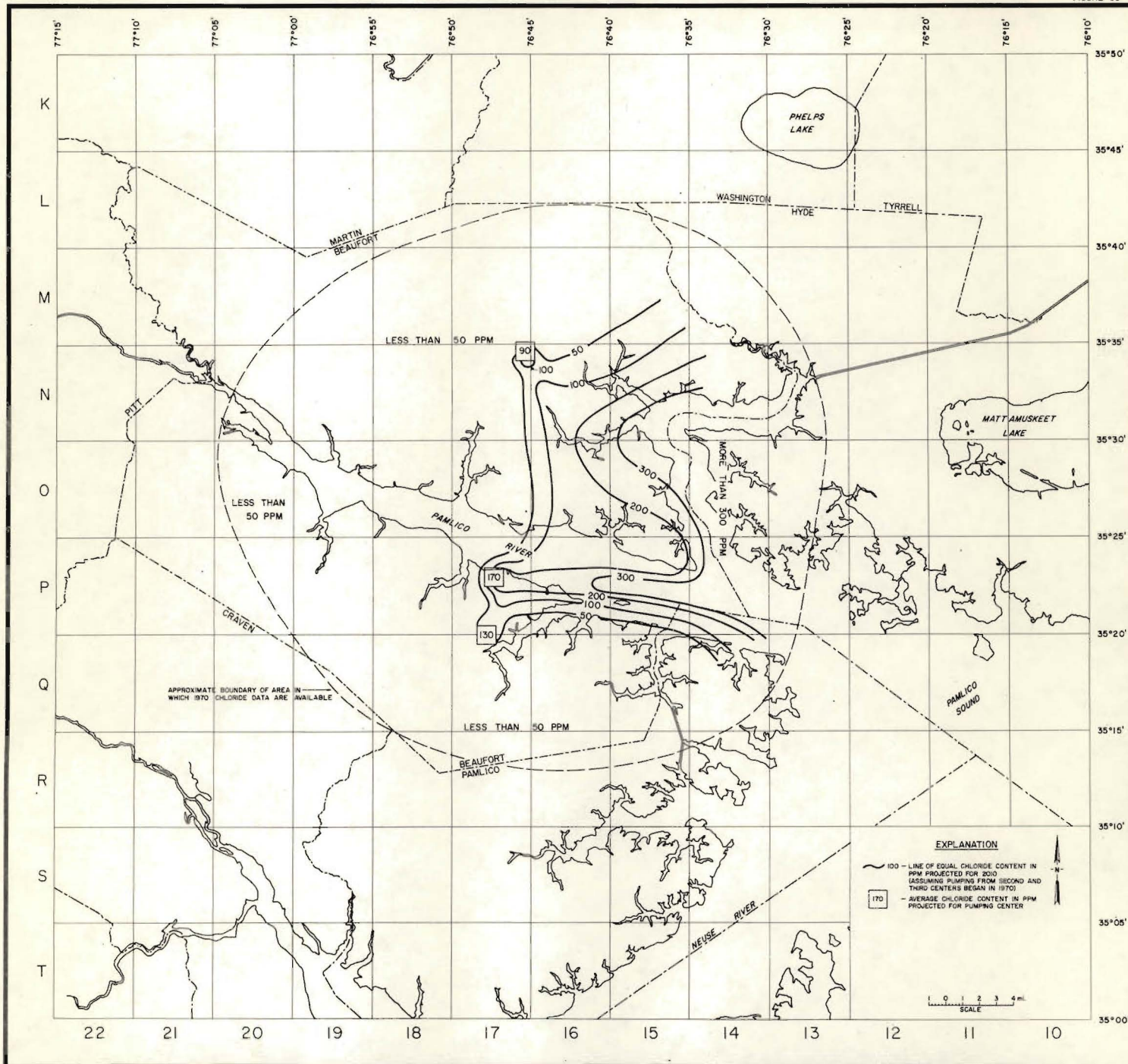




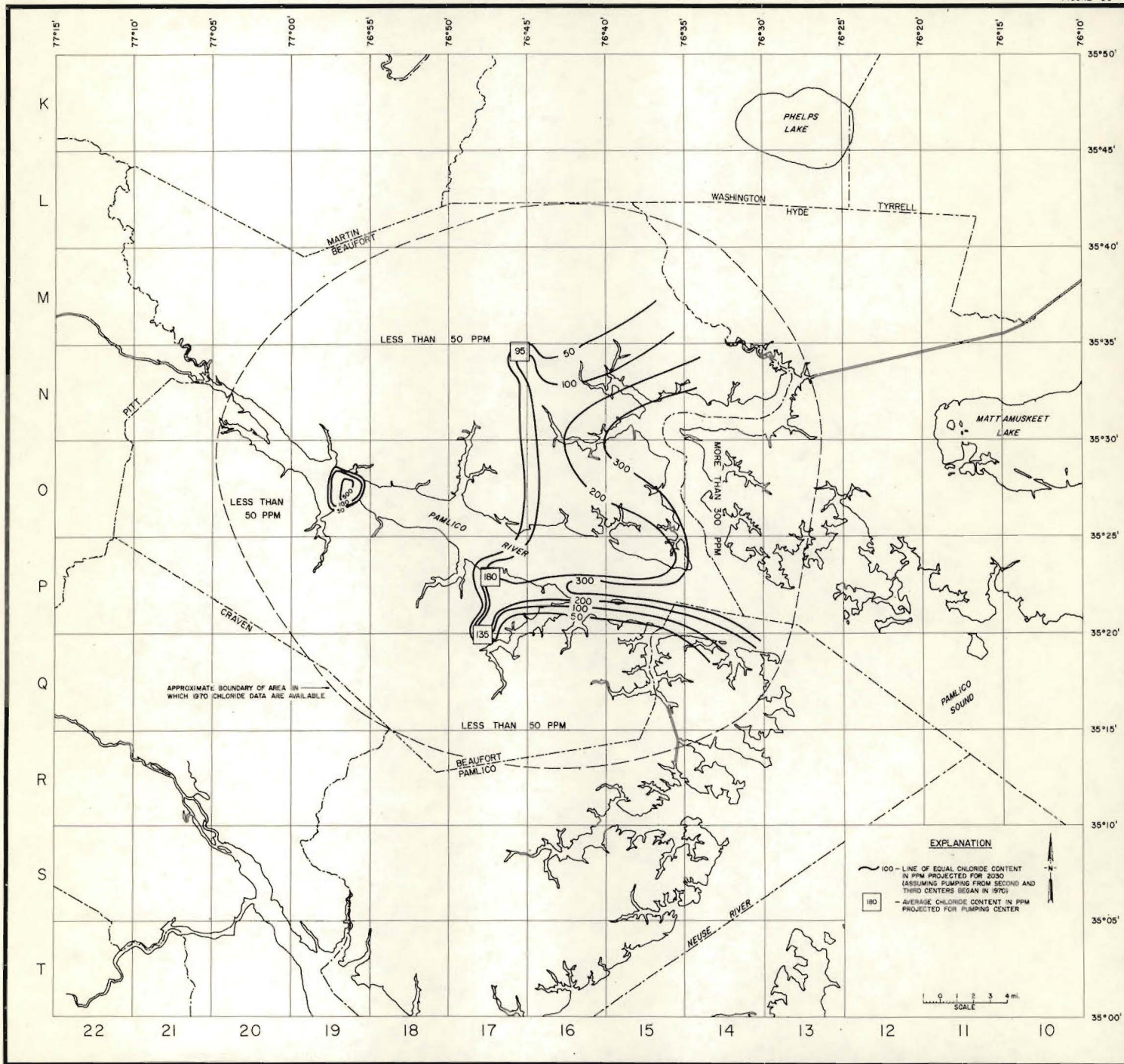
PROJECTED UPPER CASTLE HAYNE PIEZOMETRIC SURFACE FOR THREE POTENTIAL PUMPING CENTERS



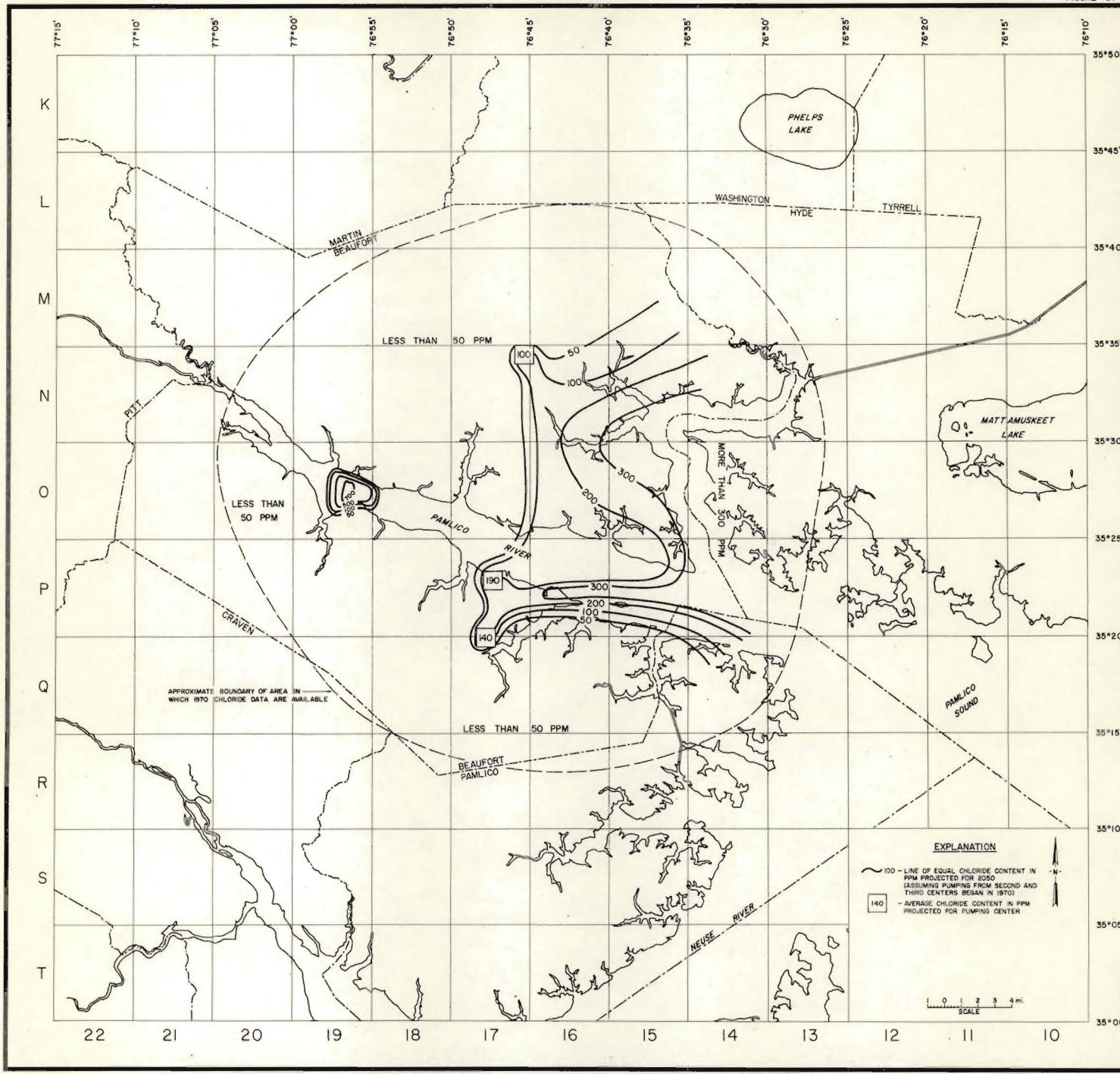
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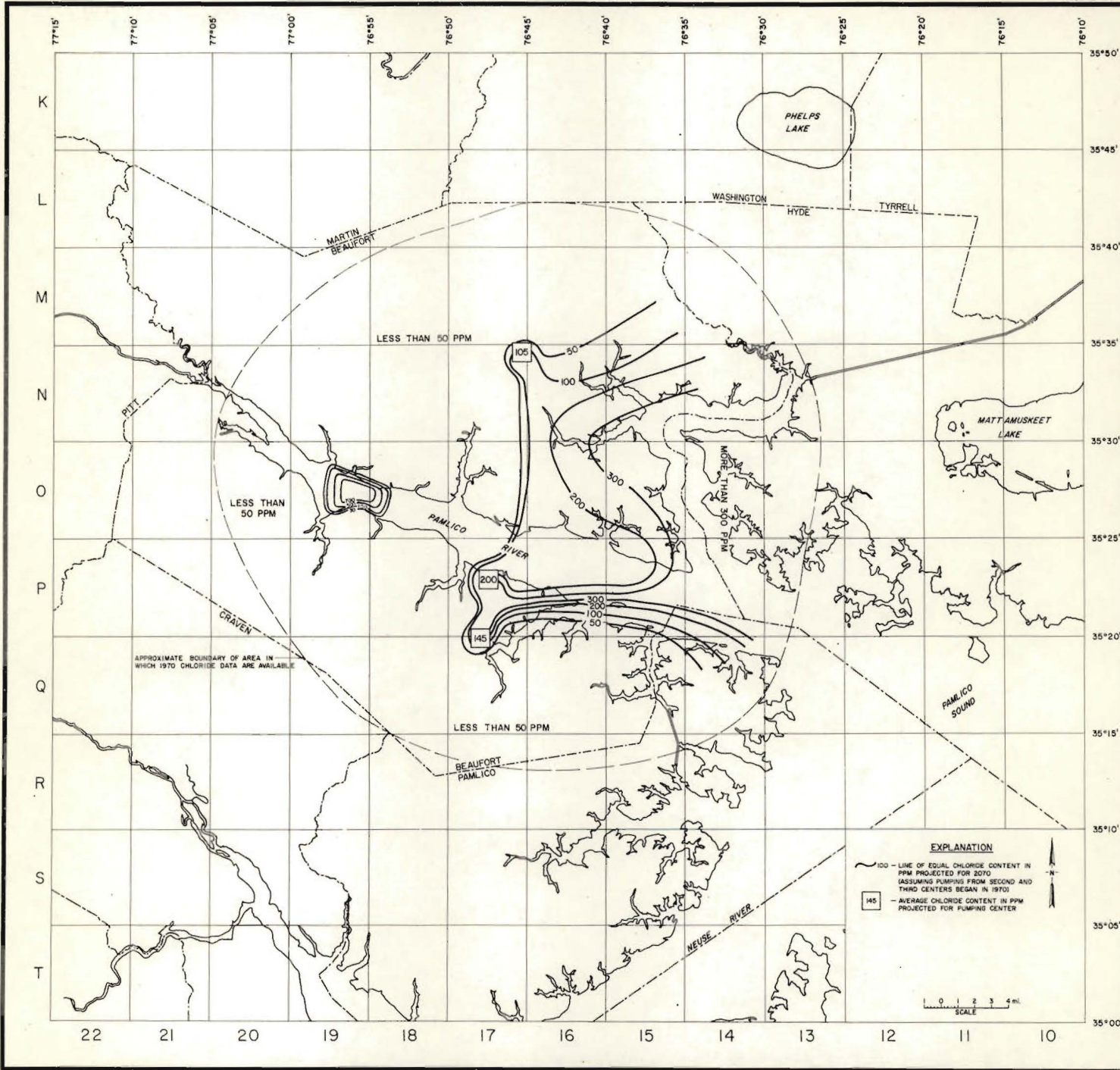
PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR THREE PUMPING CENTERS FOR 2010



PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR THREE PUMPING CENTERS FOR 2030



PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR THREE PUMPING CENTERS FOR 2050



PROJECTED CHLORIDE CONTENT IN THE UPPER CASTLE HAYNE UNIT FOR THREE PUMPING CENTERS FOR 2070