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MEJORAS DE LA ENTRADA AL PUERTO DE FRONTERA


Informe presentado a
LA SECRETARÍA DE MARINA

por
CHRISTIANI & NIELSEN DE MEXICO, S. A.



VOLUMEN I: TEXTO
VOLUMEN II: ILUSTRACIONES

ENERO 1950





SECRETARIA DE MARINA
UNIDAD DE HISTORIA
Y CULTURA NAVAL
BIBLIOTECA CENTRAL

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Lámina

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- 2 Parte más baja del sistema fluvial Usumacinta-Grijalva.
- 3 Geología, clima y vegetación en el área de captación.
- 4 Plano y perfiles de la parte más baja del río Grijalva.
- 5 Plano del estuario del río.
- 6 Análisis mecánicos.
- 7 Perfiles de perforación.
- 8 Diagramas de viento - Golfo de Campeche.
- 9 Vientos dominantes en el Golfo de México.
- 10 Diagramas de viento - Frontera.
- 11 Precipitación en el área de captación.
- 12 Variaciones en las precipitaciones anuales.
- 13 Temperatura, humedad y precipitación en Frontera.
- 14 Corrientes en el Golfo de México.
- 15 Secciones transversales en varios ríos.
- 16 Observaciones del nivel de agua en la desembocadura del río Grijalva - 1914 y 1947.
- 17 Observaciones del nivel de agua en la desembocadura del río Grijalva - 1948.
- 18 Observaciones del nivel de agua en la desembocadura del río Grijalva - 1949.
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- 31 Mediciones de sedimento - sección C.
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- 62 Estuario del río Grijalva 1518 - 1845.
- 63 Estuario del río Grijalva 1847 - 1911.
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- 65 La desembocadura del río desde 1840 hasta 1880.

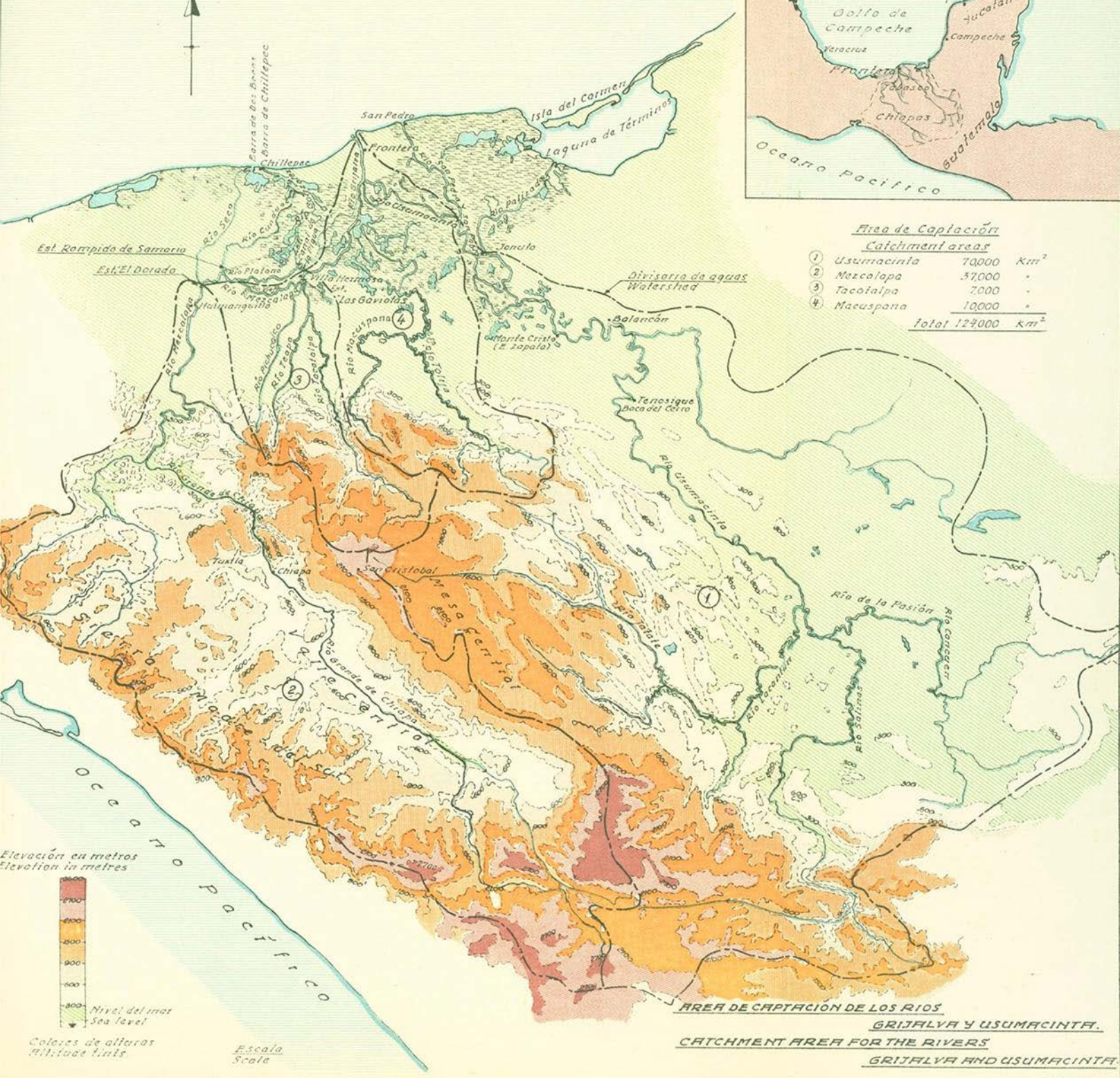
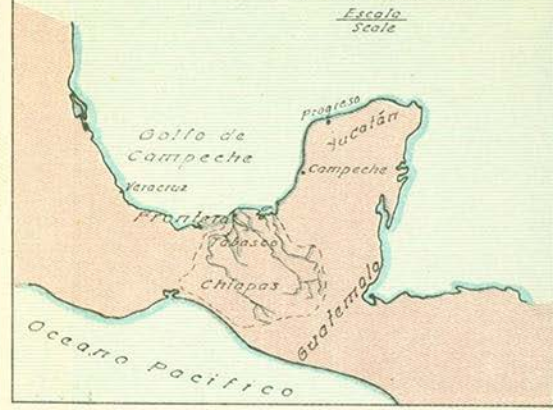
- 66 La desembocadura del río desde 1890 hasta 1910.
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- 80 Proposición I Escollera al presente canal lateral.
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- 83 Muelle para el transporte de lanchones por riel.
- 84 Aerocarril.
- 85 Forma estimada de depósitos en diferentes proposiciones.

Golfo de campeche



100 0 100 200 300 400 500 Km

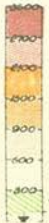
Escala
Scale



Área de Captación
Catchment areas

①	Usumacinta	70,000	Km ²
②	Mazculapa	57,000	"
③	Tacotalpa	7,000	"
④	Macuspana	10,000	"
		total	124,000
			Km²

Elevación en metros
Elevation in metres



Nivel del mar
Sea level

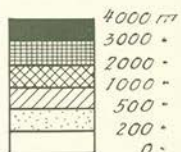
Colores de alturas
Altitude tints

Escala
Scale

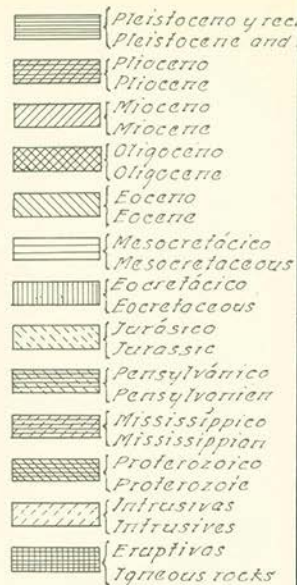
ÁREA DE CAPTACIÓN DE LOS RÍOS
GRIJALVA Y USUMACINTA.
CATCHMENT AREA FOR THE RIVERS
GRIJALVA AND USUMACINTA.



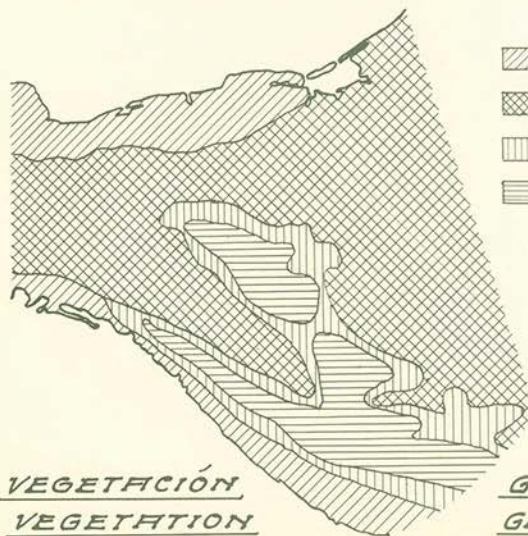
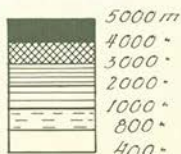
ALTITUDES
ALTITUDES



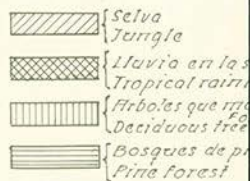
CARTA GEOLÓGICA
GEOLOGICAL MAP



PRECIPITACIÓN
ANUAL.
ANNUAL PRECIPITATION



VEGETACIÓN
VEGETATION



MAPPA
SOIL MAP
GEOLOGIA, CLIMA
GEOLOGY, CLIMATE

y reciente
and recent formations

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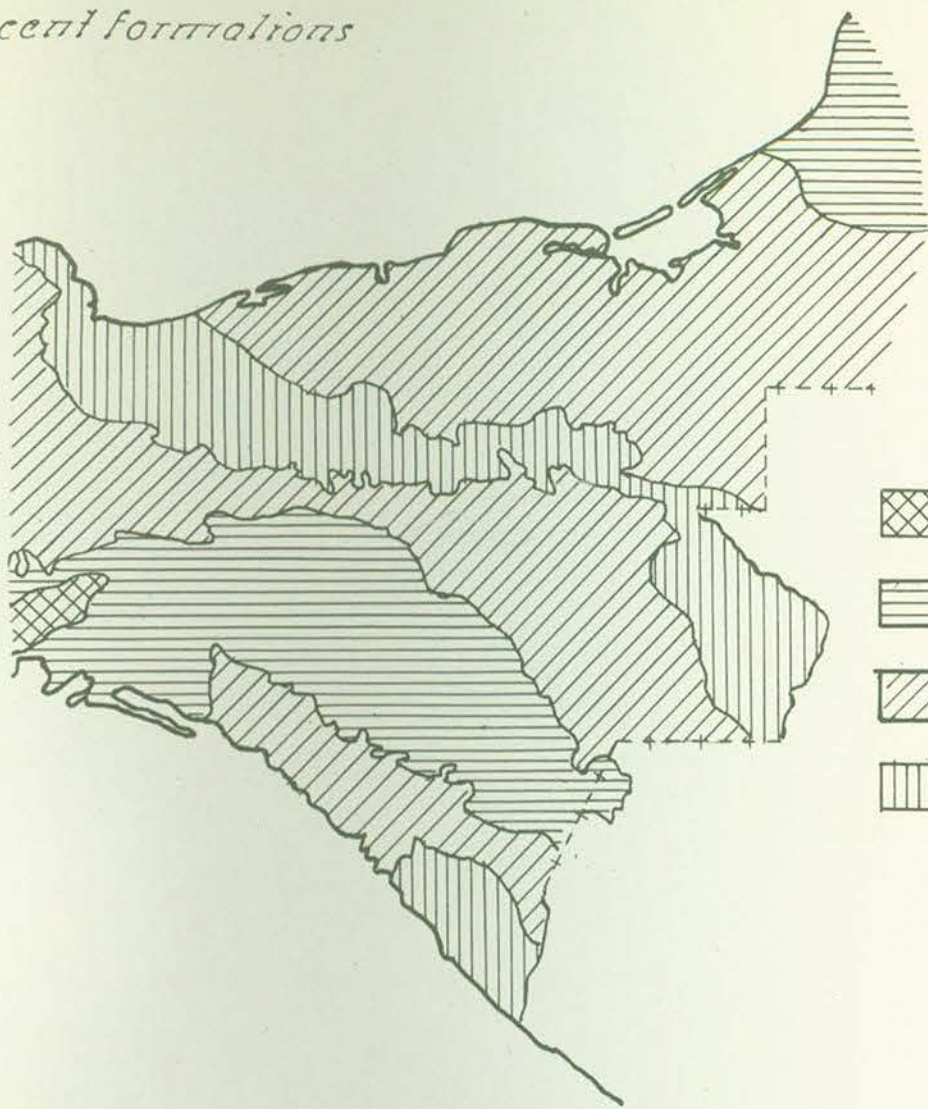
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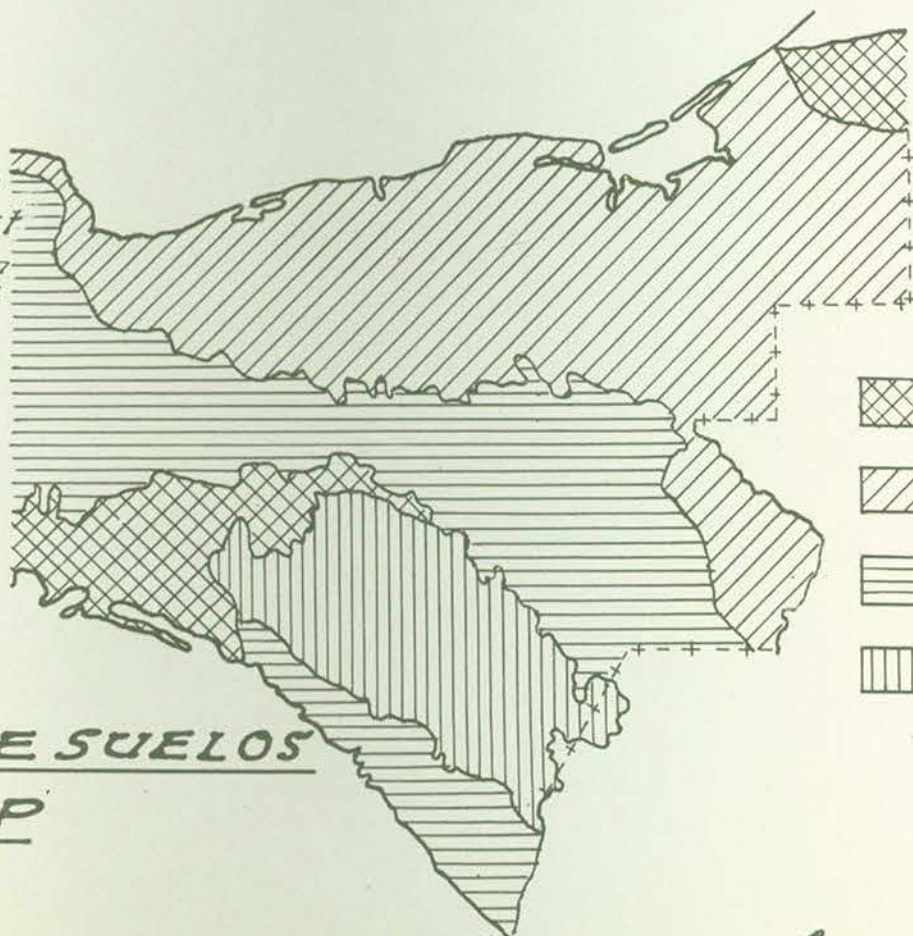
-  { *Seco*
Dry
-  { *Semi-seco*
Half dry
-  { *Húmedo*
Humid
-  { *Muy húmedo*
very humid



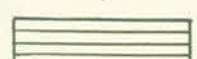

HUMEDAD
HUMIDITY

en la selva
rainforest

que mudan
Follaje
trees.

de pirros
est



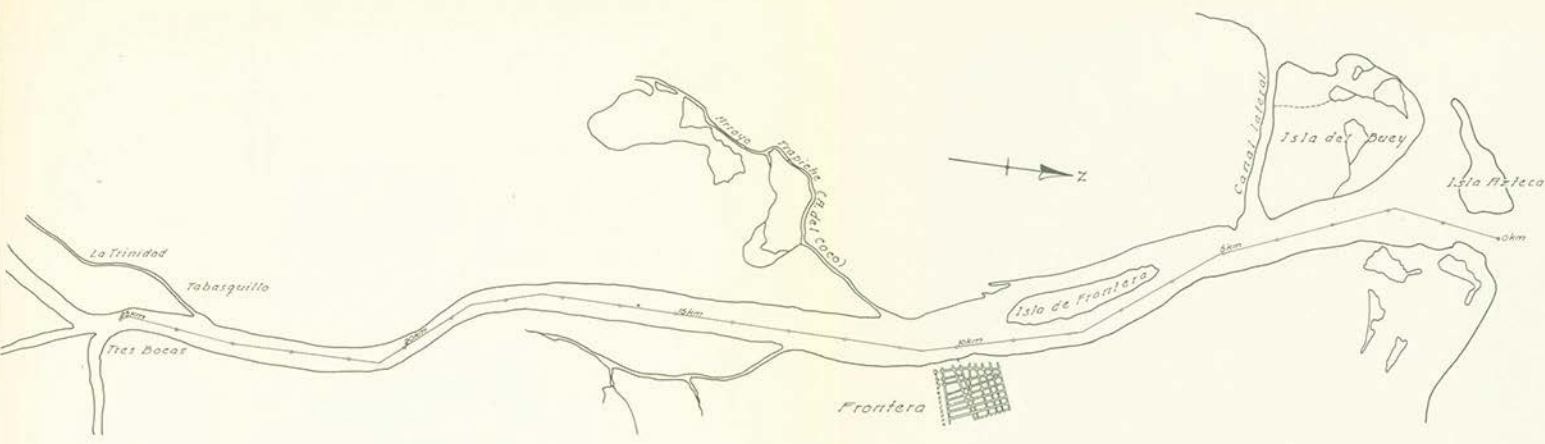
-  { *Pradera*
Meadows
-  { *Arcilla*
Clay
-  { *Amarillo del grupo*
Laterítico
Yellow Laterite
-  { *Chernozem*
Black earth

MAPA DE SUELOS

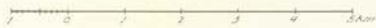
SOIL MAP

CLIMA Y VEGETACIÓN EN EL ÁREA DE CAPTACIÓN

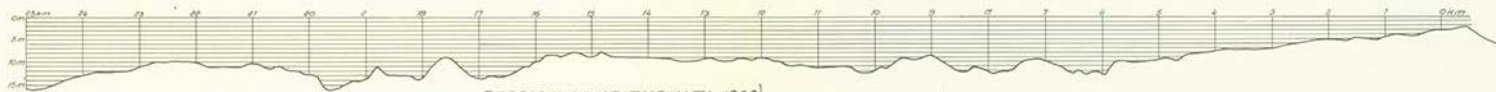
CLIMATE AND VEGETATION IN CATCHMENT Lámina
AREA. Plate 3.



PLANO
PLAN
(1945)



Escala
Scale

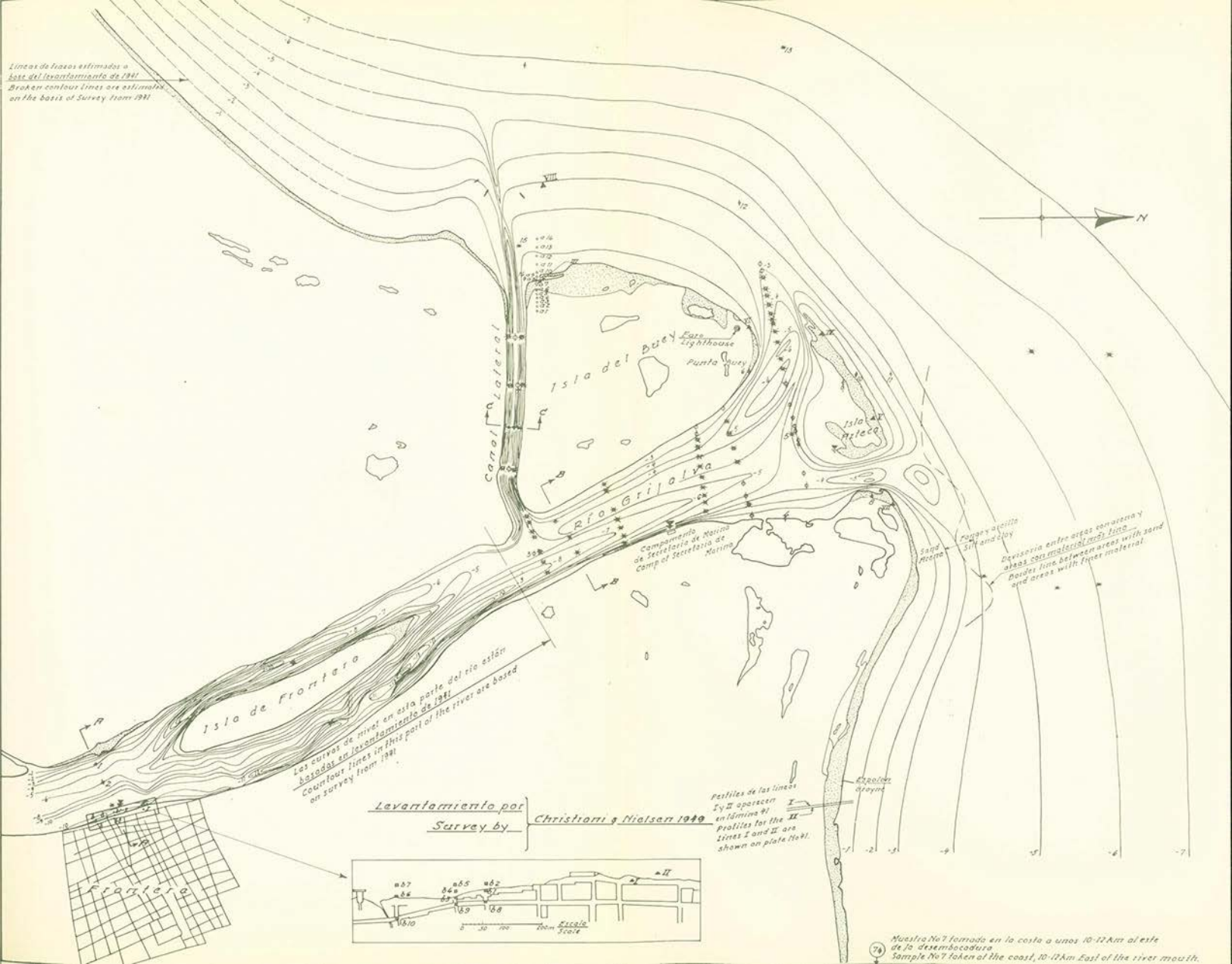


SECCION LONGITUDINAL 1909 } COMISION HIDROGRAFICA
LONGITUDINAL SECTION 1909



SECCION LONGITUDINAL 1945 } INDUSTRIAS HIGGINS
LONGITUDINAL SECTION 1945

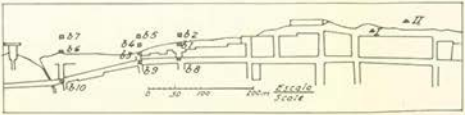
Lineas de frisos esfirmados a
 base del levantamiento de 1941
 Broken contour lines are estimated
 on the basis of Survey from 1941



Las curvas de mareas en esta parte del río están
 basadas en levantamiento de 1941
 Current lines in this part of the river are based
 on survey from 1941

Levantamiento por }
 Survey by } **Christians & Nielsen 1949**

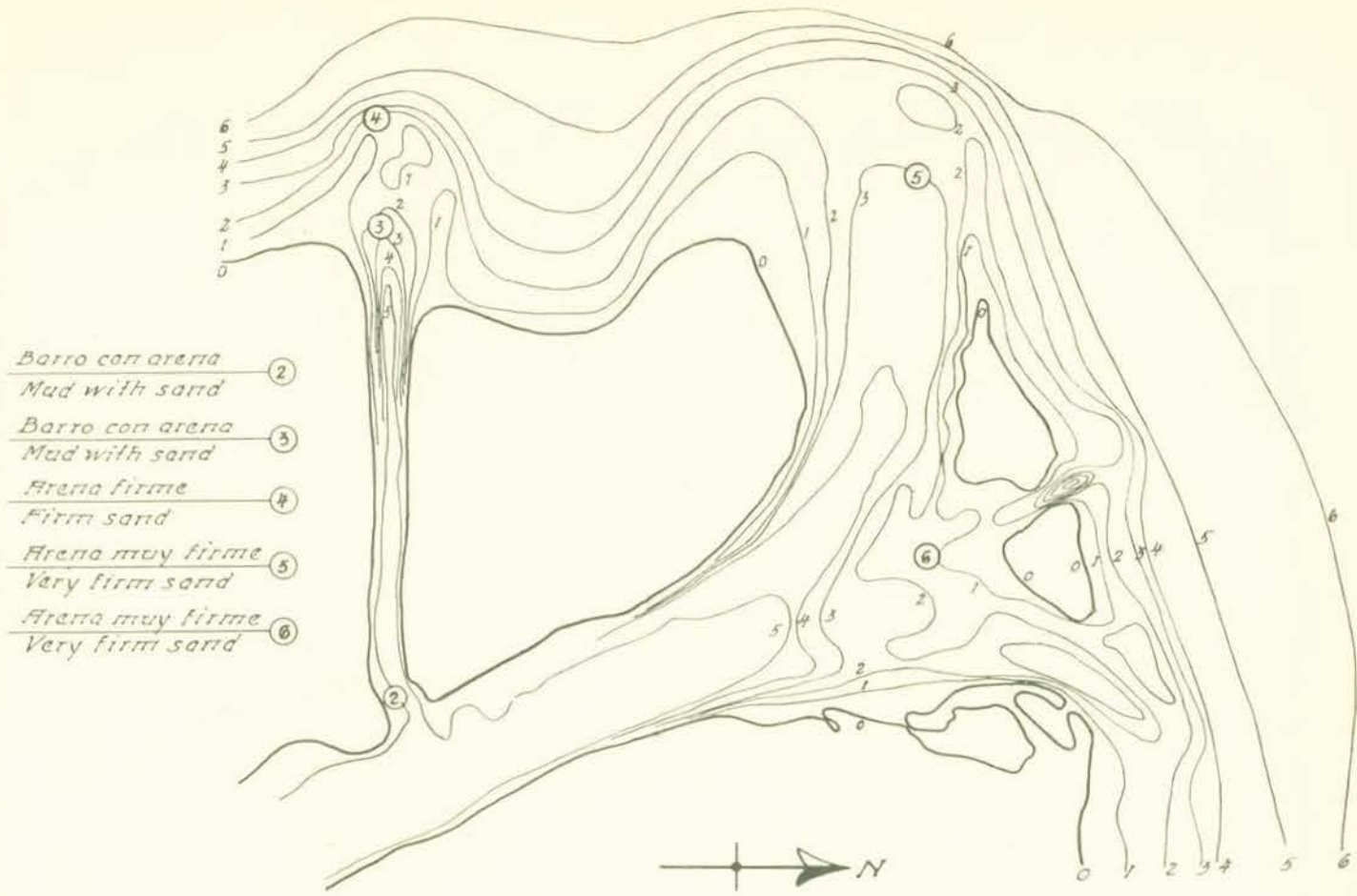
Perfiles de las líneas
 I y II aparecen
 en la figura #1
 Profiles for the
 lines I and II are
 shown on plate (No. 1)



Exposición entre áreas con arena y
 áreas con arcilla y limo
 Border line between areas with sand
 and areas with finer material

Muestra No 7 tomada en la costa a unos 10-12 Km al este
 de la desembocadura
 Sample No 7 taken at the coast, 10-12 Km East of the river mouth.

Line
base
Bro.
on 1



- Barro con arena (2)
Mud with sand
- Barro con arena (3)
Mud with sand
- Arena firme (4)
Firm sand
- Arena muy firme (5)
Very firm sand
- Arena muy firme (6)
Very firm sand

Escola / Scale 1 0 1 2 3 4 Km

MUESTRAS SUPERFICIALES TOMADAS EN 1938
SURFACE SAMPLES TAKEN 1938.

- ☒ Mareógrafo / Water level gauge
- o al - a14 { Perforaciones hechas por / Borings made by } Secretaría de Marina 1942
- b1 - b10 { Perforaciones hechas por / Borings made by } Secretaría de Marina 1948
- ▲ I - VIII { Perforaciones hechas por / Borings made by } Christiani & Nielsen 1949

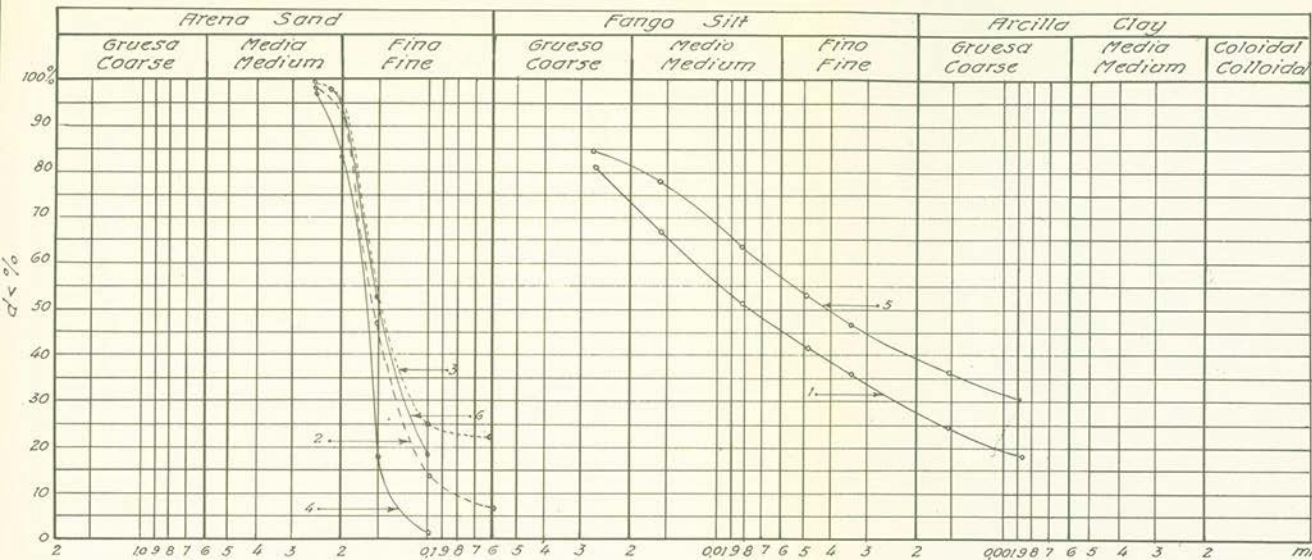
- ⊕ Arena fina / Fine sand
 - ⊕ Fango arenoso / Silty silt
 - ⊕ Fango / Silt
 - ⊕ Fango y arcilla / Silt and clay
- Muestras superficiales tomadas por Christiani & Nielsen 1949. Las curvas granulométricas de las muestras 1-15 aparecen en la lámina No. 6.
Surface samples taken by Christiani & Nielsen 1949 grain distribution curves for samples marked 1-15 are found on plate No. 6

Para las mediciones de Sedimentación. Las secciones A-B y C vease láminas No. 28-29 y 30

For sediment measurements, section A-B and C see plates No. 28-29 and 30

1 0.5 0 1 2 3 4 Km
Escola / Scale

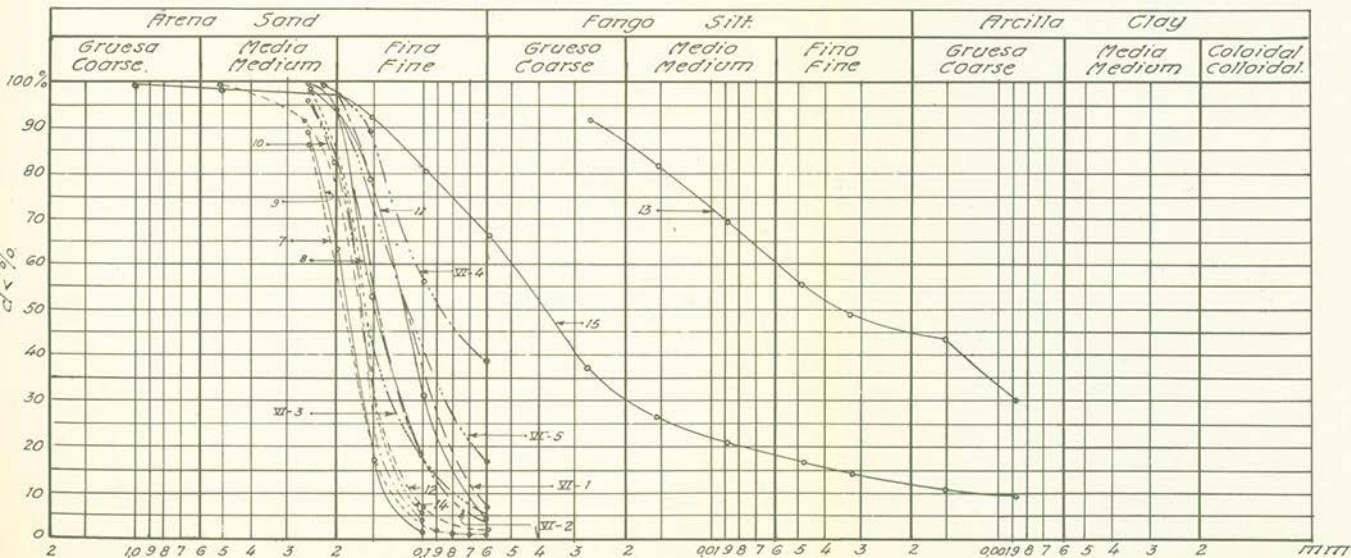
PLANO DEL ESTUARIO DEL RÍO
PLAN OF RIVER ESTUARY



Mue. Sfra. Sample	Diametro medio Mean diameter.
1	0,0076 mm
2	0,160 "
3	0,145 "
4	0,160 "
5	0,004 "
6	0,150 "

Nota: Véase la ubicación de las muestras No 1 a 15 en la lámina No 5
 VI-1 a VI-5 proceden de la perforación No VI (lámina Nos 5 y 7)

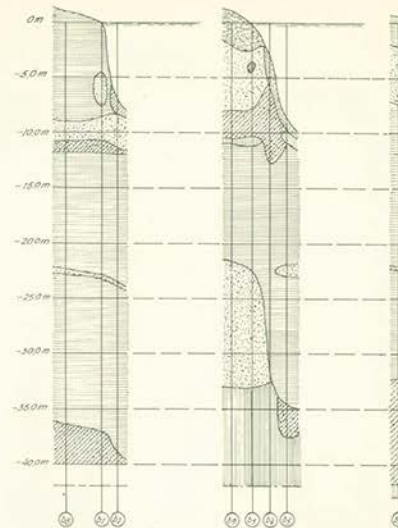
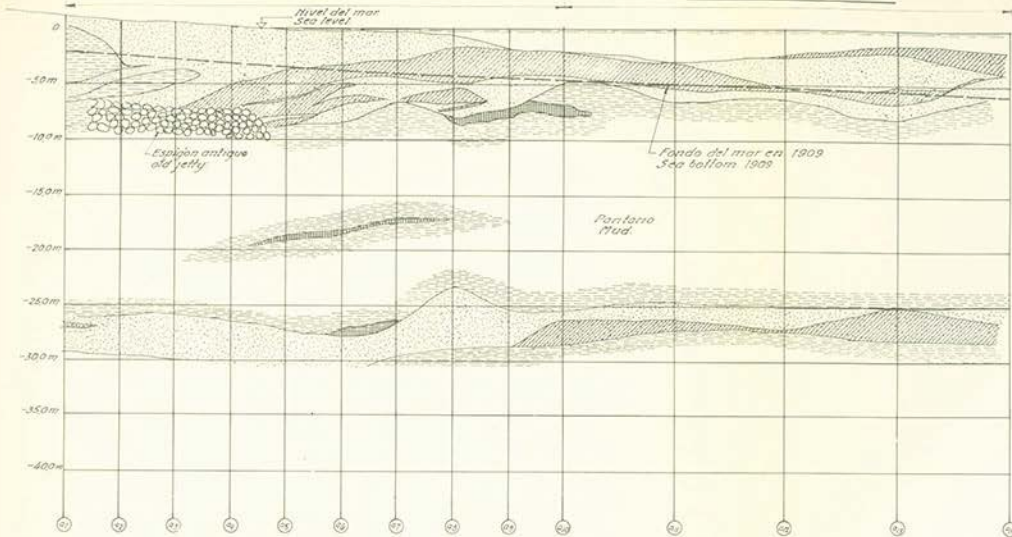
Note: For Location of surface samples No 1-15 see plate No 5
 VI-1 to VI-5 are from boring No VI (plates No 5 and 7)



Mue. Sfra. Sample	Diametro medio Mean diameter.
7	0,190 mm
8	0,146 "
9	0,182 "
10	0,167 "
11	0,120 "
12	0,170 "
13	0,0033 "
14	0,160 "
15	0,037 "
VI-1	0,122 "
VI-2	0,145 "
VI-3	0,160 "
VI-4	0,088 "
VI-5	0,122 "

**PERFORACIONES CADA 50 M.
BORINGS EVERY 50 M.**

**PERFORACIONES CADA 100 M.
BORINGS EVERY 100 M.**



**PERFORACIONES EN LA BOCA DEL CANAL LATERAL
BORINGS AT THE MOUTH OF LATERAL CANAL
(SECRETARÍA DE MARINA 1942)**

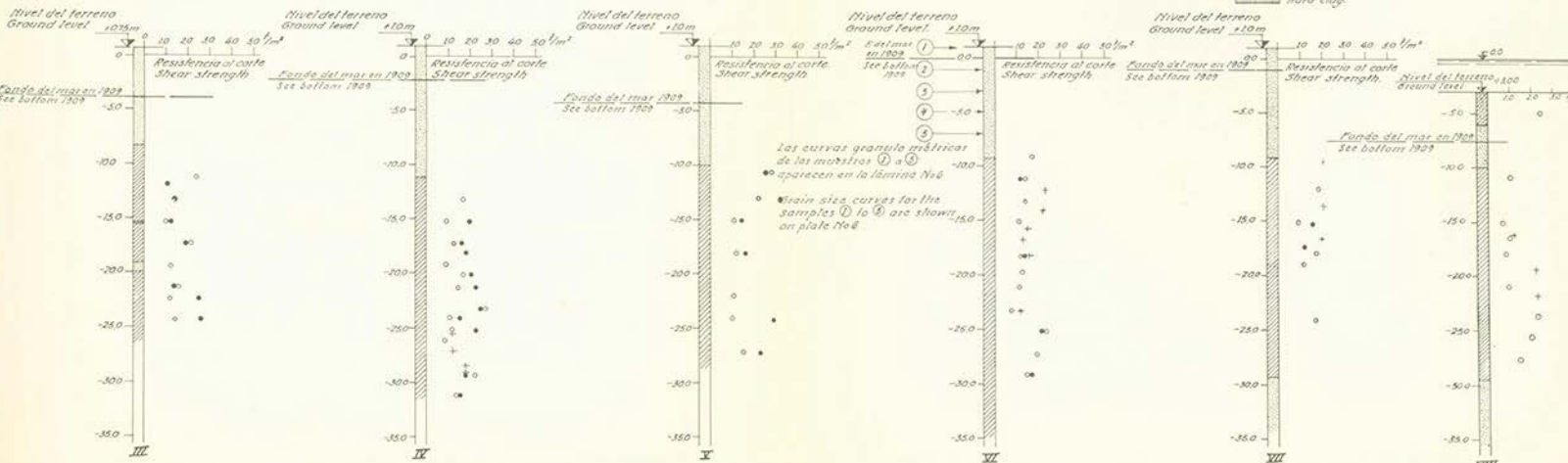
**PERFORACIONES EN FRONTERA
BORINGS AT FRONTERA
(SECRETARÍA DE MARINA)**

- Arena Sand
- Arcilla con arena Clay with sand
- Arcilla Mud
- Metano Methane

- Arena fina Fine Sand
- Pantano Mud
- Pantano arenoso Mud with sand
- Barro suave Soft mud
- Barro arenoso Clay with sand
- Barro duro Hard clay

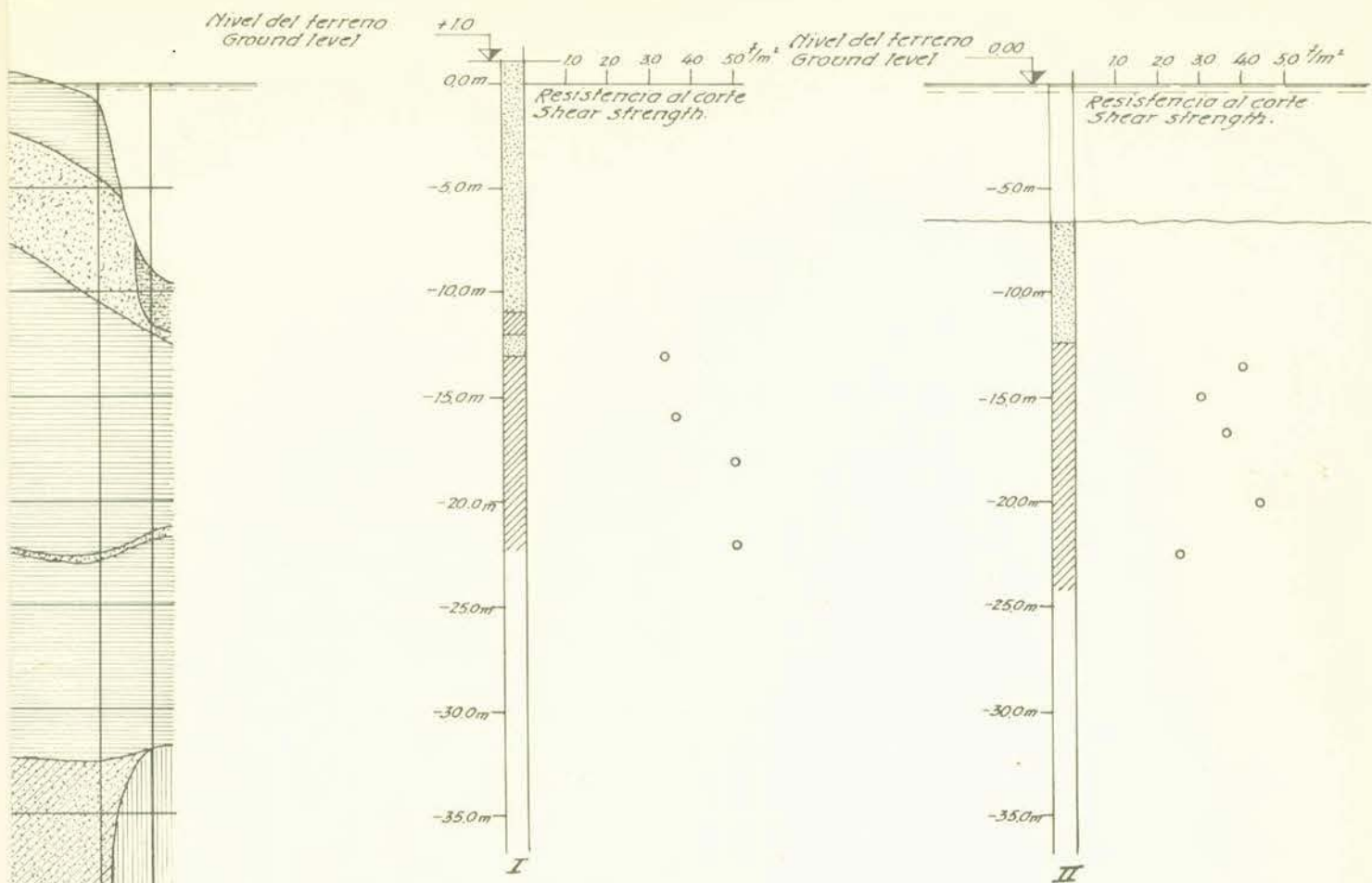
Escala horizontal Horizontal scale.

Escala horizontal Horizontal scale.



**PERFORACIONES EN LA COSTA
BORINGS AT THE COAST
(CHRISTIAN & NIELSEN)
1949 - 1950**

- Arena Sand
- Arcilla Clay
- Arcilla arenosa Sandy clay



**PERFORACIONES EN FRONTERA.
BORINGS AT FRONTERA.
(CHRISTIANI & NELSEN 1949)**

RA
1948)
100m.

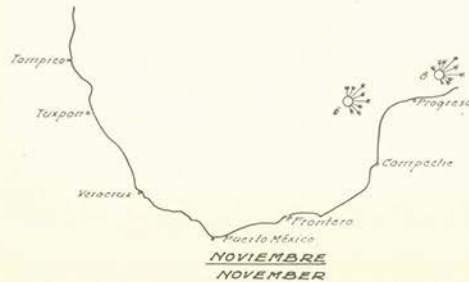
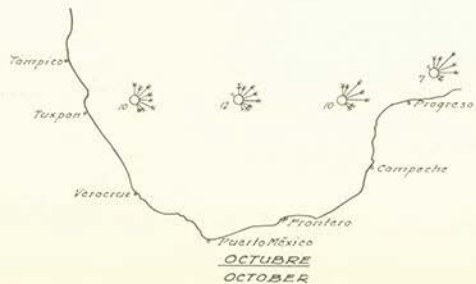
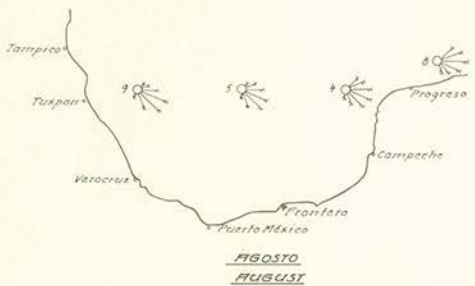
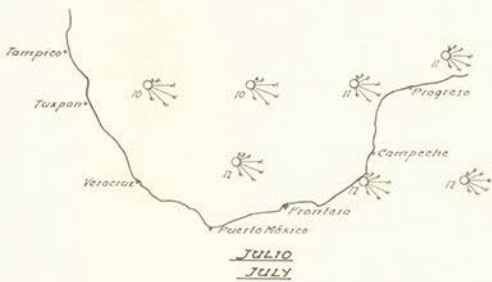
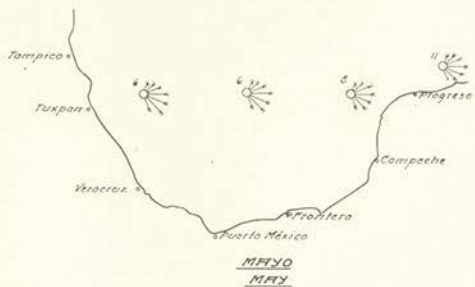
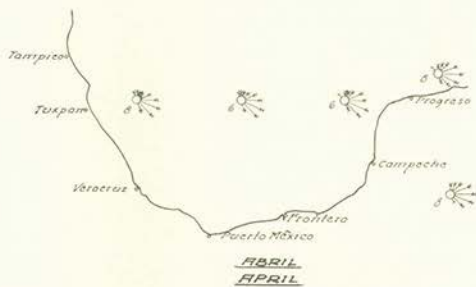
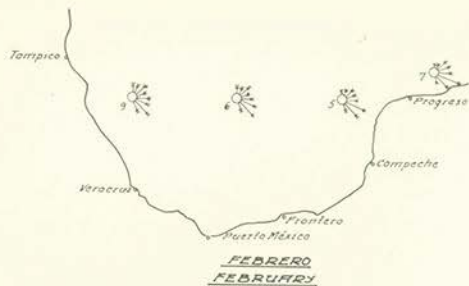
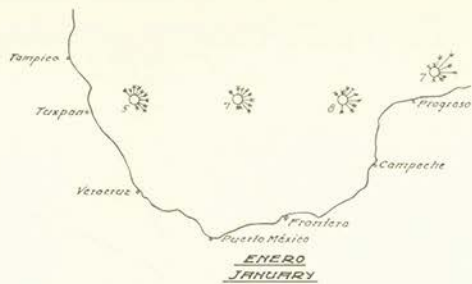
Arena Sand.
Arcilla Clay.

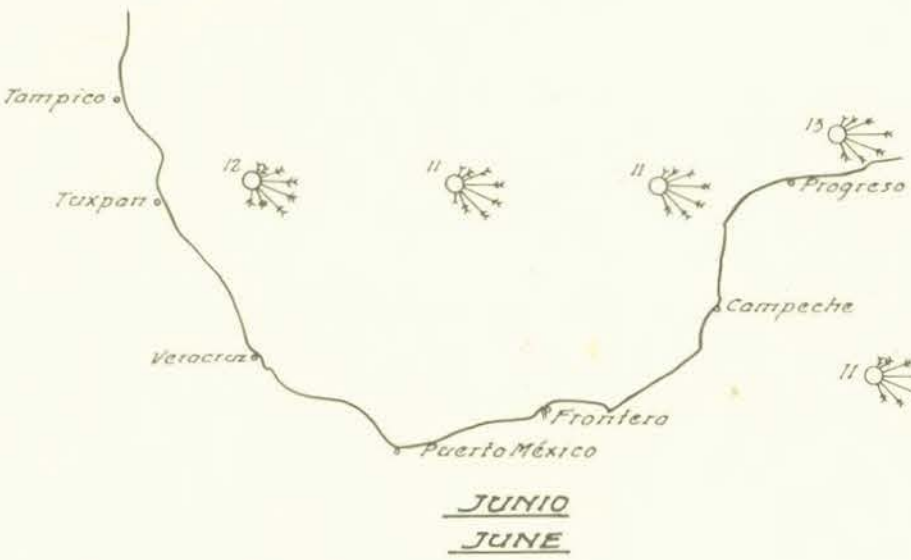
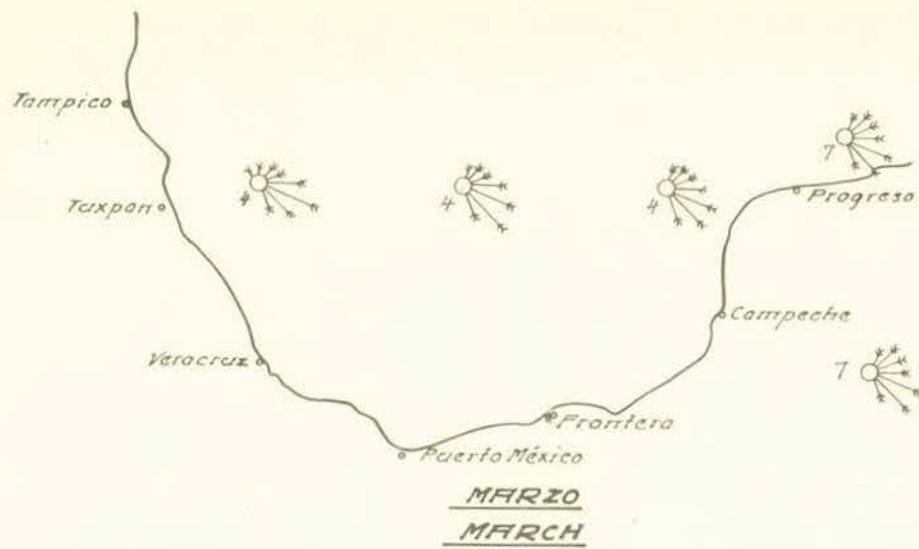
Resistencia al corte
 $F_{0.1}$ Shear strength
kg.
Se.

- o { Pruebas de compresión libre en el sitio
Unconfined compression tests on site
- { Pruebas de compresión libre en el laboratorio.
Unconfined compression tests in laboratory
- + { Pruebas de paleta.
Vane tests.

Para la ubicación de las perforaciones,
véase la lámina N° 5
For location of borings, see plate no. 5

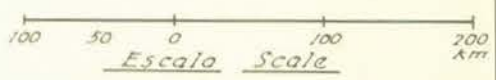




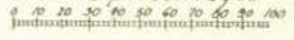


Nota:
 Los flechas en la rosa de vientos indican:
 a Dirección y sentido de los vientos
 b Porcentajes de vientos en proporción al largo de las flechas.
 c Intensidad (promedio) según la escala de Beaufort: igual al número de plumas en las flechas
 d Los números dan porcentajes de calmas y variables

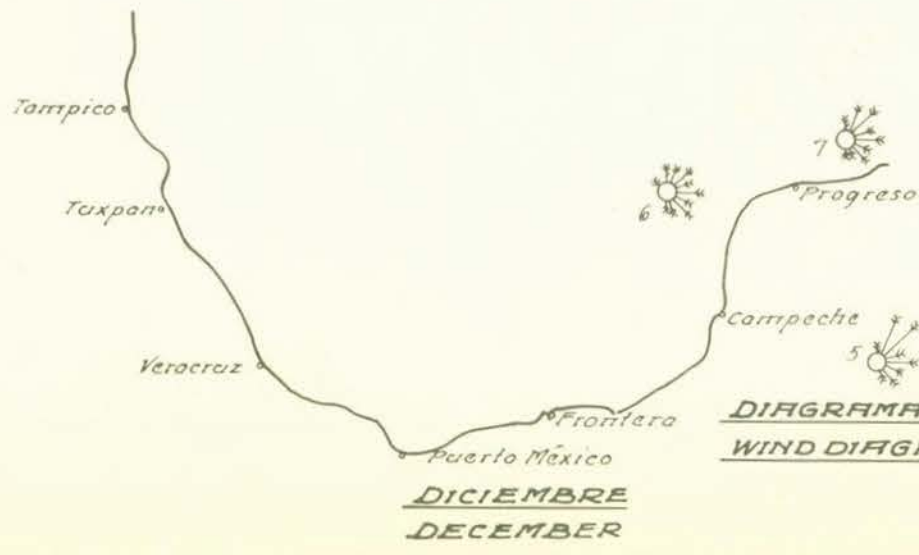
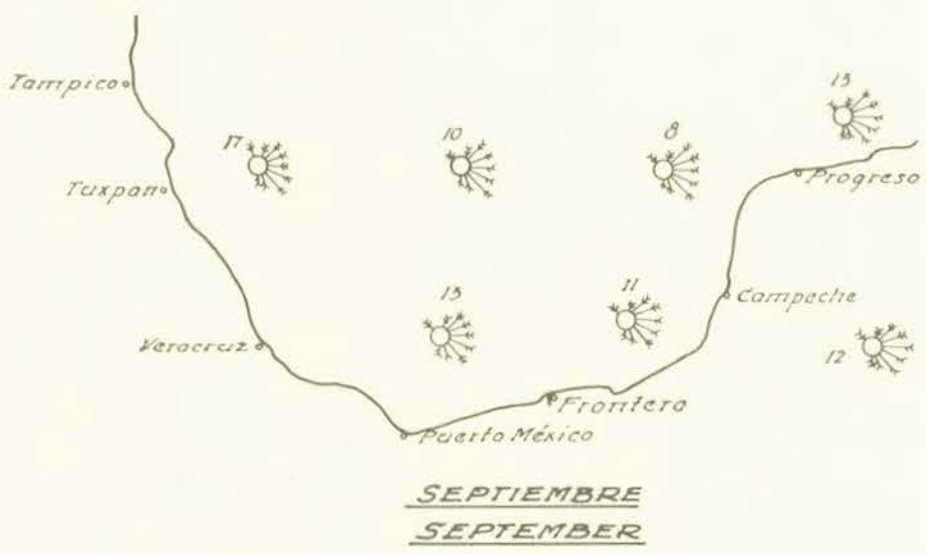
Note:
 The arrows in the wind roses show:
 a directions of the winds (the arrows fly with the wind)
 b Wind percentages in proportion to the length of the arrows
 c wind forces (average), scale equal to the number of feathers on the arrows
 d Numbers give percentages of calms and variables.



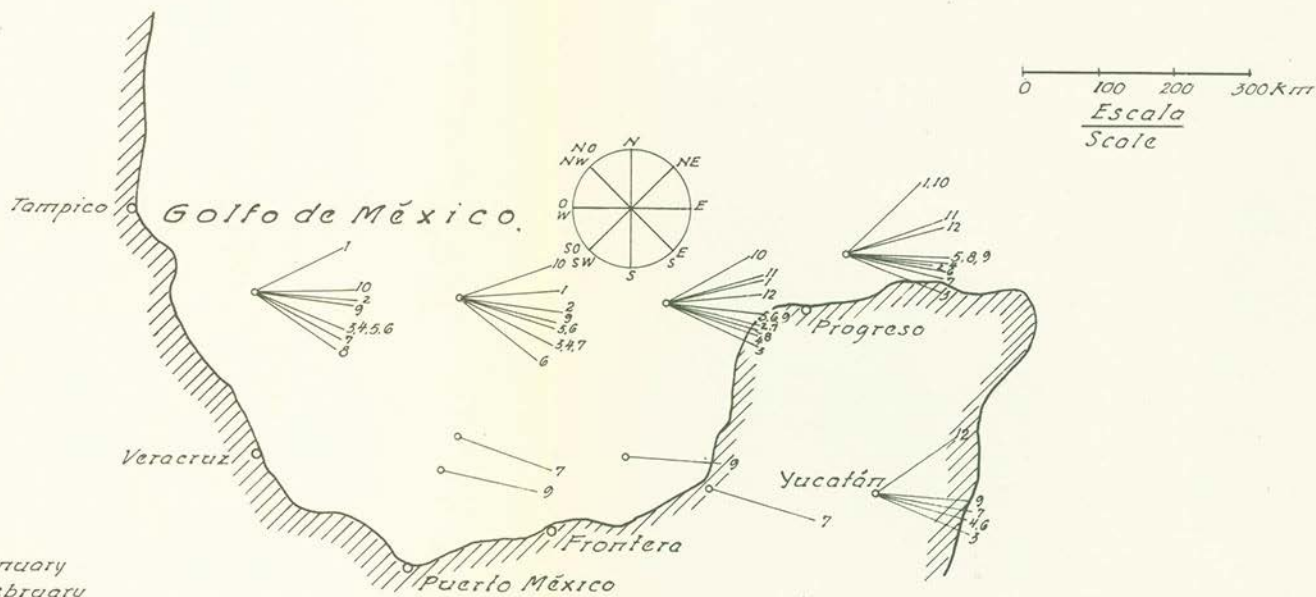
Escales de porcentajes de vientos
 Scale of wind percentages



Copiado de "Pilot chart of the Central American Waters" 1947-1949.



DIAGRAMAS DE VIENTOS GOLFO DE CAMPECHE
WIND DIAGRAMS GOLFO DE CAMPECHE.

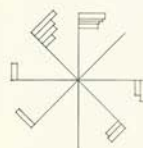
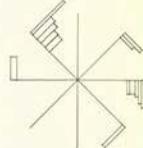
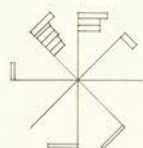
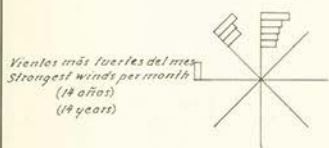
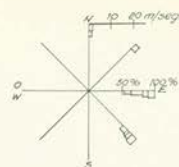
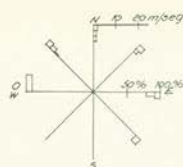
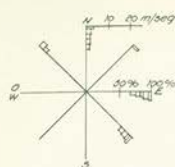
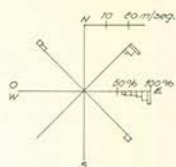
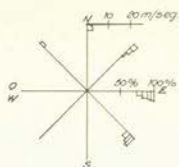
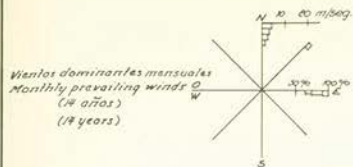


Enero	1	January
Febrero	2	February
Marzo	3	March
Abril	4	April
Mayo	5	May
Junio	6	June
Julio	7	July
Agosto	8	August
Septiembre	9	September
Octubre	10	October
Noviembre	11	November
Diciembre	12	December

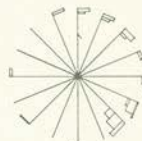
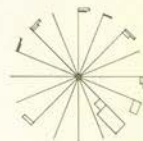
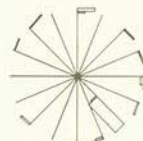
Nota: Las líneas indican la dirección del viento dominante de cada mes dado en la lámina No 8

Note: The lines show the direction of the prevailing wind for each month found from plate No 8

VIENTOS DOMINANTES EN EL GOLFO DE MEXICO
PREVAILING WINDS IN GOLFO DE MEXICO



Vientos durante 1980
Winds during 1980



ENERO
JANUARY

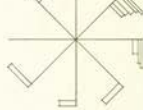
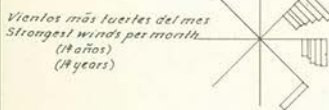
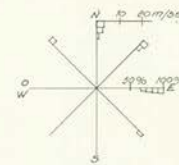
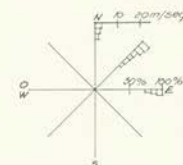
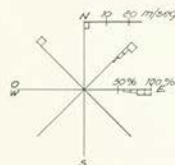
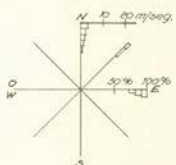
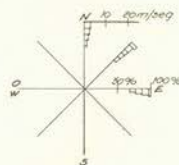
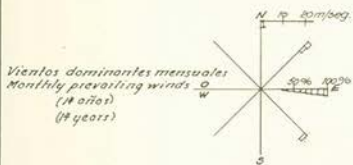
FEBRERO
FEBRUARY

MARZO
MARCH

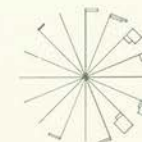
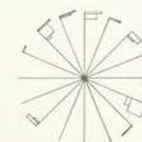
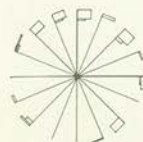
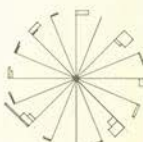
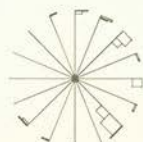
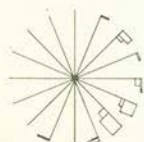
ABRIL
APRIL

MAYO
MAY

JUNIO
JUNE



Vientos durante 1980
Winds during 1980



JULIO
JULY

AGOSTO
AUGUST

SEPTIEMBRE
SEPTEMBER

OCTUBRE
OCTOBER

NOVIEMBRE
NOVEMBER

DECEMBER
DECEMBER

Nota: Velocidades en m/seg.
Frecuencias en %

Nota: Velocities in m.p.s.ec.
Frequencies in %



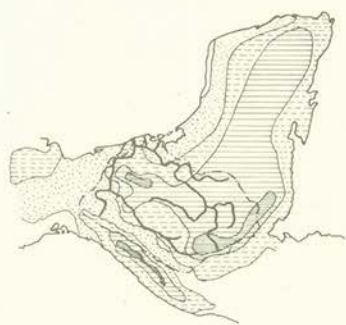
ENERO
JANUARY



FEBRERO
FEBRUARY



MARZO
MARCH



ABRIL
APRIL



JULIO
JULY



AGOSTO
AUGUST



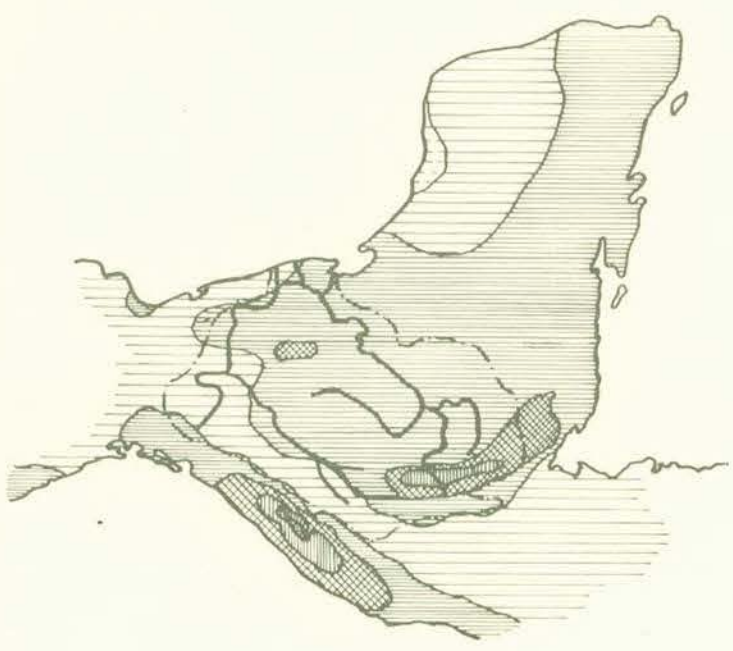
SEPTIEMBRE
SEPTEMBER



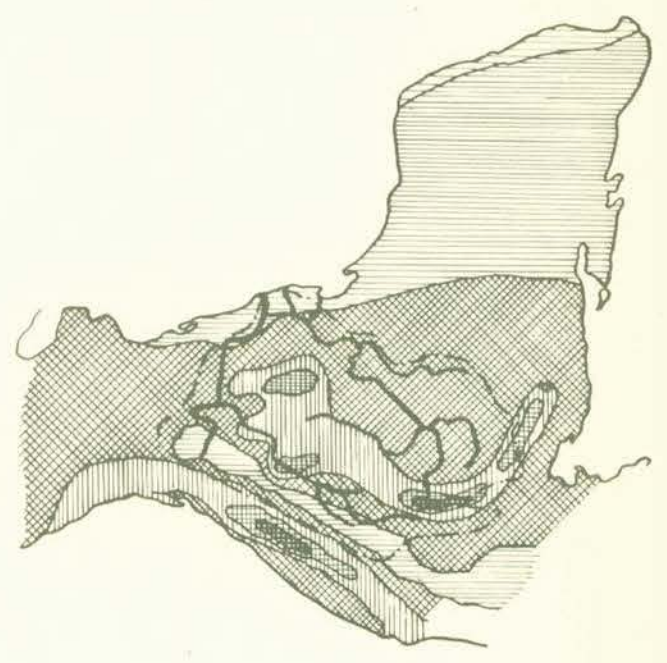
OCTUBRE
OCTOBER

Escala
Scale 100 200 300 400 500 Km

Nota: Basada en observaciones de 1921 a 1930
Note: Based on observations from 1921 to 1930



MAYO
MAY



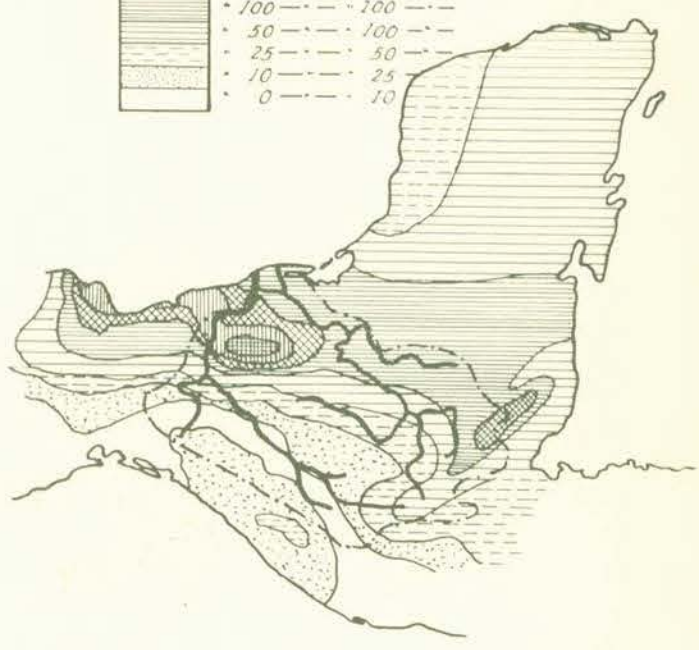
JUNIO
JUNE

Lluvia en mm. mes por mes del año
Precipitation in mm. per month.

de 600 mm a 700 mm	
• 500 —	• 600 —
• 400 —	• 500 —
• 300 —	• 400 —
• 200 —	• 300 —
• 100 —	• 200 —
• 50 —	• 100 —
• 25 —	• 50 —
• 10 —	• 25 —
• 0 —	• 10 —



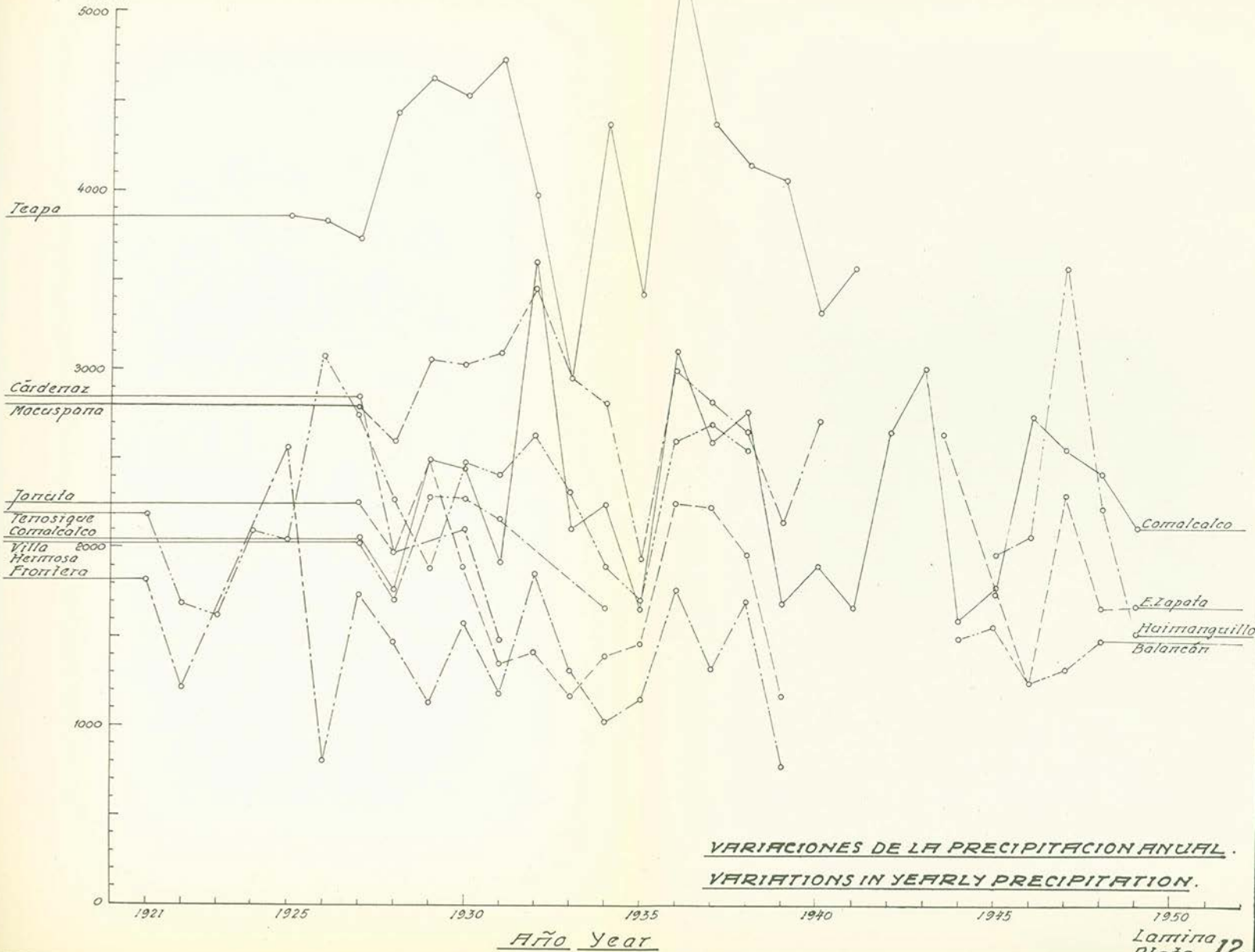
NOVIEMBRE
NOVEMBER.



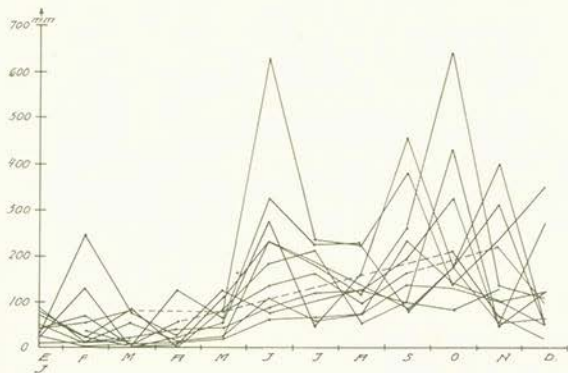
DICIEMBRE
DECEMBER

PRECIPITACIÓN EN LA CUENCA
PRECIPITATION IN CATCHMENT AREA

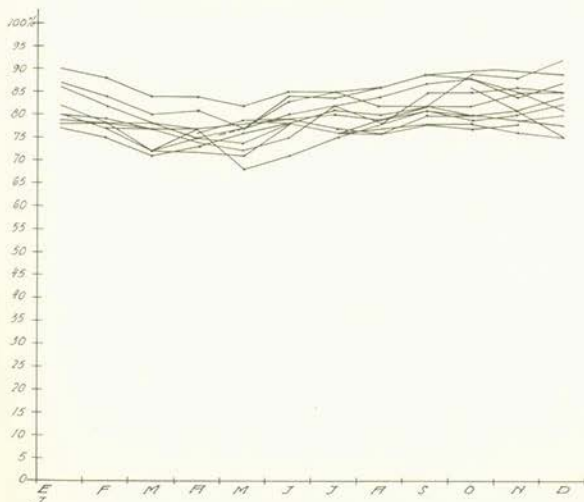
Precipitación
Precipitation
mm



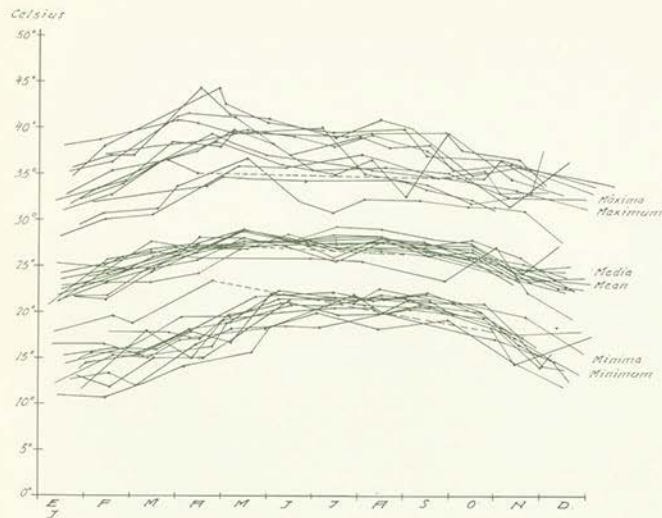
VARIACIONES DE LA PRECIPITACION ANUAL.
VARIATIONS IN YEARLY PRECIPITATION.



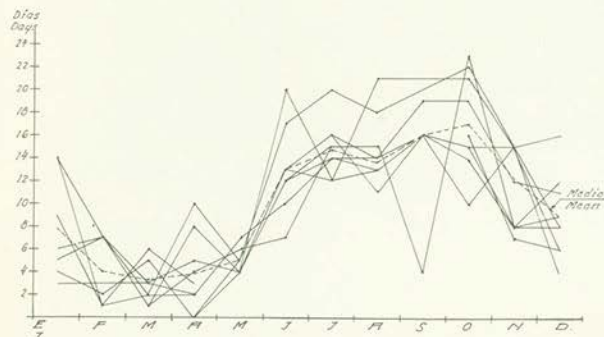
LLUVIA MENSUAL
MONTHLY PRECIPITATION



HUMEDAD
HUMIDITY



TEMPERATURA MENSUAL
MONTHLY TEMPERATURE



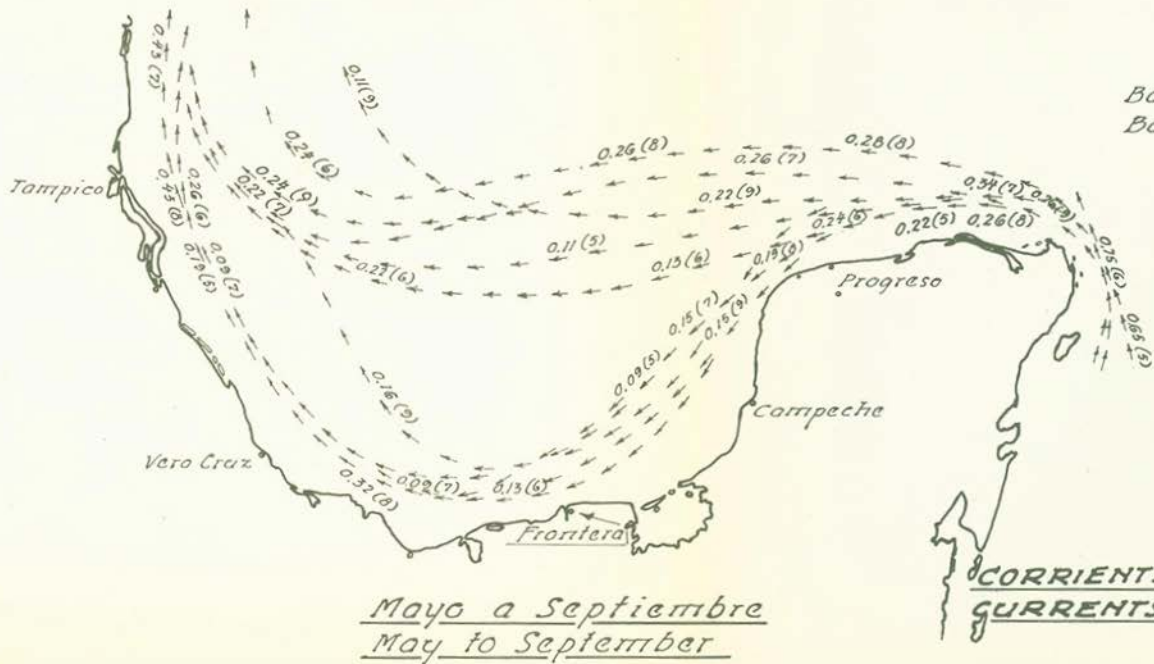
DÍAS CON MÁS DE 0.1mm DE LLUVIA
DAYS WITH MORE THAN 0.1mm RAIN

TEMPERATURA, HUMEDAD Y PRECIPITACIÓN EN
FRONTERA
TEMPERATURE, HUMIDITY AND PRECIPITATION AT



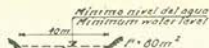
Nota:
 0.22 (10) significa 0.22 m/sec
 medido en Octubre.

Note:
 0.22 (10) means 0.22 m/sec
 measured in October



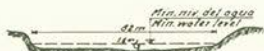
Basado en } Pilots Chart of
 the Central
 Based on } American Waters

CORRIENTES EN EL GOLFO DE MEXICO
CURRENTS IN THE GULF OF MEXICO



RIO GONZÁLEZ

Km 34



RIO Tlacotalpa o de la Sierra

Km 20



RIO TERPA

Km 1

La boca de la barra restringe la profundidad útil a 0.5m
The sand bar at the entrance to the river limits the effective depth to 0.5m



RIO MEZCALAPA

Sección en el Km 40 al Oeste de Villa Hermosa
Section at Km 40 west of Villa Hermosa



RIO MEZCALAPA

Sección típica aguas abajo del Km 50
El fondo es de grava fina y arena en constante cambio
Typical Section below Km 50
The bottom is of sand and fine gravel and in continuous change



RIO MACUSPANA

Km 61



RIO MACUSPANA

Km 170



RIO MACUSPANA

Km 112



RIO MACUSPANA

Km 187



RIO MACUSPANA

Km 143

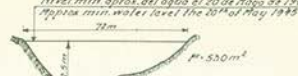
Nota: Basado en investigaciones de Industrias Higgins*

Nota: Based on investigations by Industrias Higgins*



RIO CHILAPILLAS

Km 50



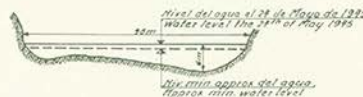
RIO CHILAPA

Km 11



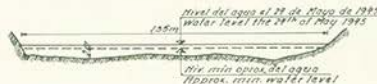
RIO GRIJALVA

(Villa Hermosa)



RIO GRIJALVA

Km 104



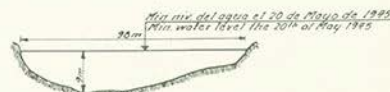
RIO GRIJALVA

Km 70



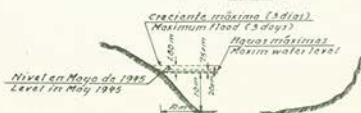
RIO GRIJALVA

Km 65



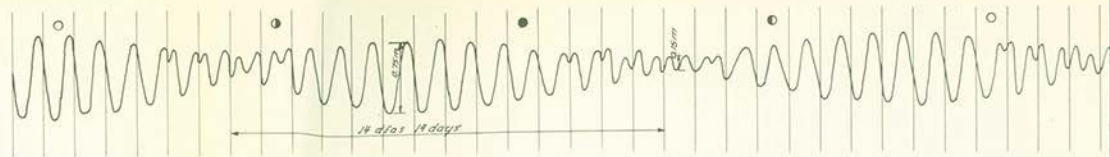
RIO GRIJALVA

Km 46

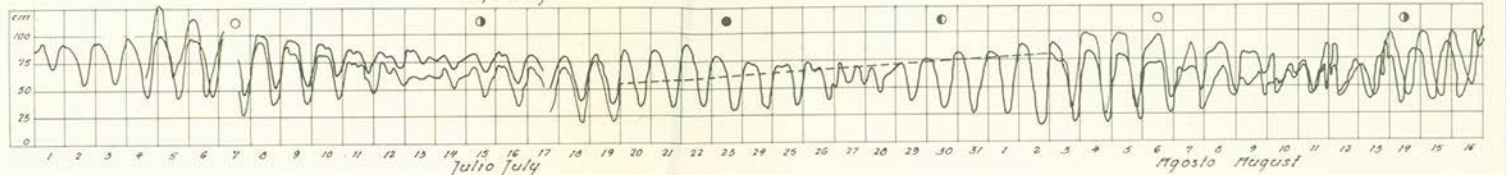
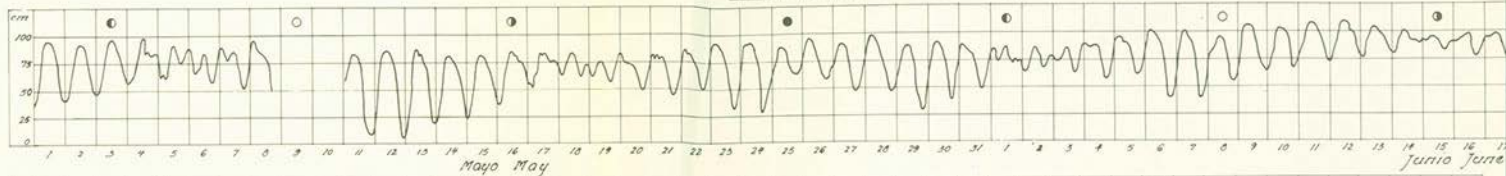


RIO GRIJALVA

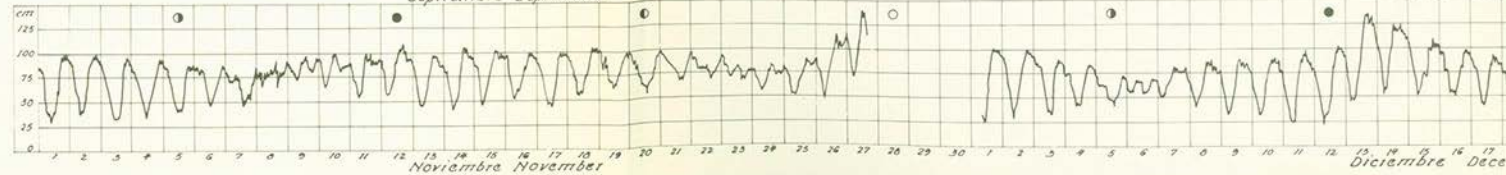
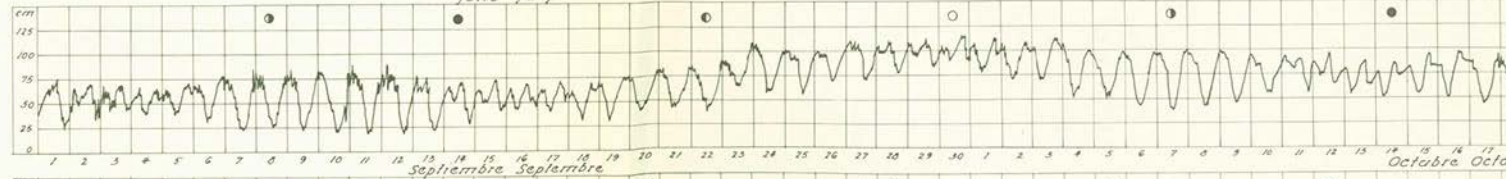
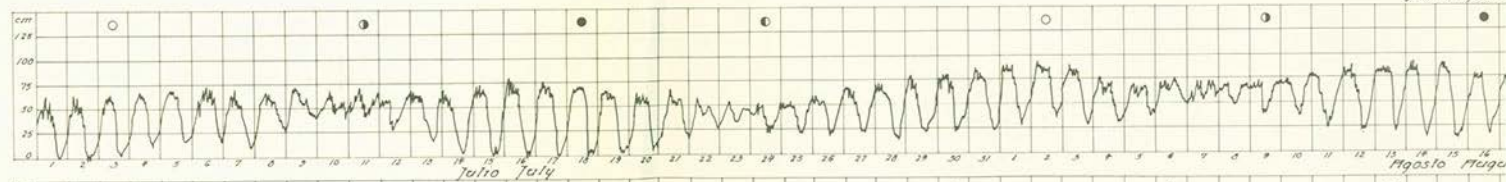
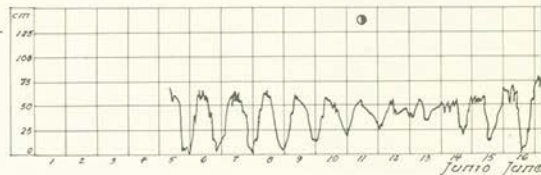
(Frontera)



CARTAS TÍPICAS DE MAREA EN EL GOLFO DE CAMPECHE
TYPICAL TIDE CHARTS FOR GOLFO DE CAMPECHE.

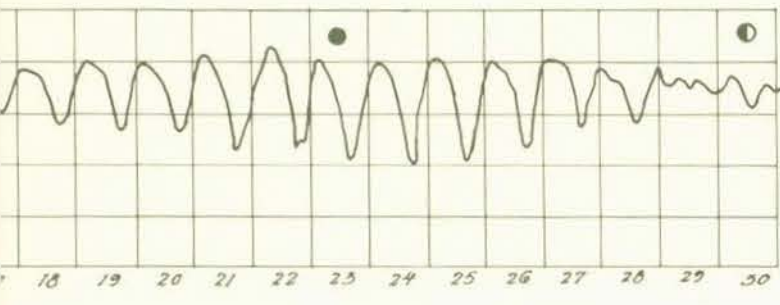
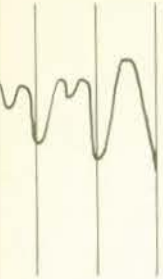


OBSERVACIONES EN EL RÍO EN FRONTERA Y EN EL CANAL EN 1914.
OBSERVATIONS IN THE RIVER AT FRONTERA AND AT THE LATERAL CANAL 1914.

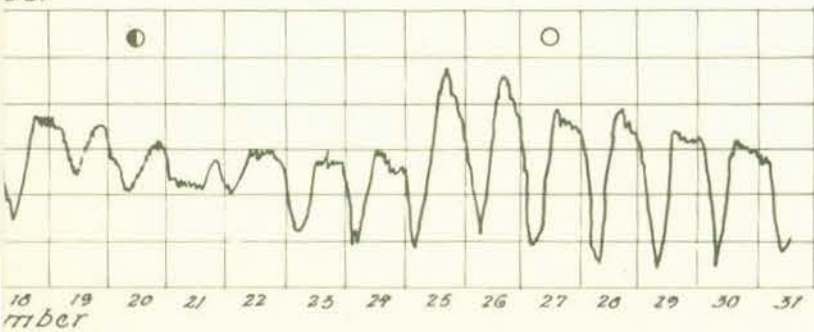
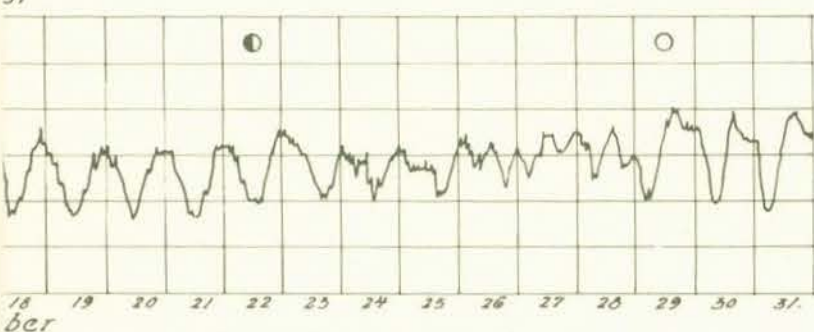
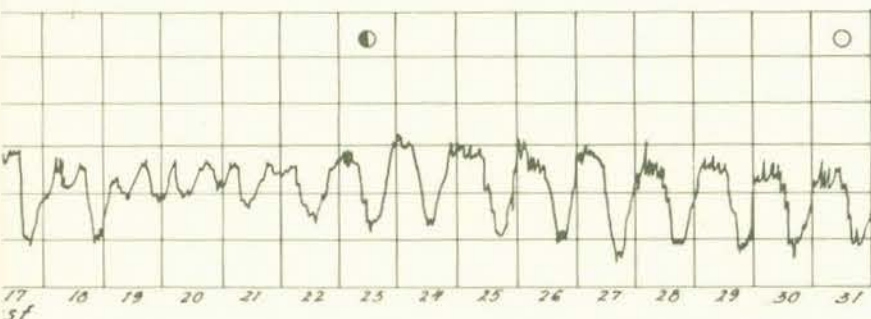
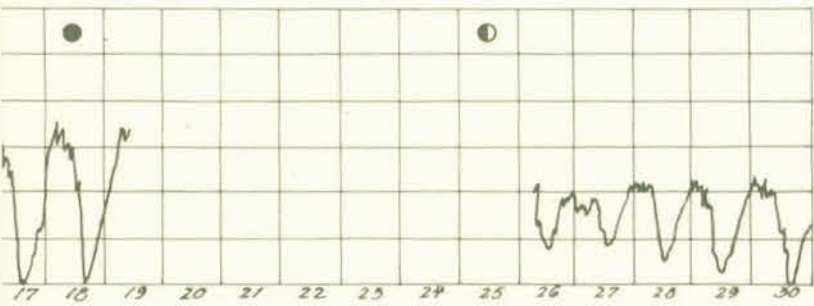


OBSERVACIONES DURANTE 1917 EN EL CAMPAMENTO DE LA SECRETARIA DE MARINA
OBSERVATIONS 1917 AT THE CAMP OF SECRETARIA DE MARINA

OBSERVACIONES D
WATER LEVEL

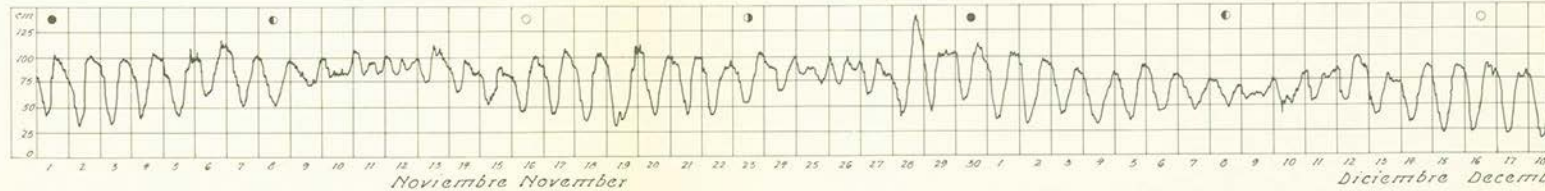
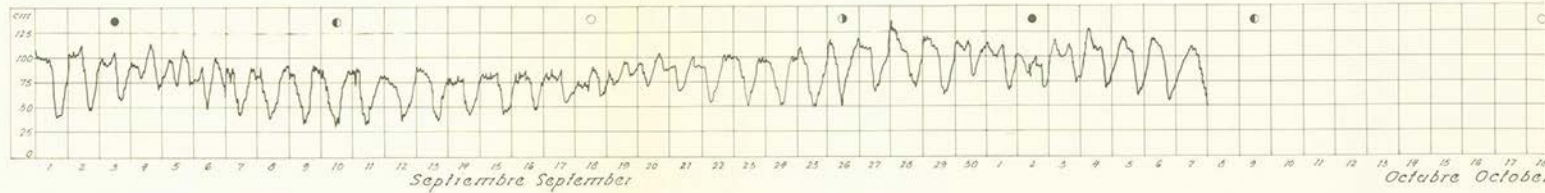
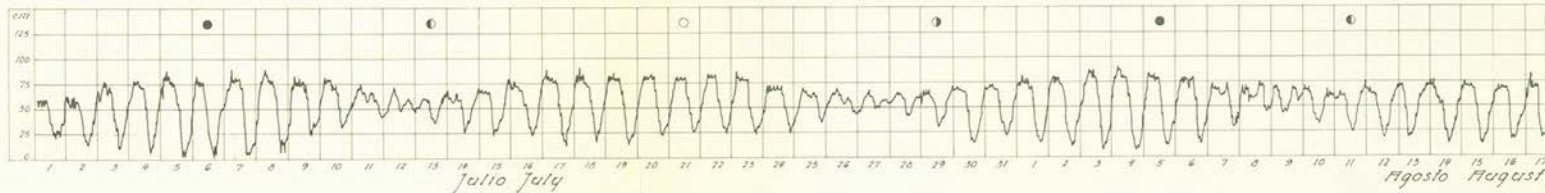
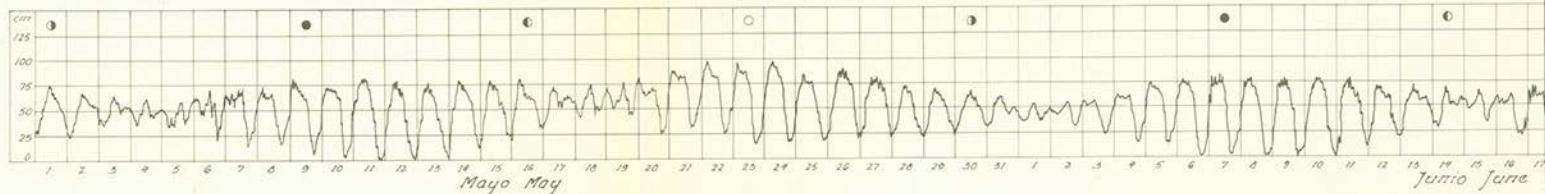
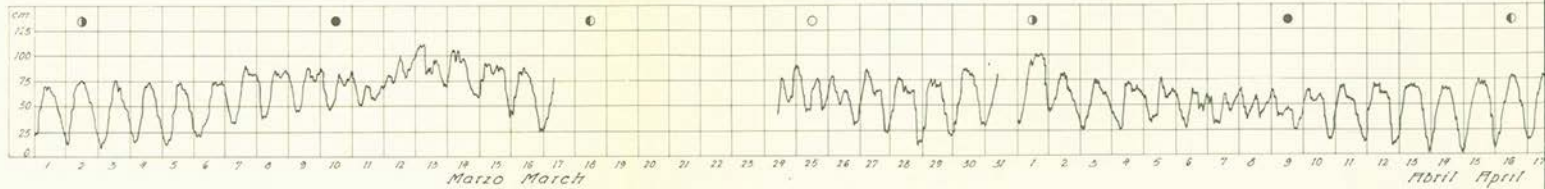
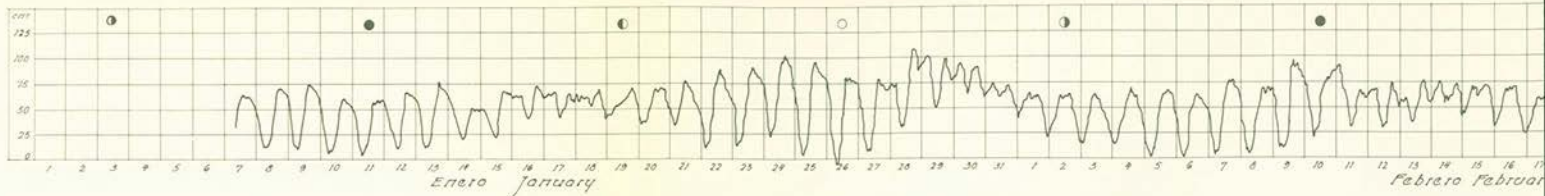


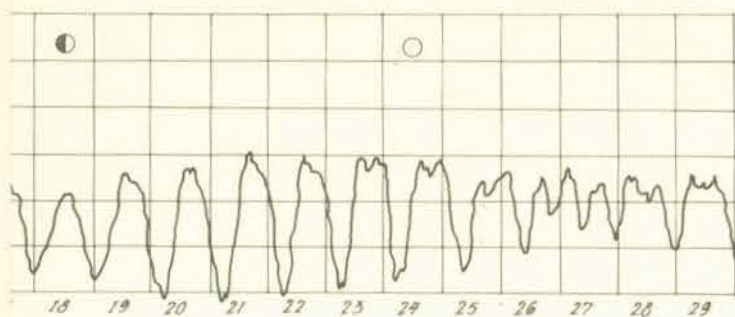
SECRETARIA DE MARINA
 UNIDAD DE HISTORIA
 Y CULTURA NAVAL
 BIBLIOTECA CENTRAL



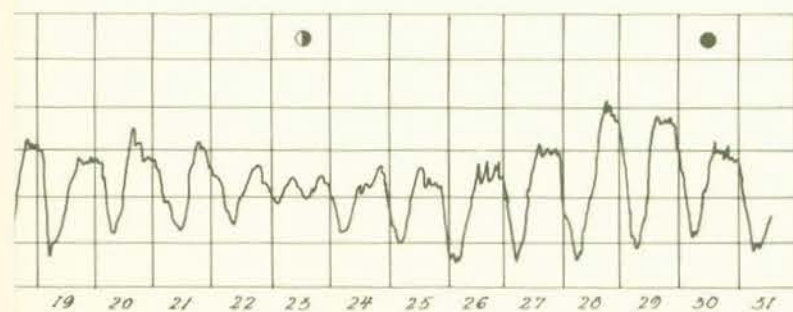
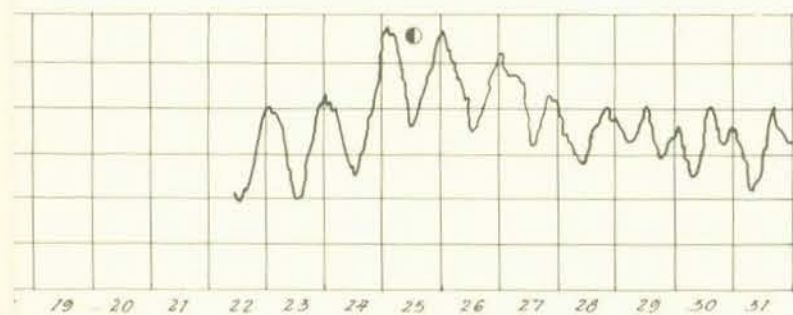
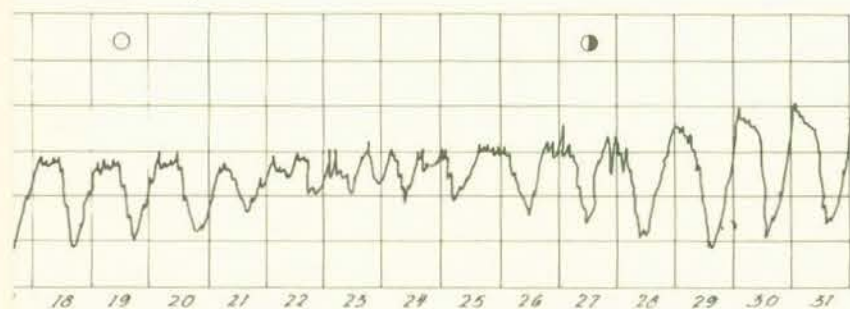
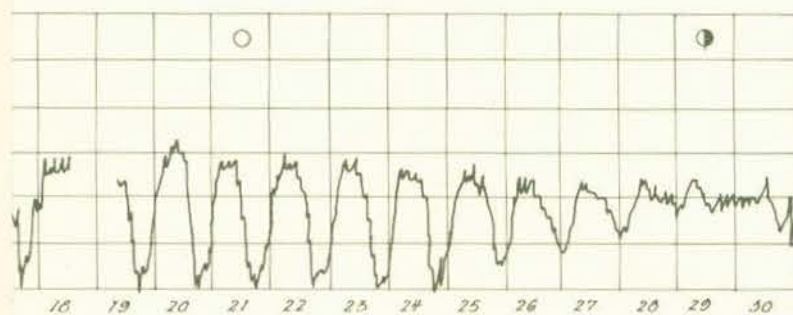
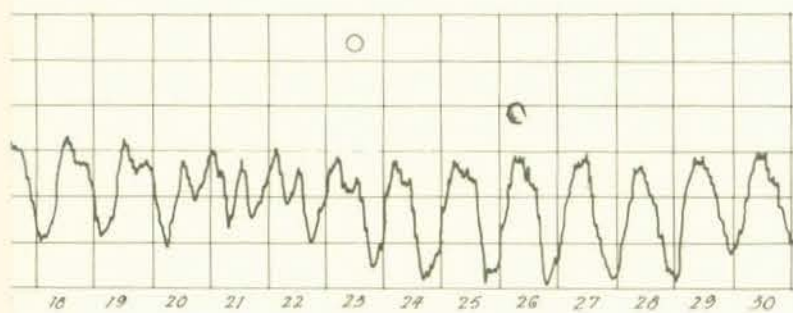
Nota: Los niveles del agua están medidos tomando como cero la más baja marea

Note: Water levels are measured from a zero point corresponding to minimum Low water.





4



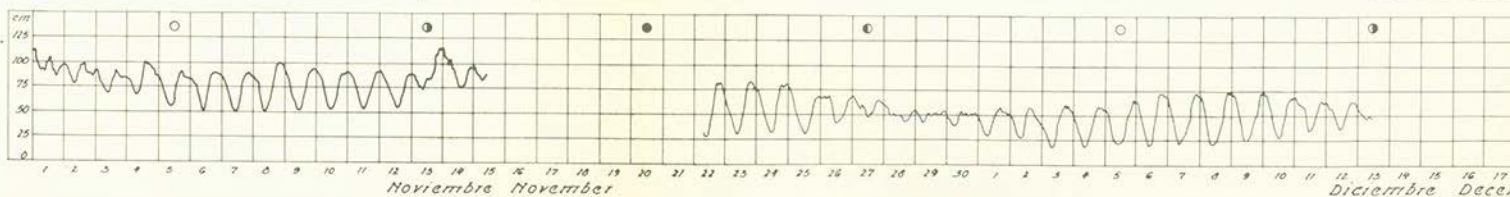
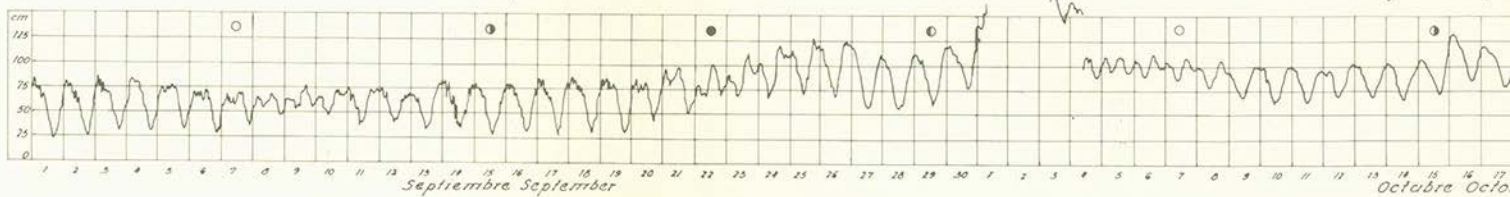
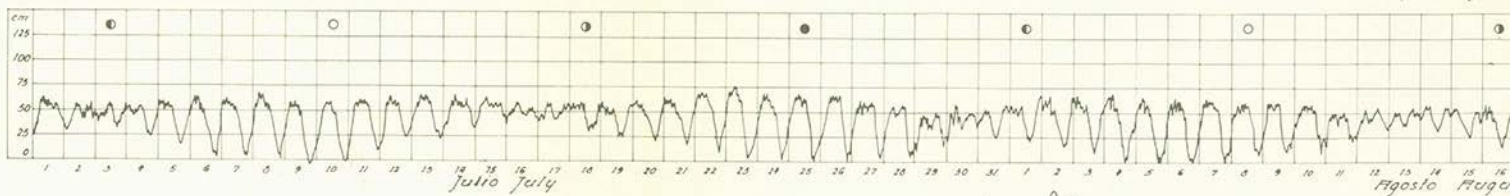
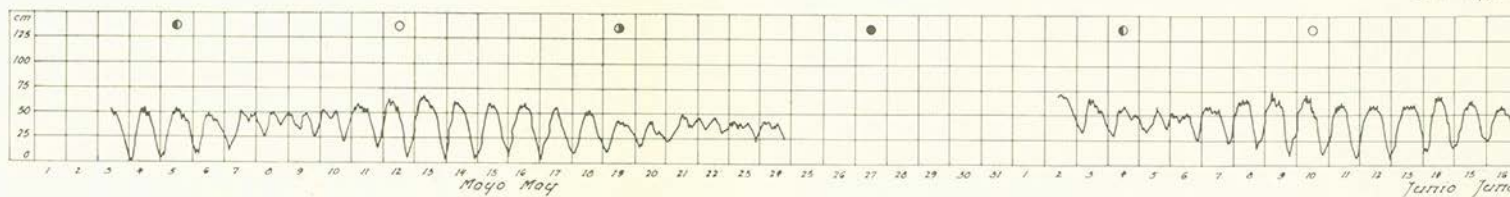
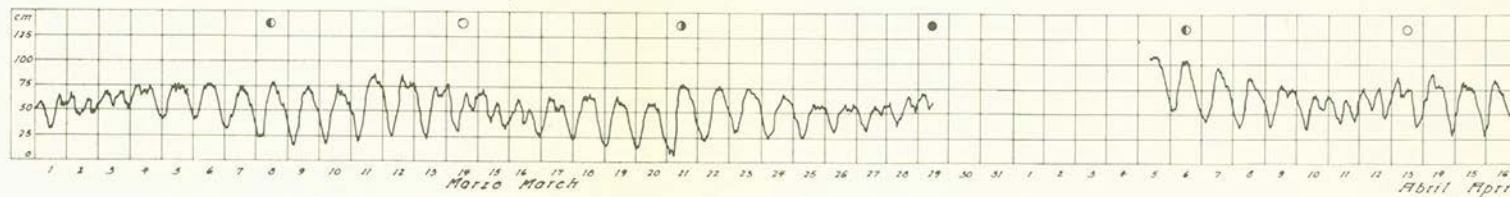
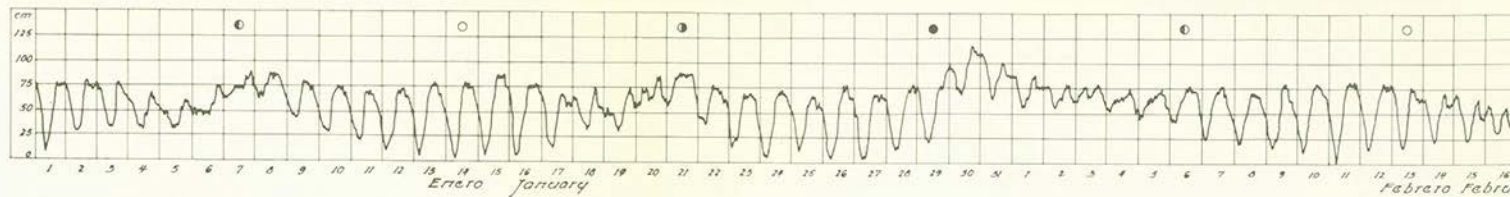
CT

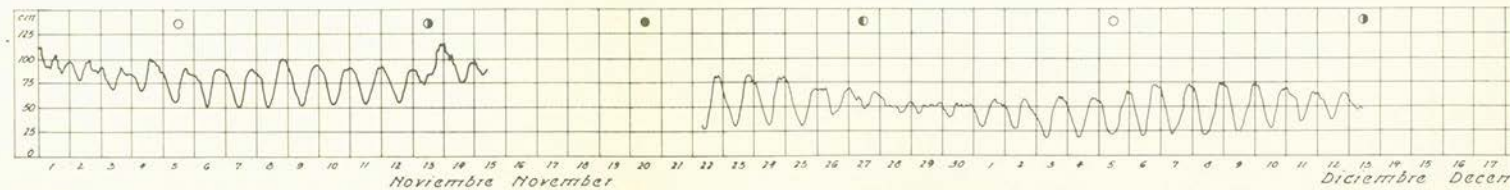
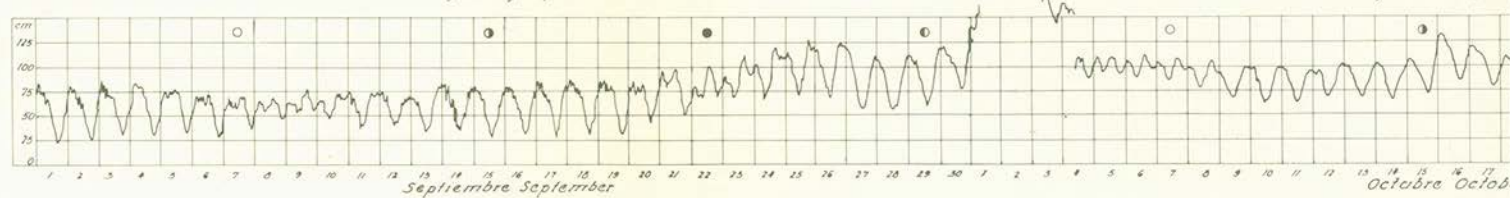
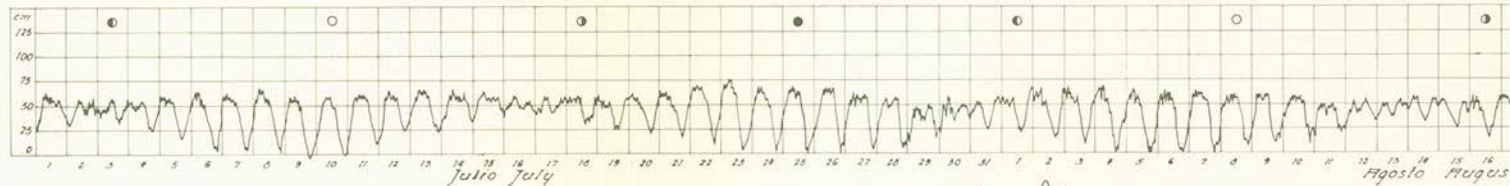
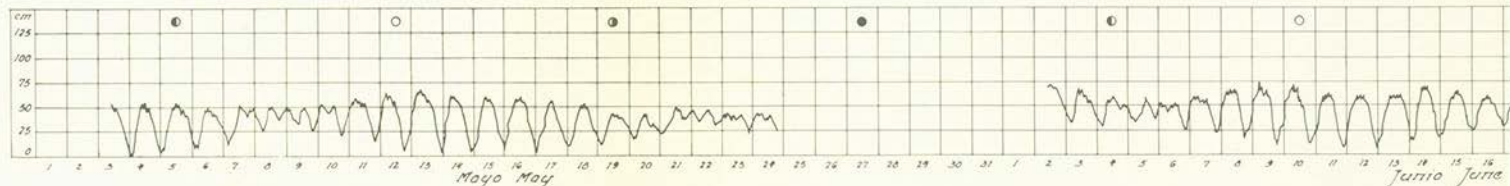
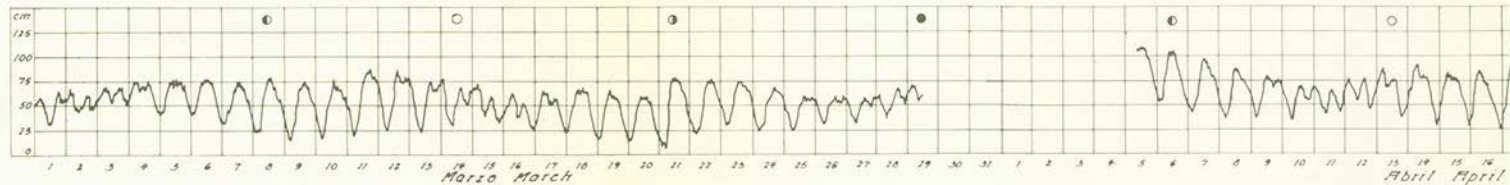
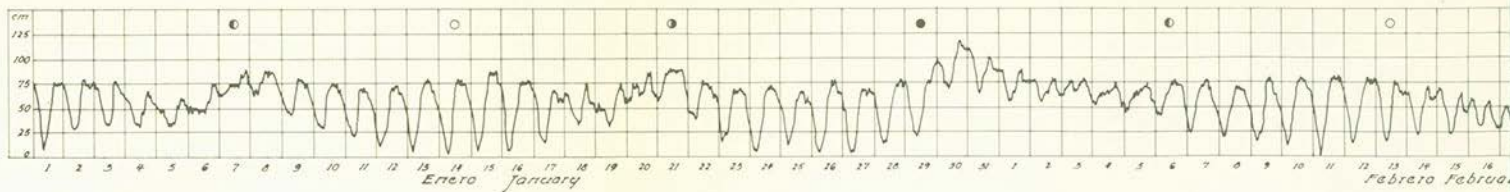


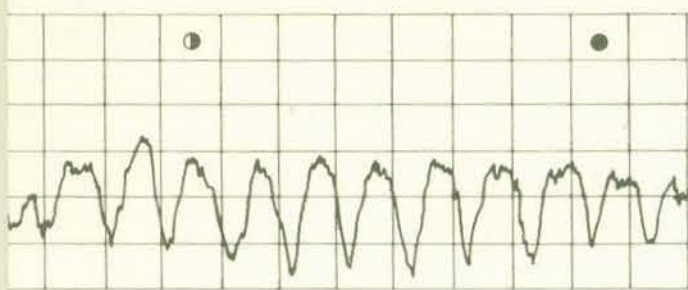
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UNIDAD DE HISTORIA
Y CULTURA NAVAL
BIBLIOTECA CENTRAL

Note: La escala se halla en el campamento de la secretaria de Marina (ver Lámina 5) El cero corresponde a la mínima bajamar

Note: The gauge is located at the camp of Secretaria de Marina (see plate 5) Zero point corresponds to minimum Low water

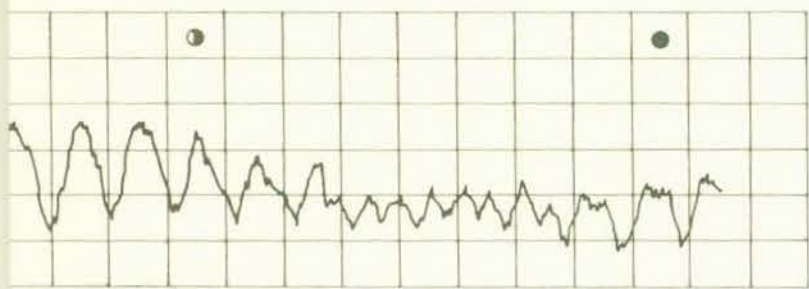




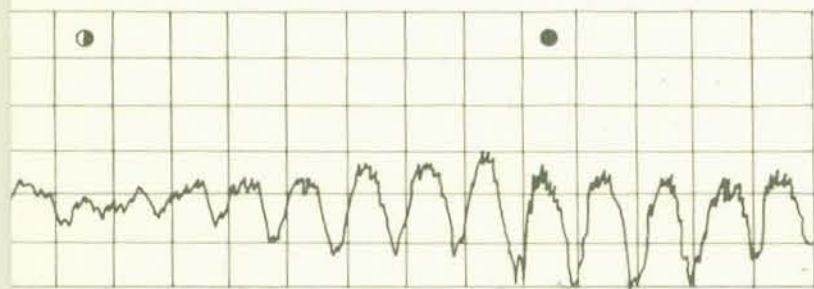


17 18 19 20 21 22 23 24 25 26 27 28

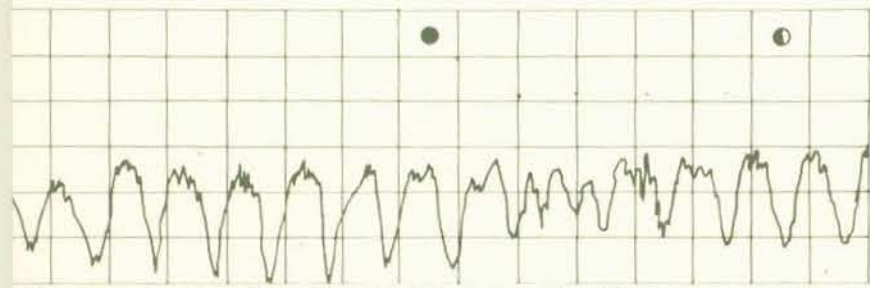
1949



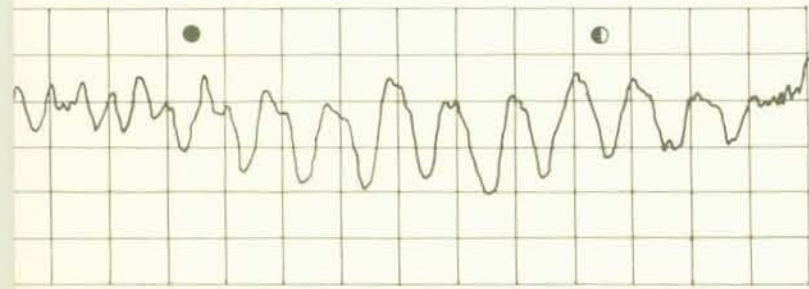
17 18 19 20 21 22 23 24 25 26 27 28 29 30



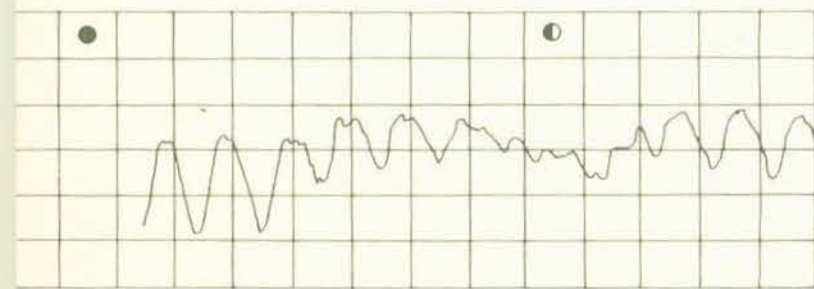
17 18 19 20 21 22 23 24 25 26 27 28 29 30



17 18 19 20 21 22 23 24 25 26 27 28 29 30 31



18 19 20 21 22 23 24 25 26 27 28 29 30 31



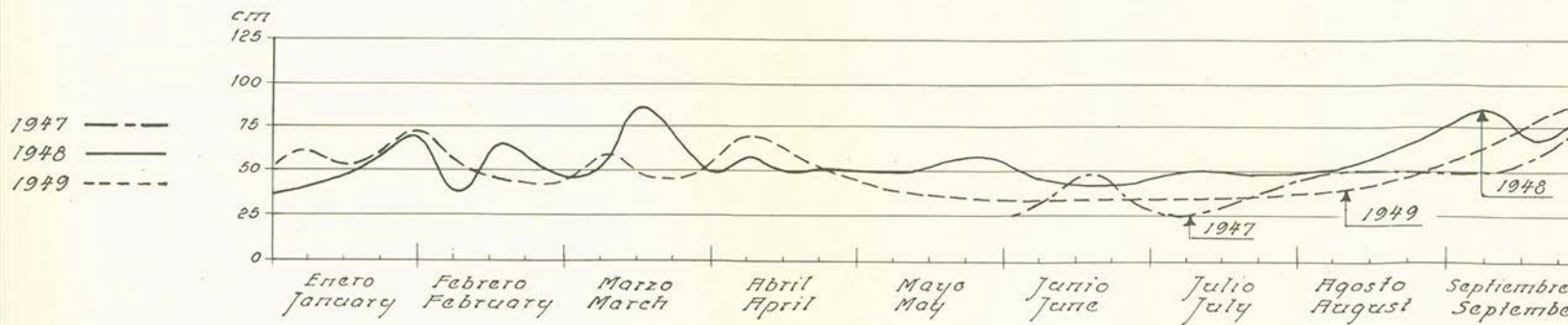
18 19 20 21 22 23 24 25 26 27 28 29 30 31

1949

Nota: La escala se halla en el carrizamiento de la secretaría de Marina (ver lámina 5)

El cero corresponde a la mínima bajamar

Note: The gauge is located at the carriz of Secretaría de Marina (see plate 5)
Zero point corresponds to minimum Low water

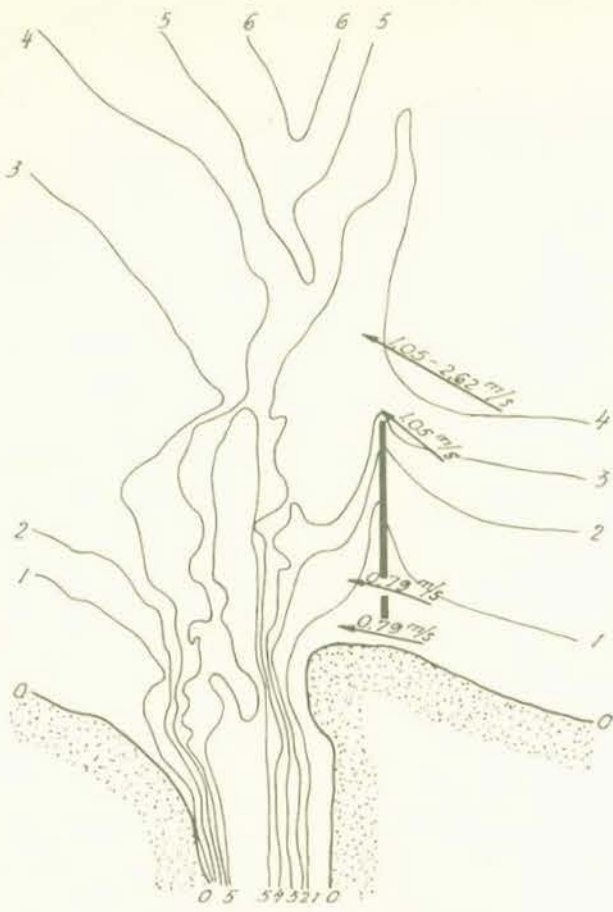


FLUCTUACIONES ANUALES DEL NIVEL DE AGUA DIARIO MEDIO EN EL CAMPAMENTO

YEARLY FLUCTUATIONS IN DAILY MEAN WATER LEVELS AT THE CAMP OF THE SE

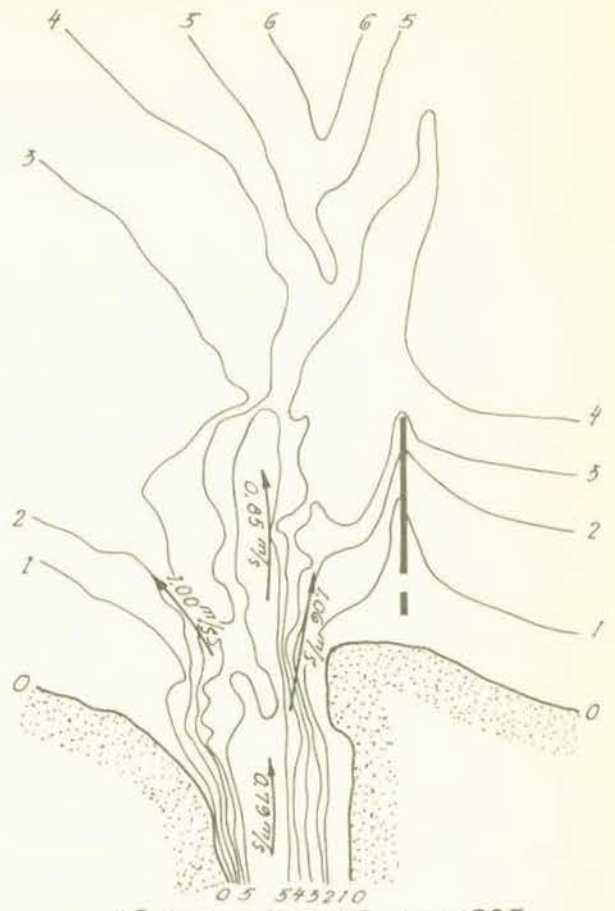
Nota: El ce

Note: Zero,



16 DE JULIO DE 1925

16th OF JULY 1925

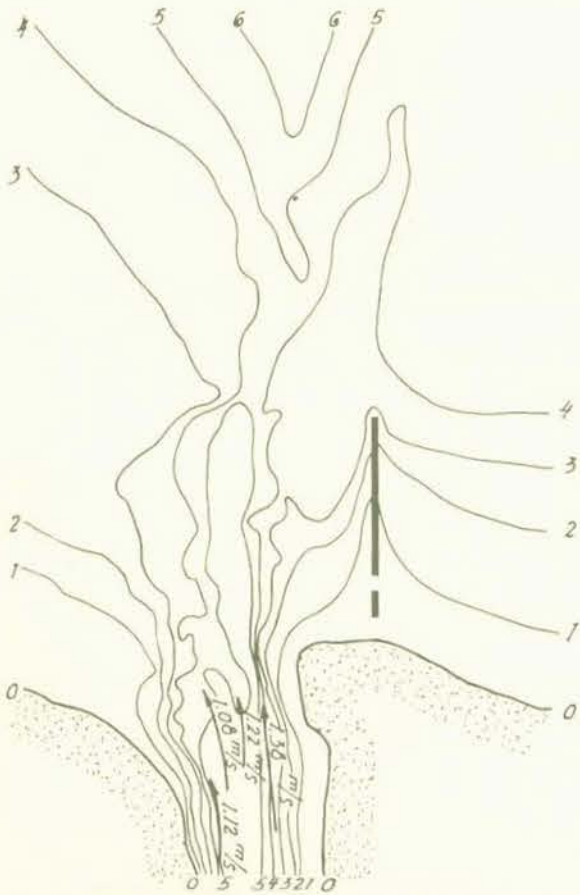


16 DE AGOSTO DE 1925

16th OF AUGUST 1925.

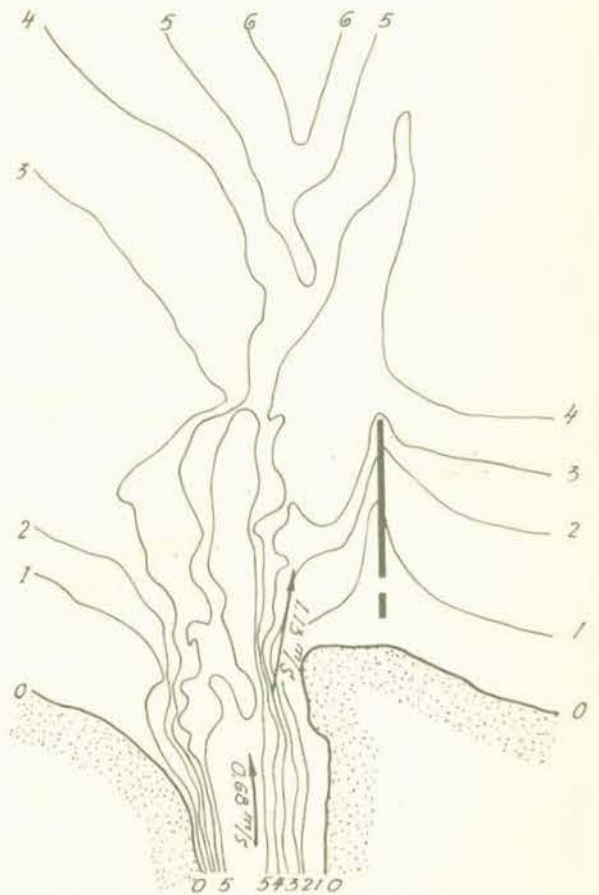
Nota: Las profundidades indicadas corresponden al año 1927

Note: The depths shown correspond to the year 1927



NOVIEMBRE DE 1926

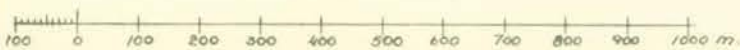
NOVEMBER 1926.

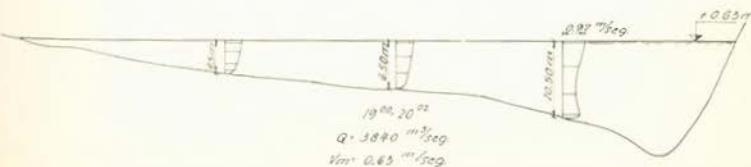
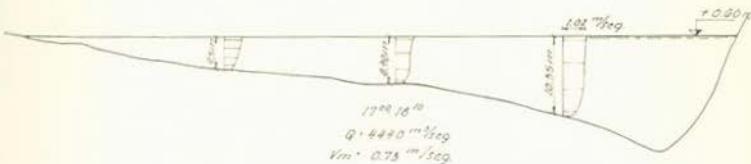
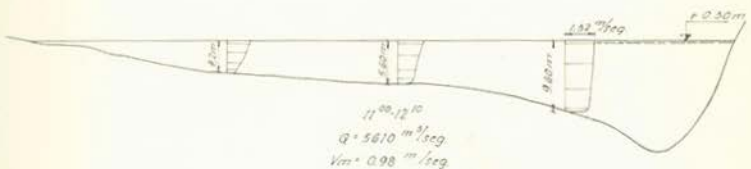
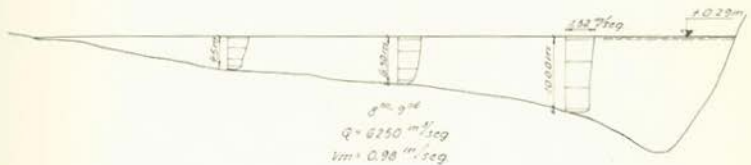
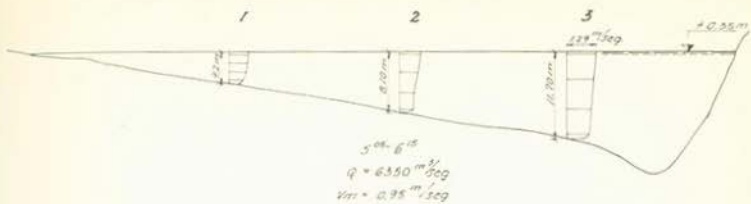


JUNIO DE 1927

JUNE 1927

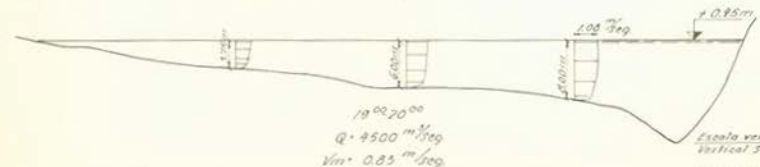
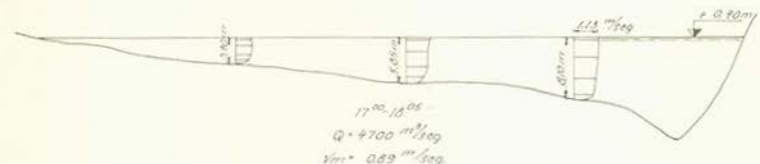
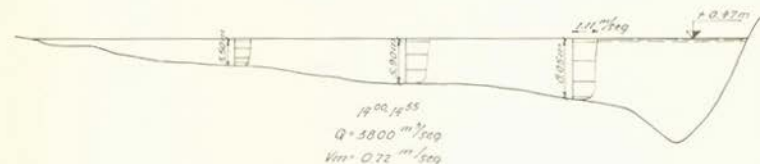
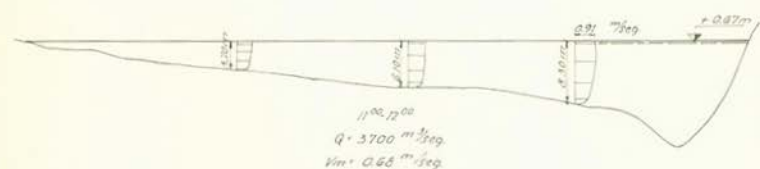
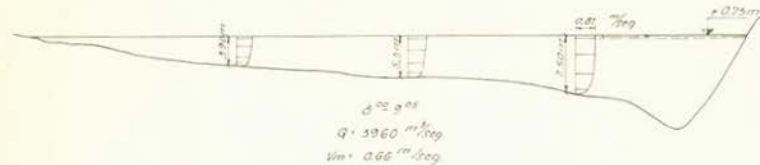
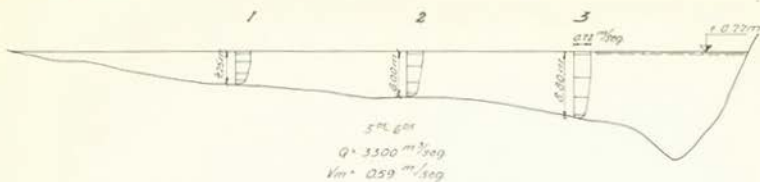
CORRIENTES EN LA BOCA DEL CANAL LATERAL ENTRE 1925 y 1927
CURRENTS IN THE MOUTH OF THE LATERAL CANAL 1925 TO 1927.





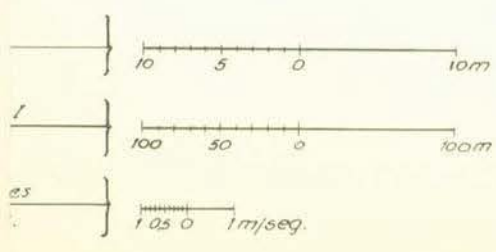
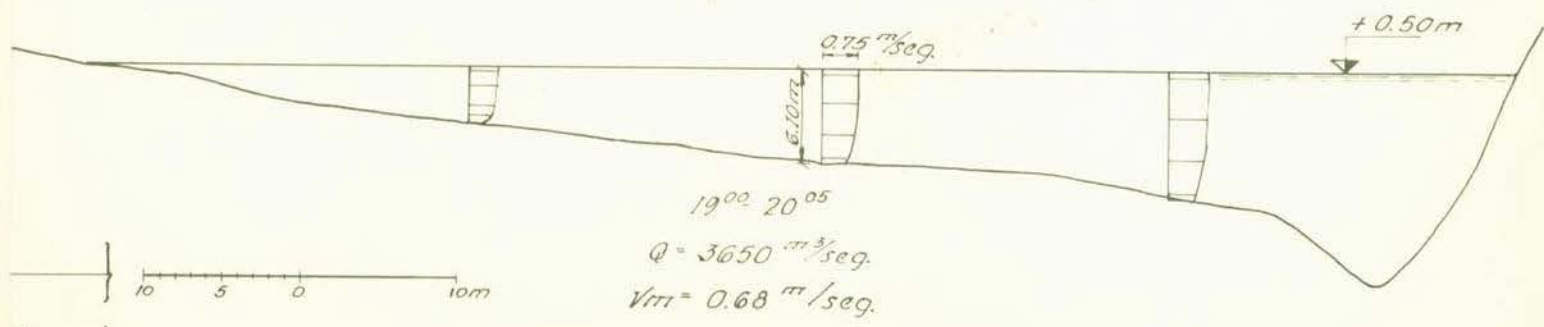
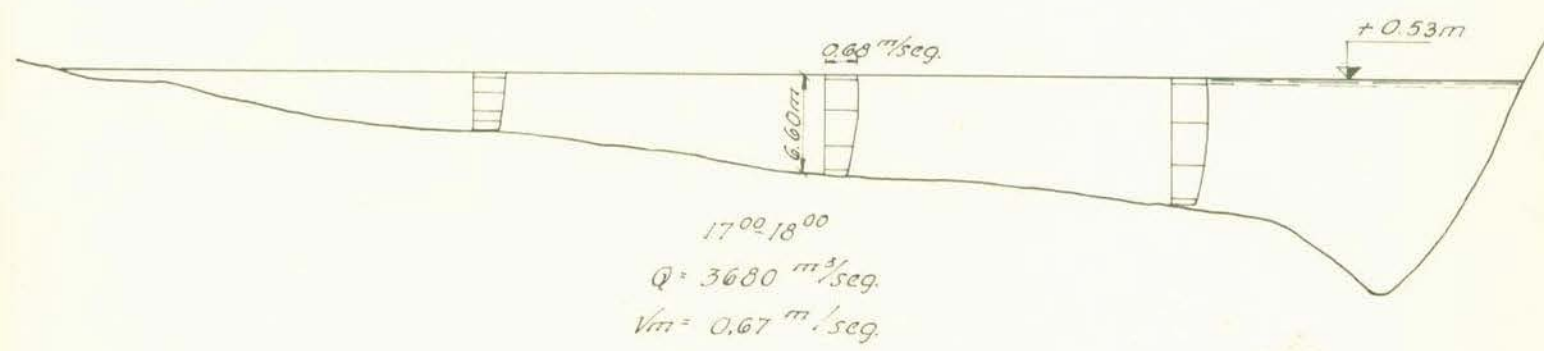
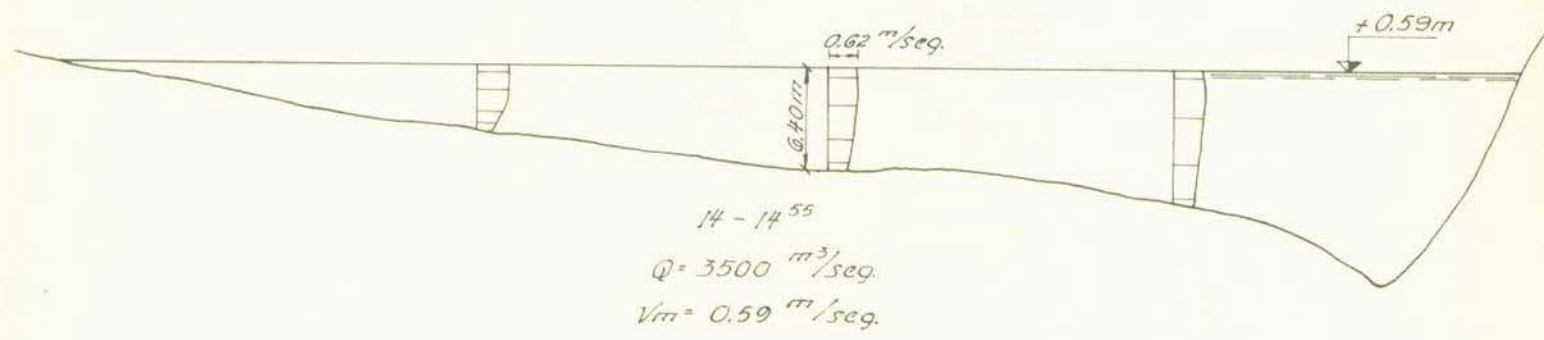
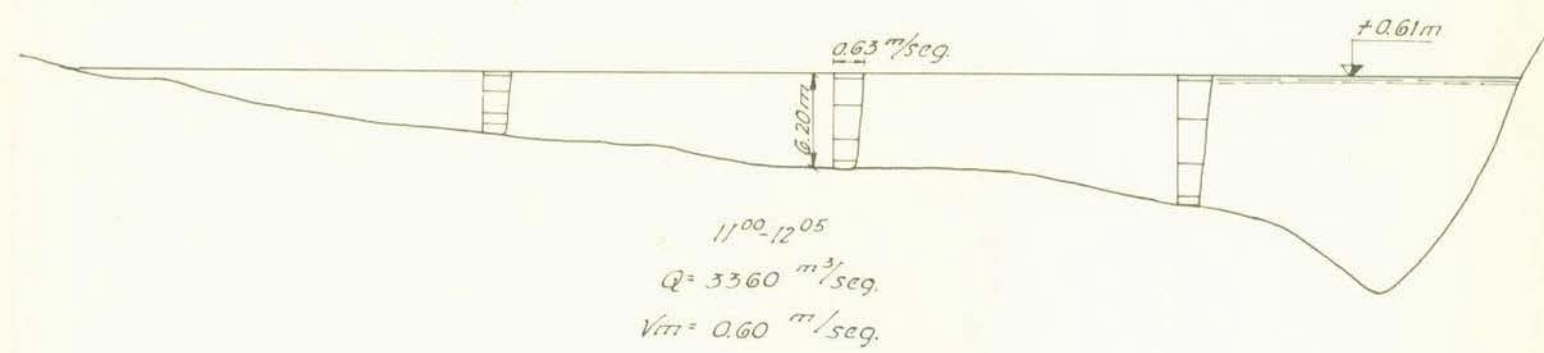
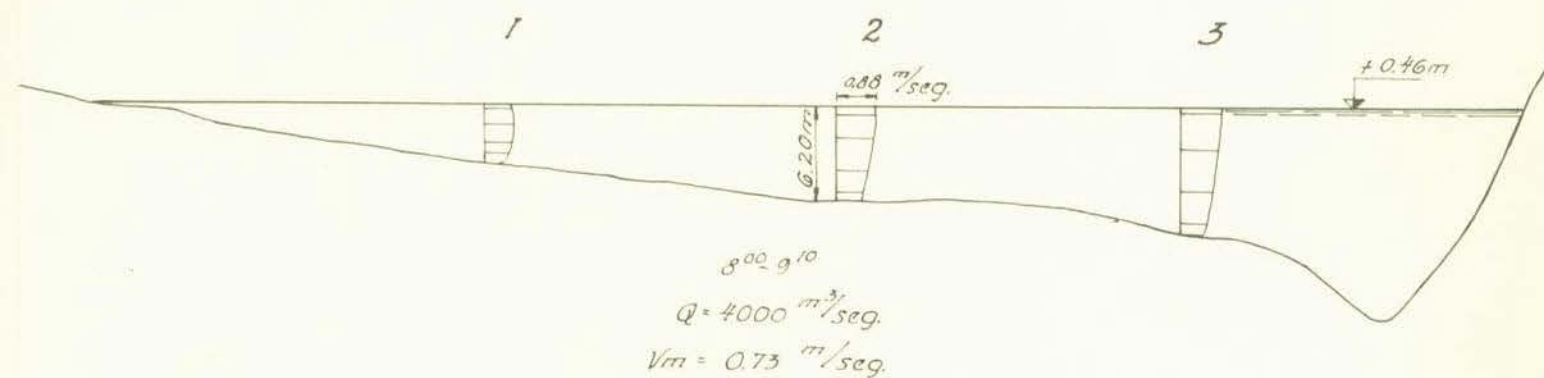
10 DE OCTUBRE
 10th OF OCTOBER, 1929

Nota: El corte II está ubicado en Proxirera (lámina No 5)
 Note: Section II is located at Proxirera (plate No 5)

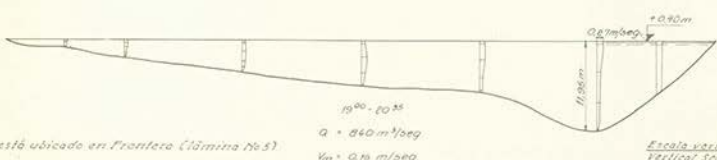
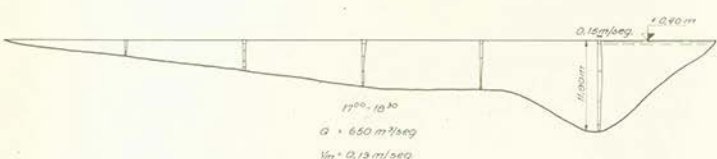
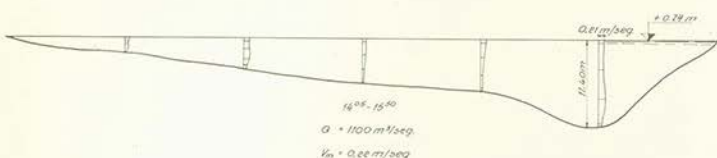
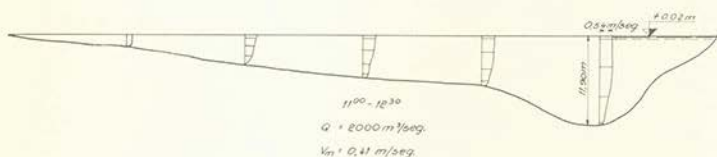
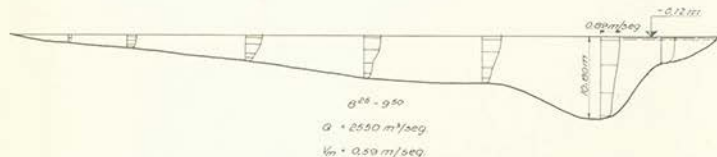
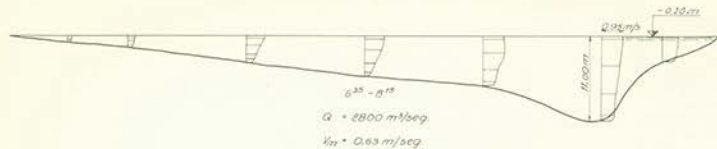
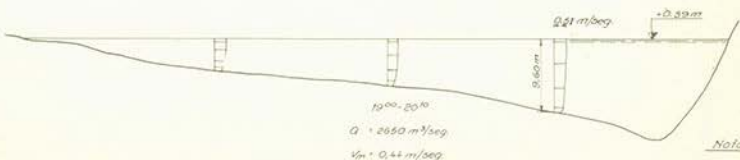
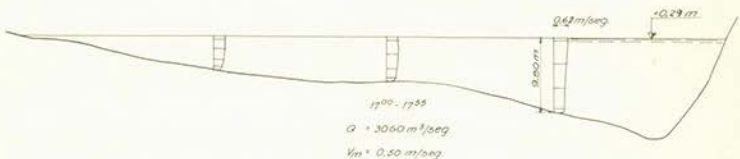
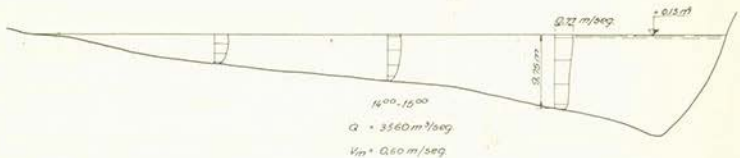
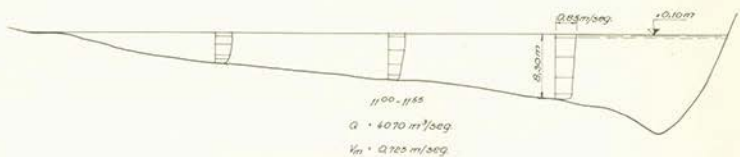
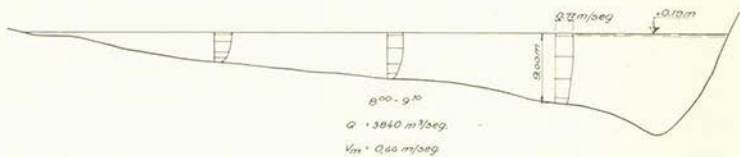
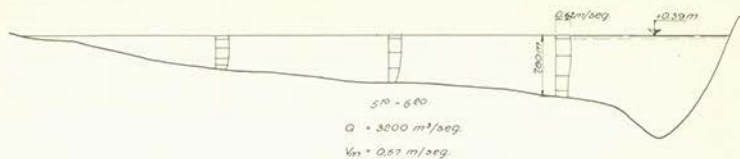


17 DE OCTUBRE
 17th OF OCTOBER, 1929

Escala vertical
 Vertical Scale
 Escala Horizontal
 Horizontal Scale
 Escala de corrientes
 Scale for currents



17 DE NOVIEMBRE
17th OF NOVEMBER. 1949
MEDIDAS DE CORRIENTE, CORTE A
CURRENT MEASUREMENTS, SECTION A



Nota: El corte A está ubicado en Frontera (lámina No 5)

Nota: Section A is located at Frontera (plate No 5)

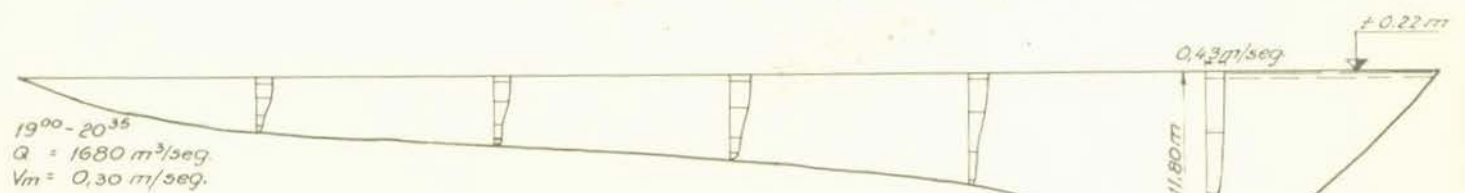
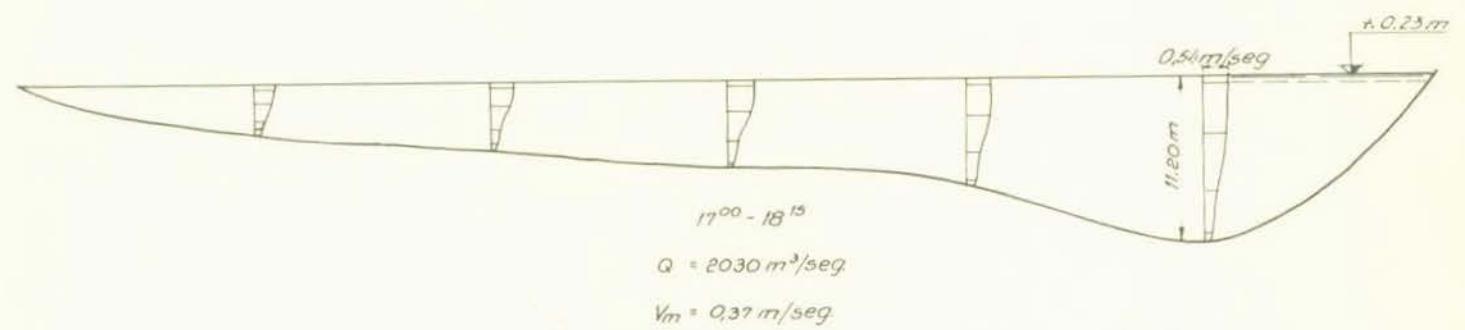
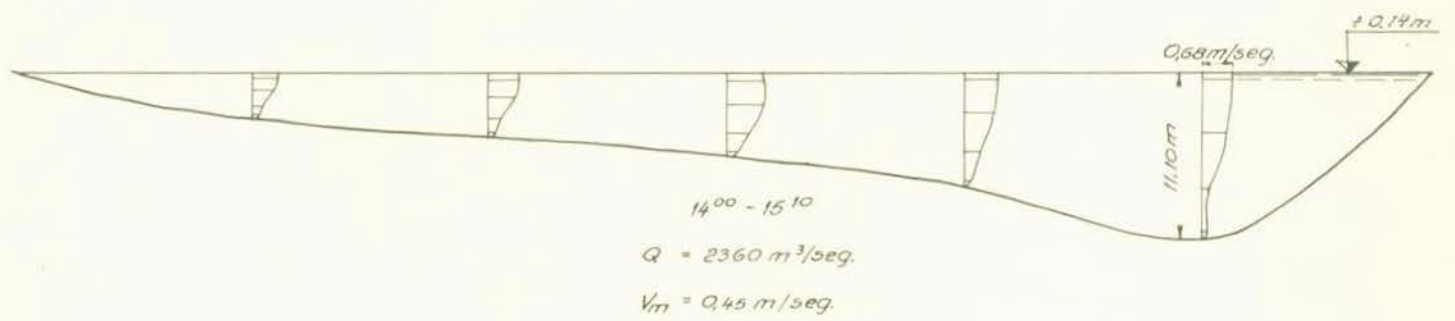
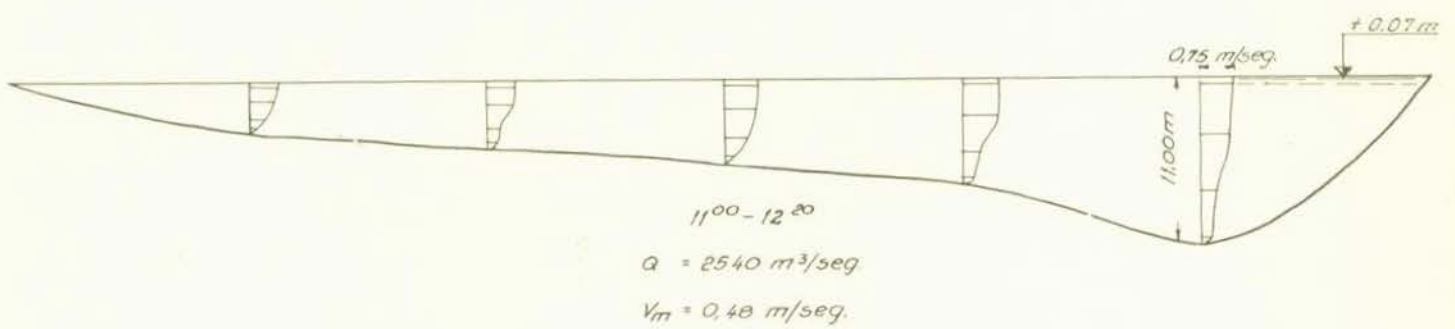
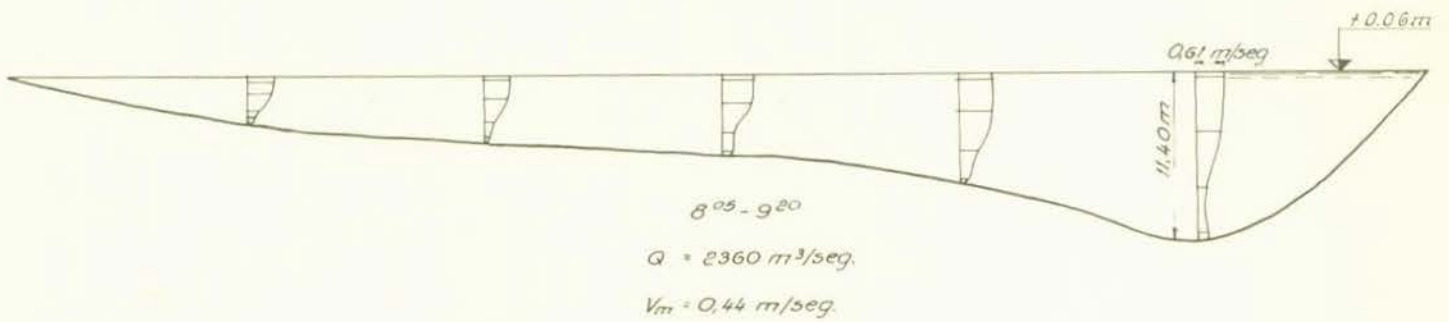
6 DE DICIEMBRE
6th OF DECEMBER 1949

Escala vertical
Vertical Scale

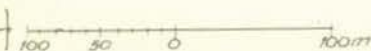
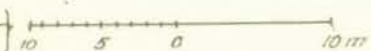
Escala Horizontal
Horizontal Scale

Escala de corrientes
Scale for currents

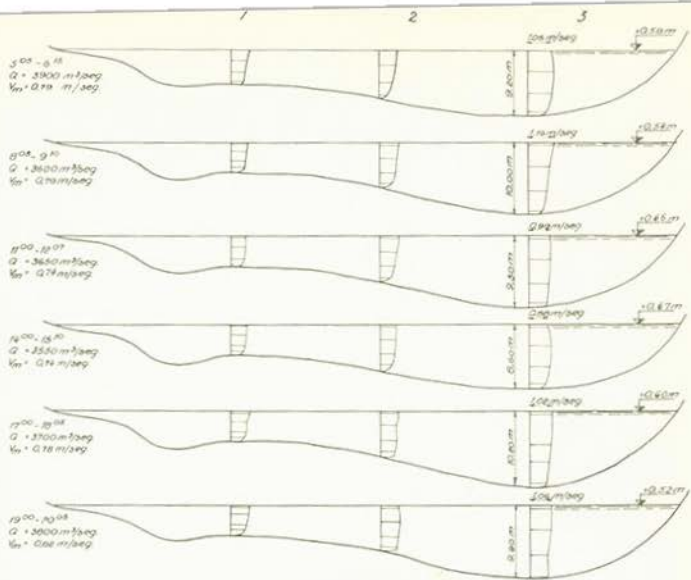
25 DE NOVIEMBRE
25th OF NOVEMBER 1949



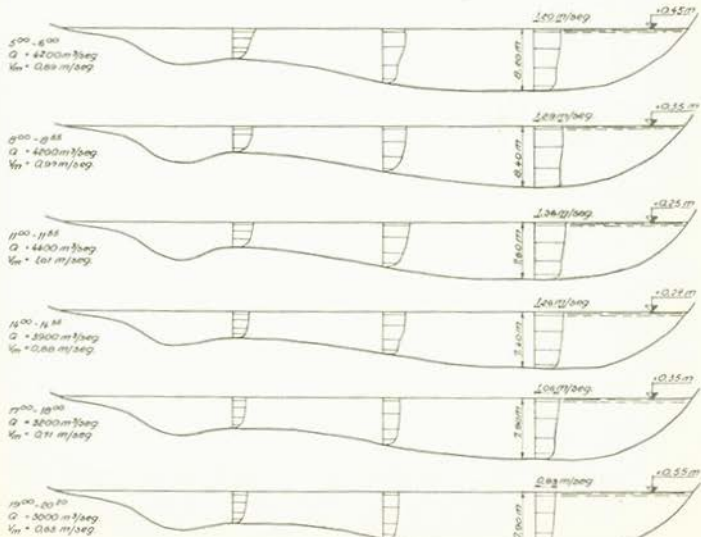
13 DE DICIEMBRE
13th OF DECEMBER 1949



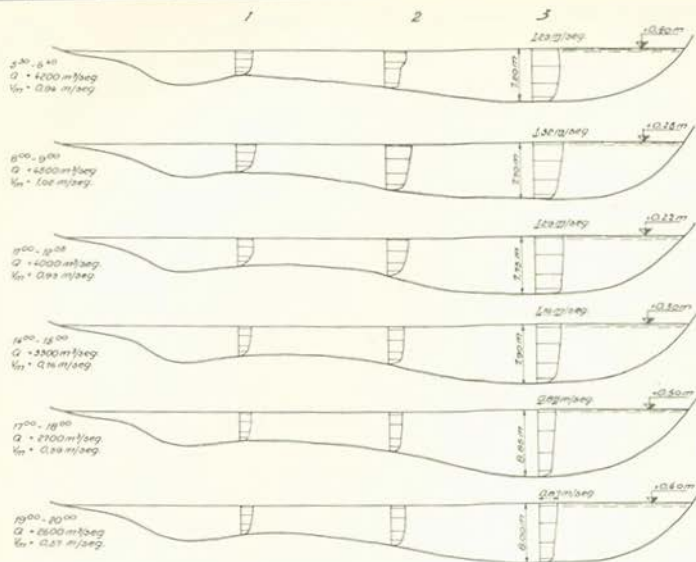
MEDIDAS DE CORRIENTE, CORTE F.
CURRENT MEASUREMENTS, SECTION F.



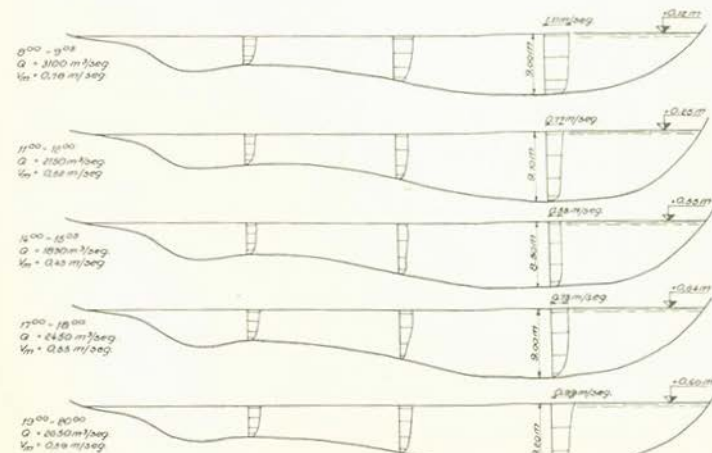
5 DE OCTUBRE 1949
5TH OF OCTOBER 1949



12 DE OCTUBRE 1949
12TH OF OCTOBER 1949

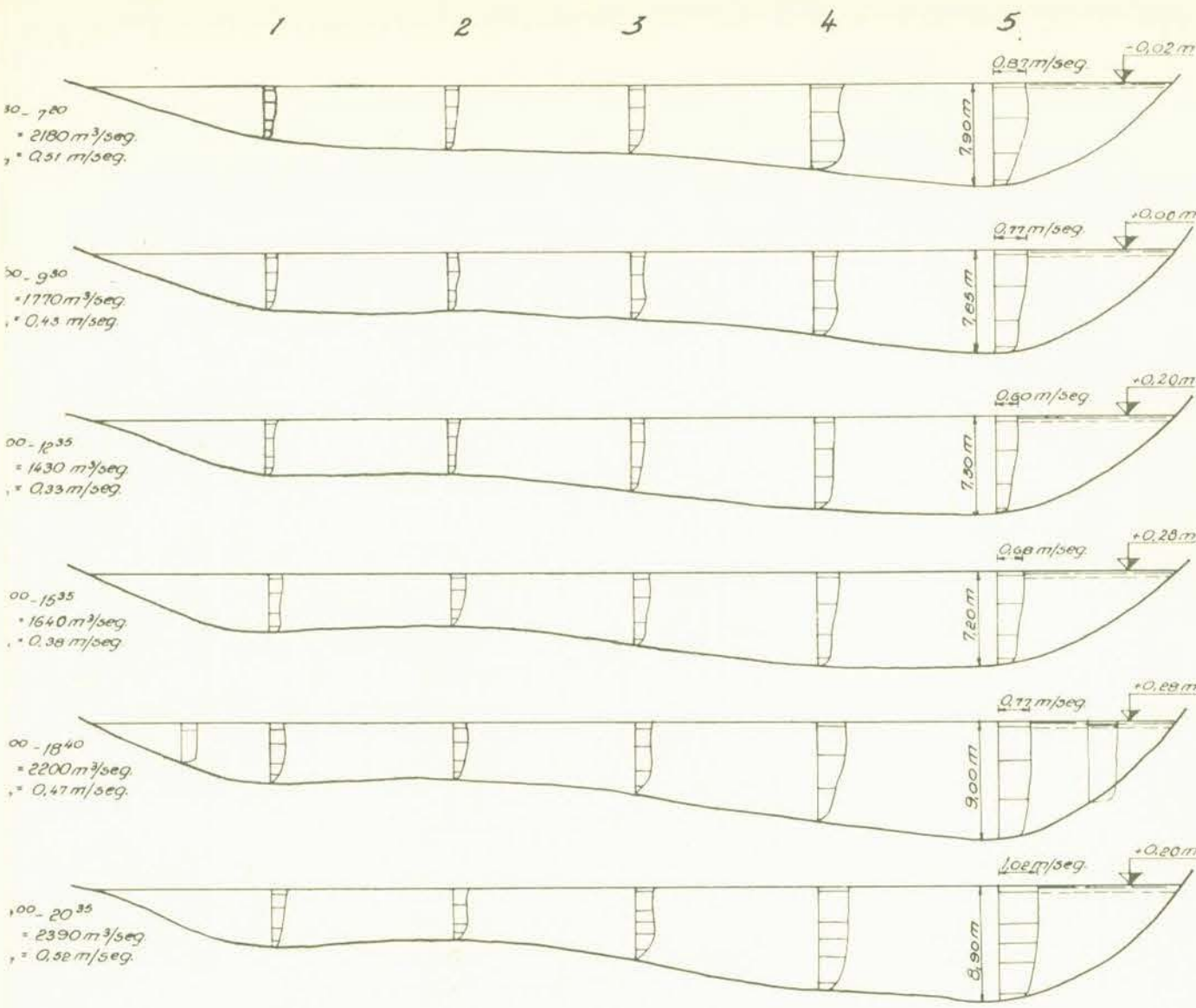


9 DE NOVIEMBRE 1949
9TH OF NOVEMBER 1949

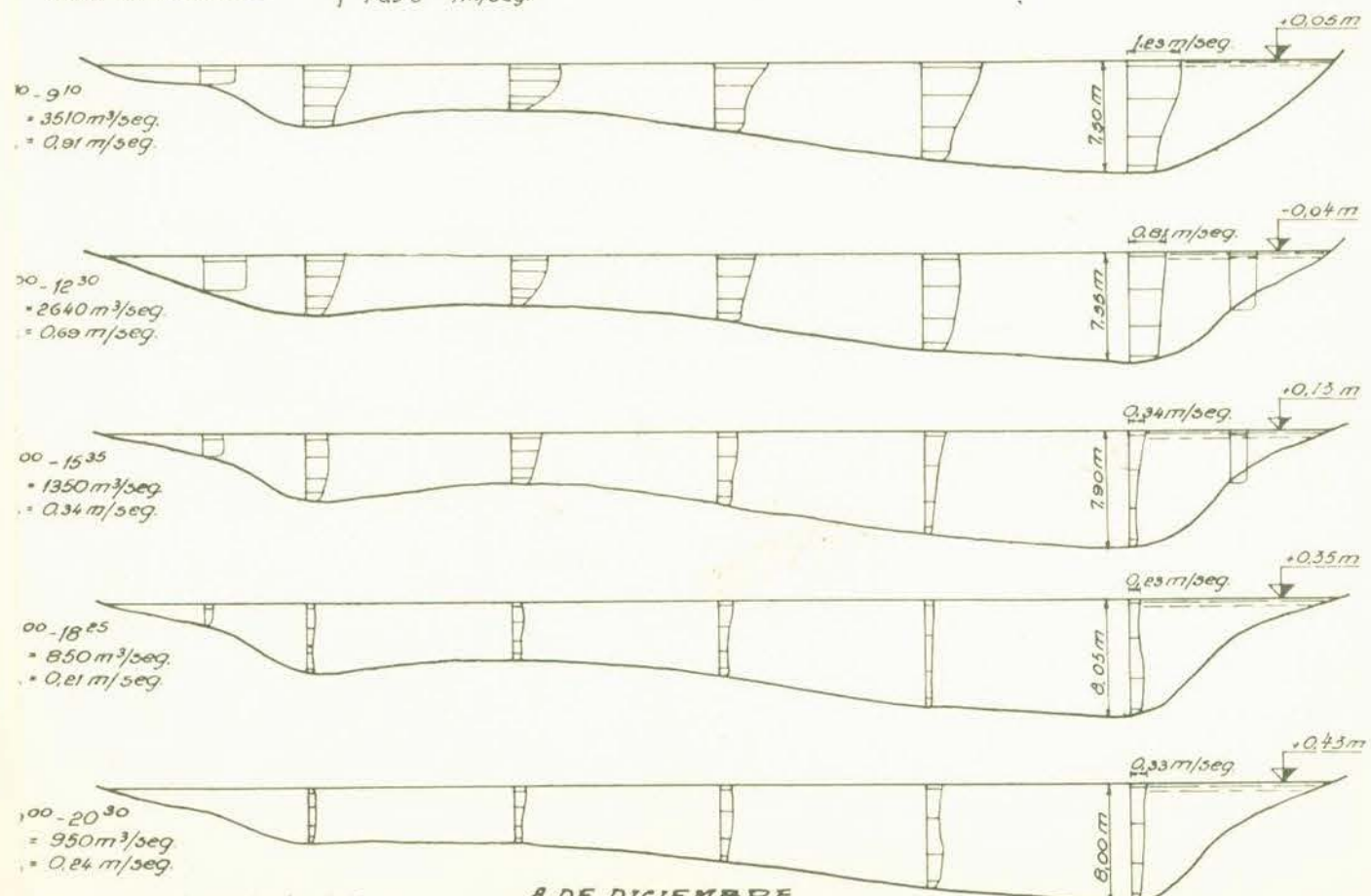
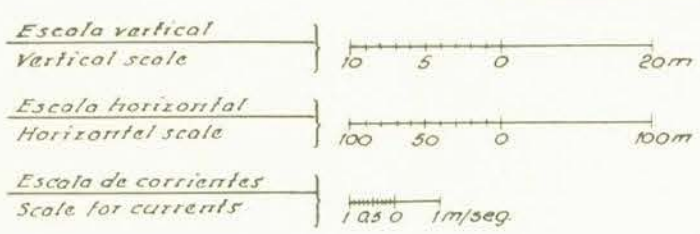


19 DE NOVIEMBRE 1949
19TH OF NOVEMBER 1949

Nota: la sección B es canal lateral (B)
Nota: Section B is lateral canal (B)

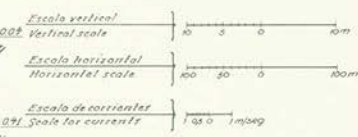
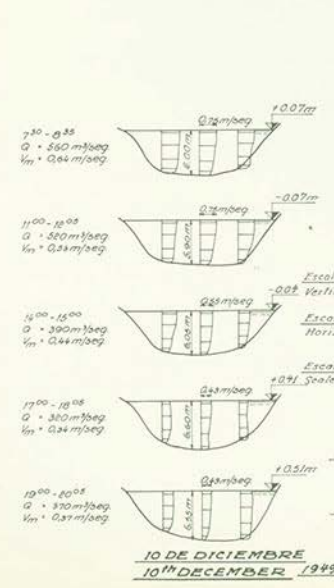
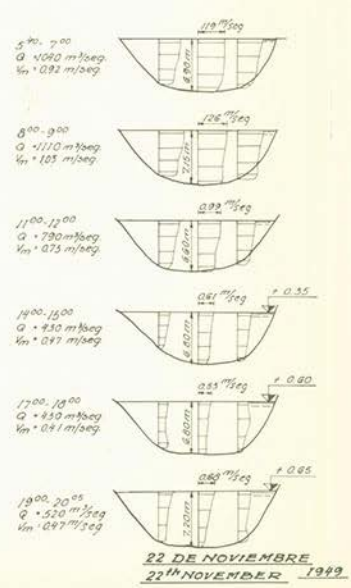
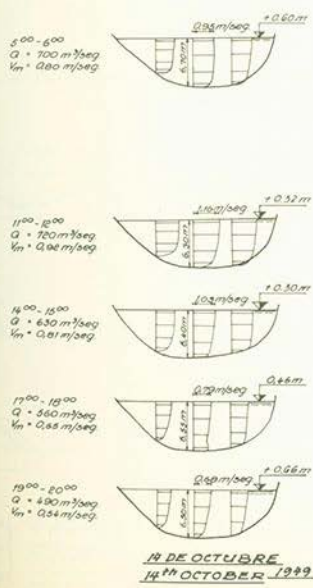
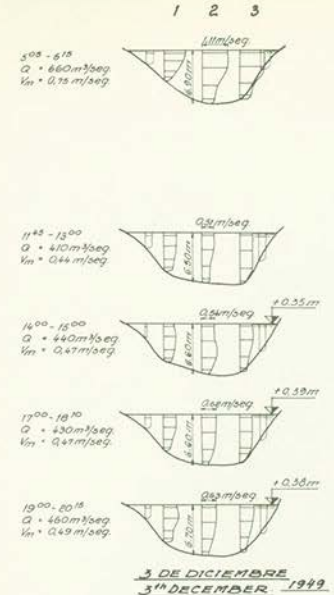
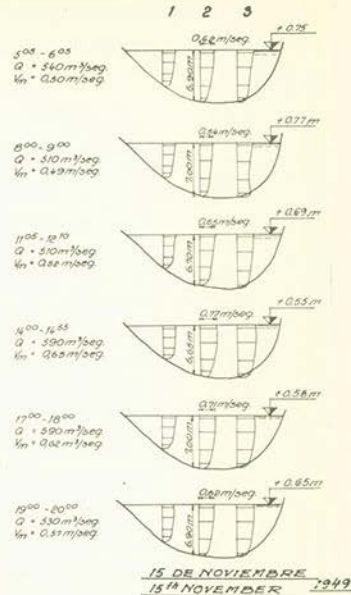
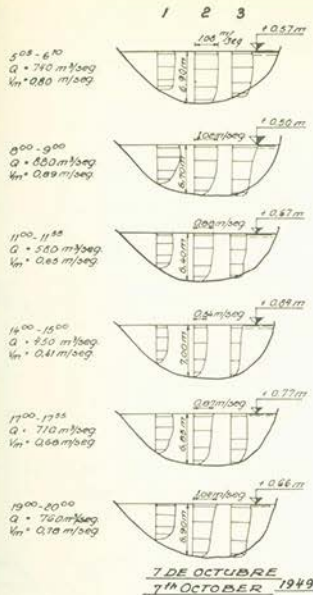


1 DE DICIEMBRE
1st OF DECEMBER 1949



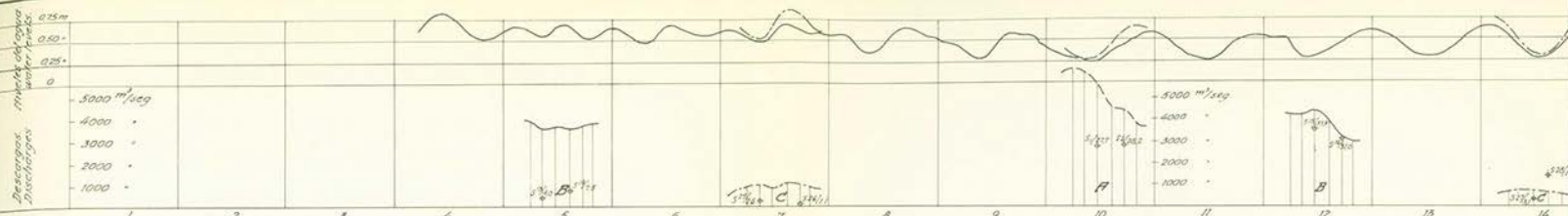
8 DE DICIEMBRE
8th OF DECEMBER 1949

situada aguas abajo del
mita No 5)
(ed in the river below the
ite No 5)

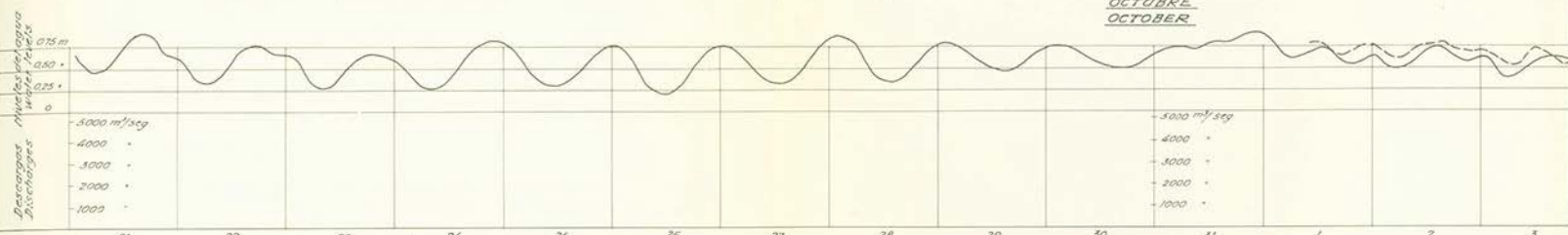


Nota: La sección C se encuentra en el canal lateral (Véase lámina Nº 5)

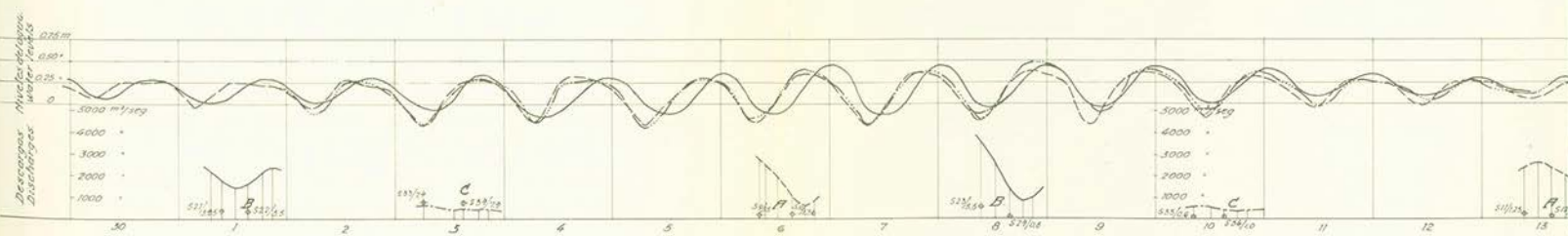
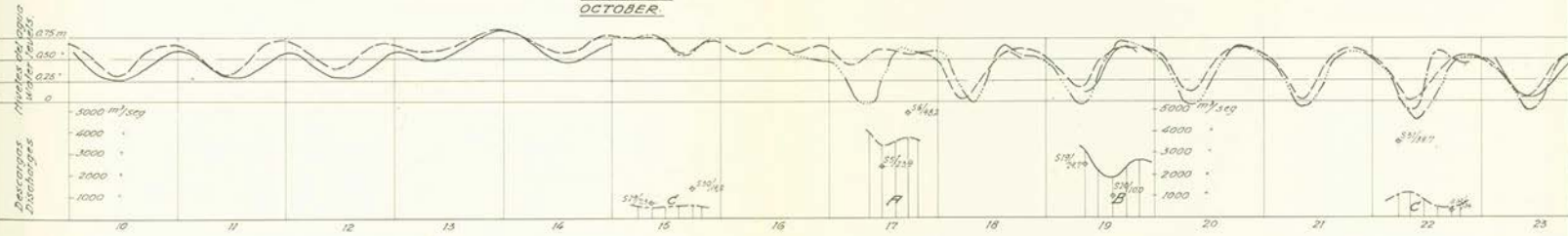
Note: Section C is located in the lateral canal (see Plate Nº 5)



OCTUBRE
OCTOBER



OCTUBRE
OCTOBER



DICIEMBRE
DECEMBER

Nota: Para la ubicación de las secciones B y C y los mareógrafos véase lámina 5. Las descargas se basan en las mediciones de corrientes según láminas 21, 22, 23 y 24. Para los datos concernientes a mediciones de sedimentos véase láminas 28, 29, 30 y 31. En la curva de los niveles de agua del mareógrafo de la villa Moleca se ha formado un cero arbitrario pues el verdadero nivel se ha formado en un cero arbitrario.

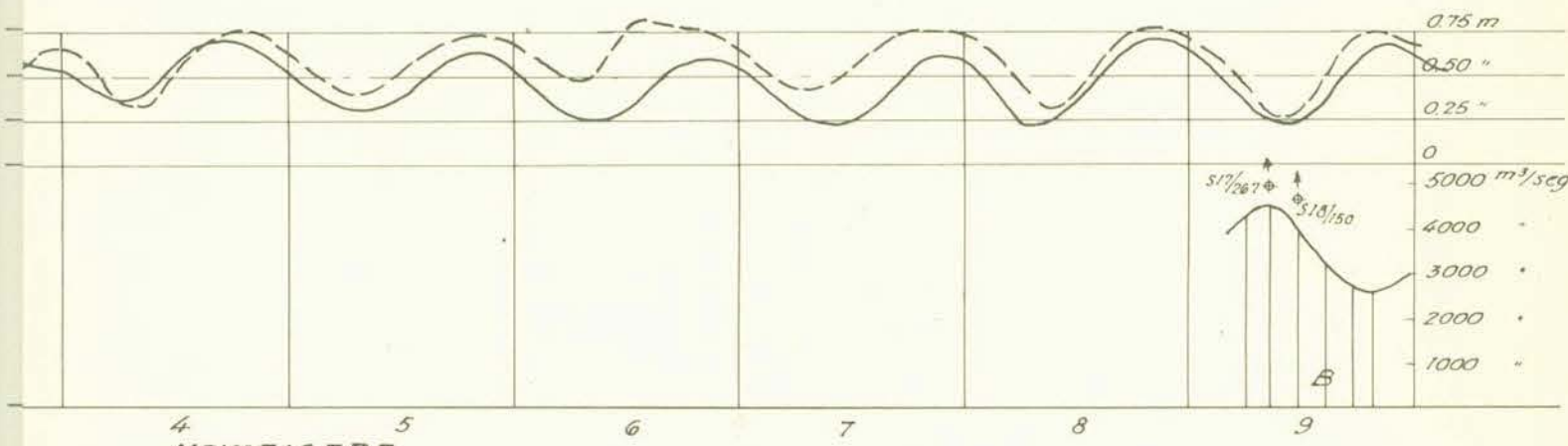
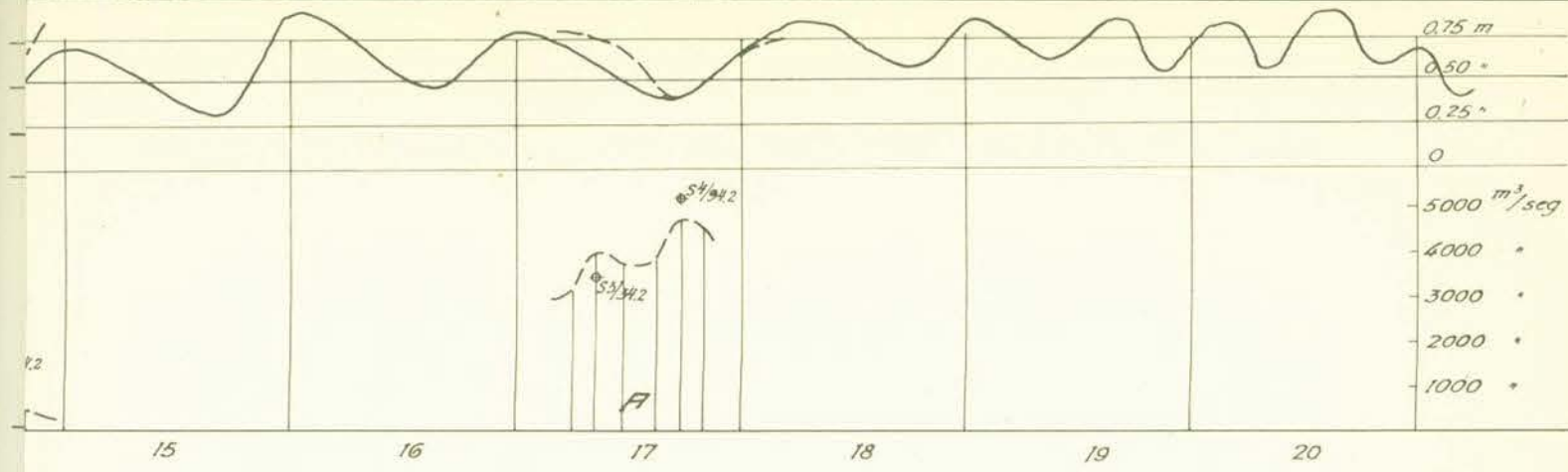
Nota: For location of sections B and C and water level gauges see plate No. 5. The discharges are based on current measurements on plates 21, 22, 23 and 24. For details concerning sediment measurements see plates No. 28, 29, 30 and 31. Water level curve for gauge at Moleca island is shown in estimated height as level zero point is unknown.

529/75

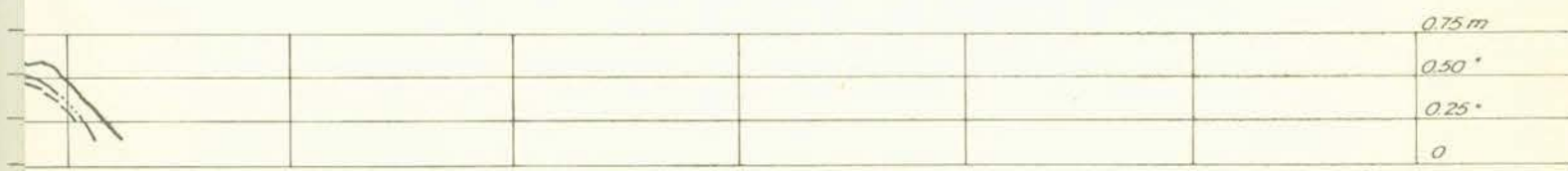
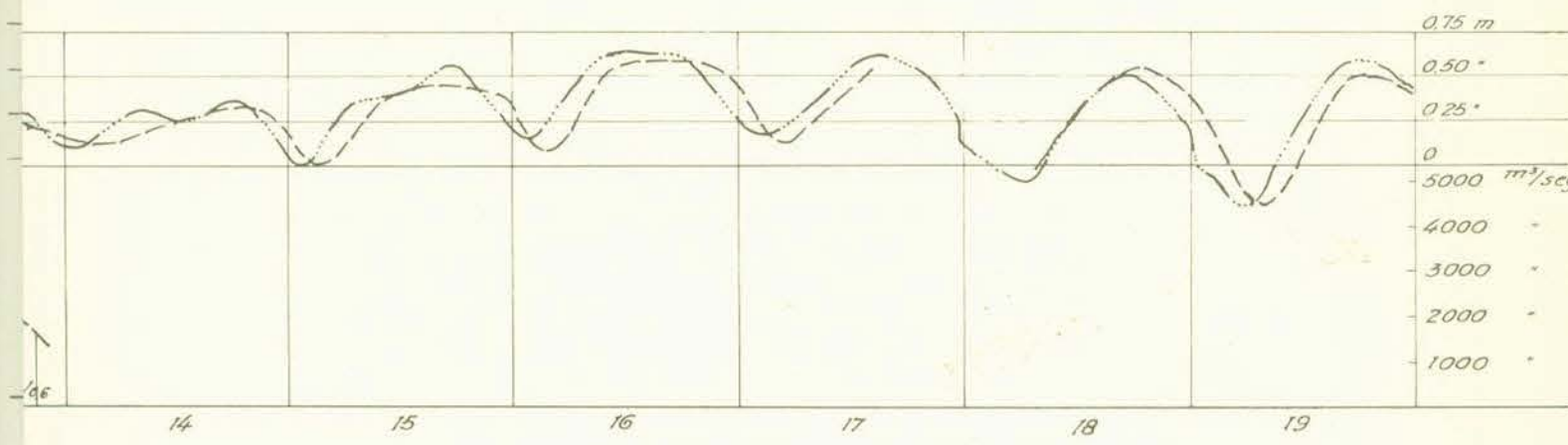
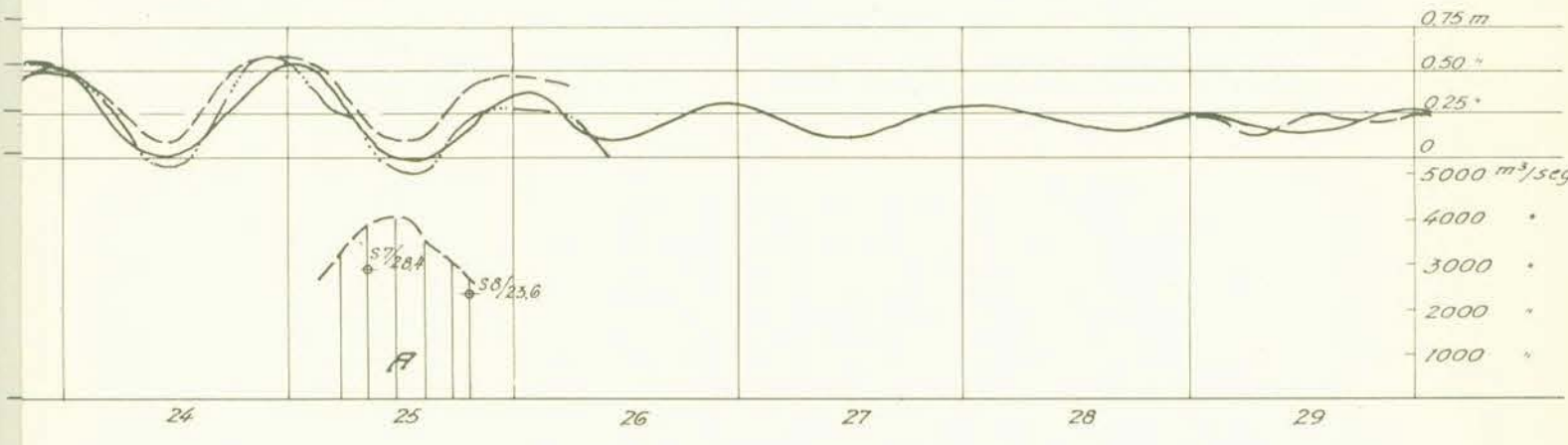
Medidas de sedimento No. 529 with 7.5 m³/sec of sand transported in suspension.
Sediment measurement No. 529 with 7.5 m³/sec of sand transported in suspension.

Observaciones en sección

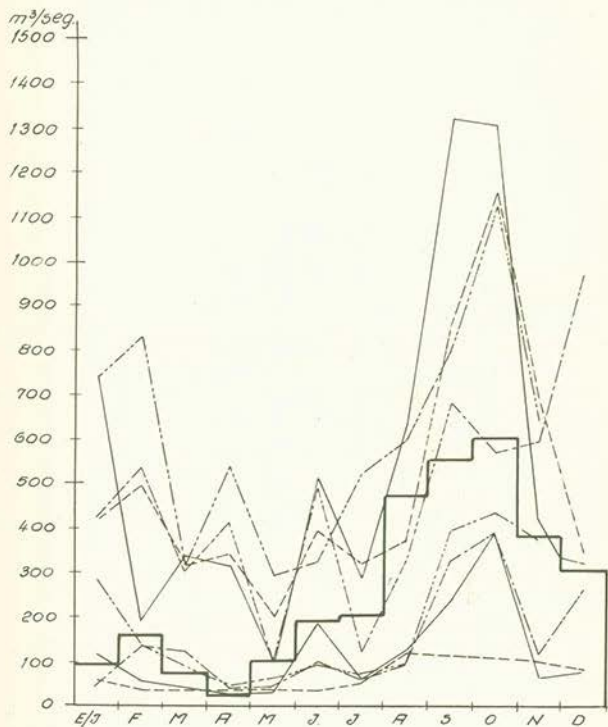
Niveles de agua en la Water levels at



NOVIEMBRE
NOVEMBER.

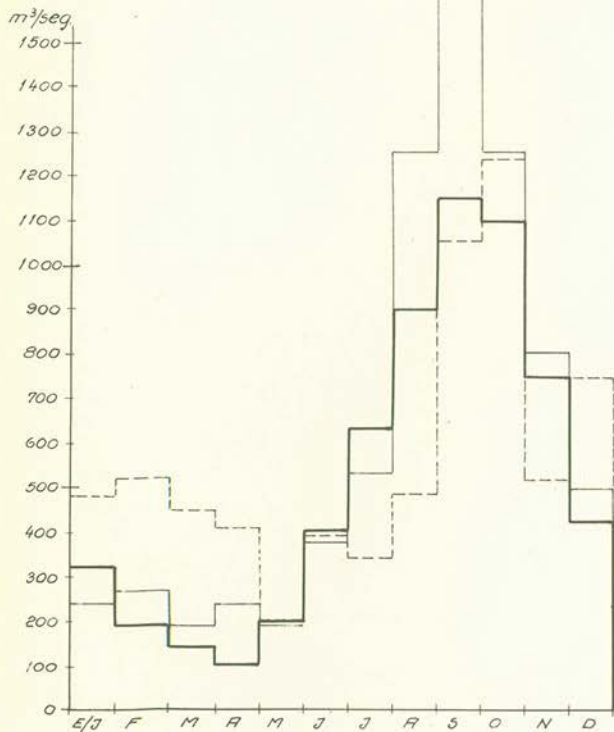


- No. {
- A { en Frontera
at Frontera
 - B { aguas abajo canal
river below canal.
 - C { canal lateral.
lateral canal.
 - Isla Azteca



——— 1944
 - - - - 1945 } *Medido en Las Gaviotas*
 - · - · 1946 } *Measured at Las Gaviotas*
 · - - · 1947 }
 { *Estimado por C&N para la cuenca del Tacotalpa (3)*
 { *(ver lámina 27)*
 { *Estimated by C&N for the Tacotalpa area (3)*
 { *(see Plate 27)*

Las Gaviotas } *Máximas y mínimas descargas de cada mes*
 } *Maximum and minimum discharges of*
 } *each month*



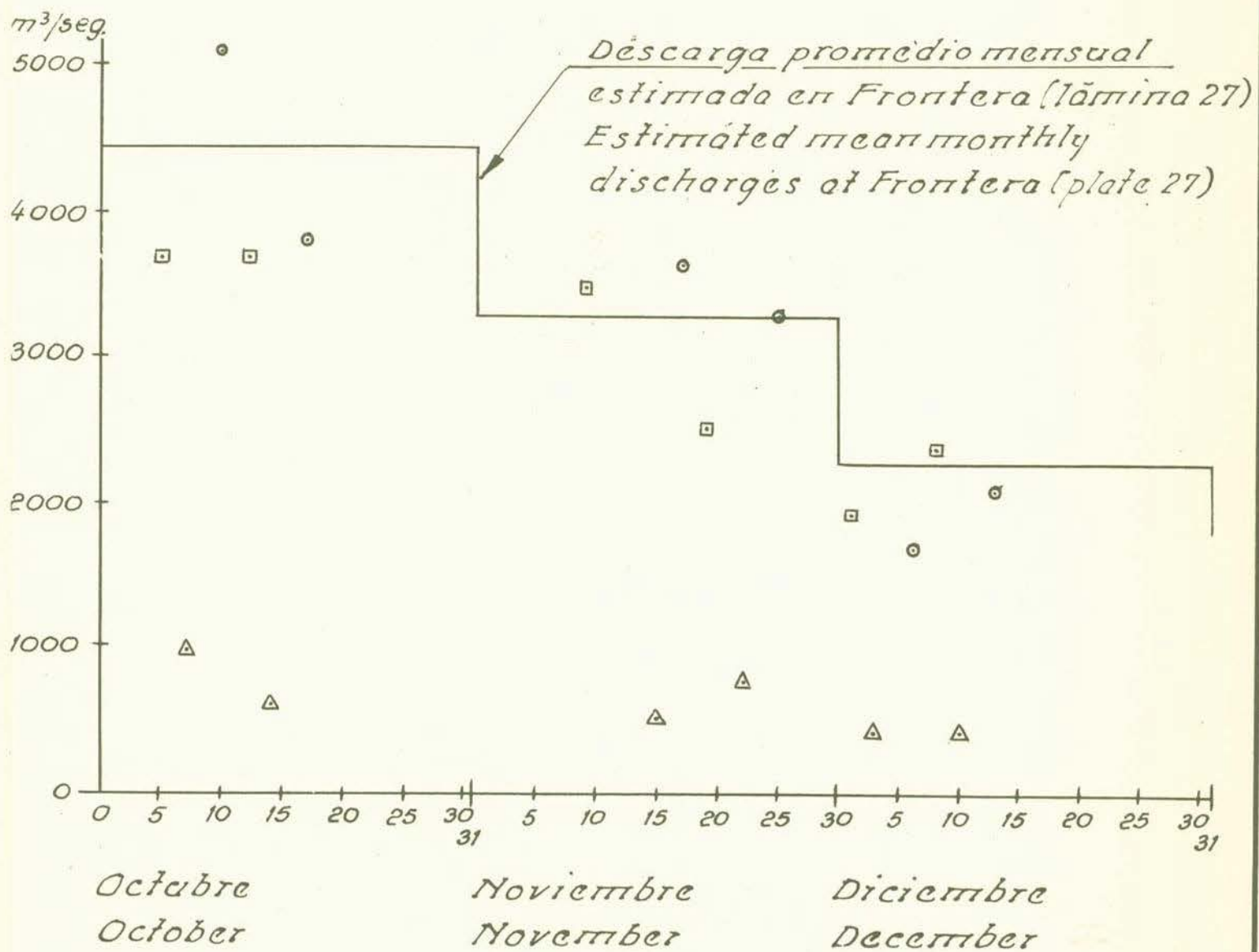
——— 1945 } *Medido en El Dorado*
 - - - - 1946 } *Measured at El Dorado*
 { *Estimado por C&N para la cuenca del Mezcalapa (2)*
 { *(ver lámina 27)*
 { *Estimated by C&N for the Mezcalapa area (2)*
 { *(see Plate 27)*

El Dorado } *Descargas promedio mensuales*
 } *Average monthly discharges. DESCARGAS REG*
 } *RECORDED DISCH*

○ Sección A Frontera
Section

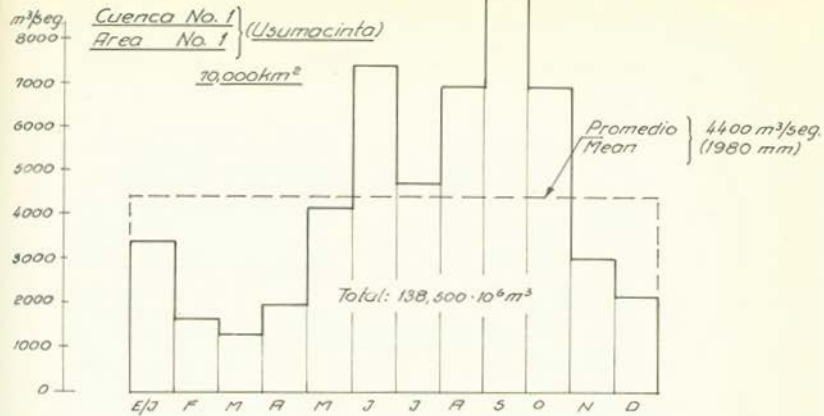
□ Sección B { Río abajo canal
Section { River below canal

△ Sección C { canal lateral
Section { Lateral canal

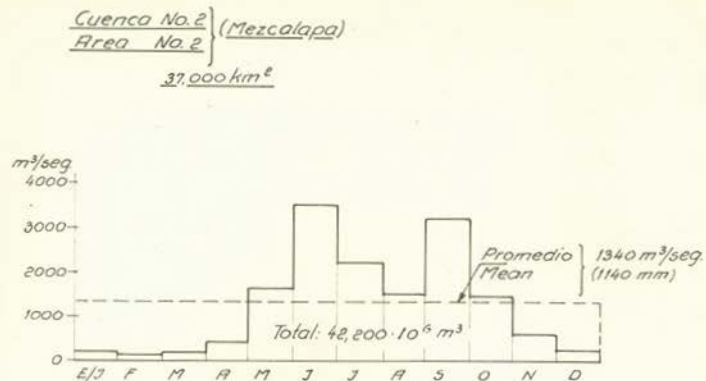


DISCARGAS EN VARIOS PUNTOS DEL RÍO

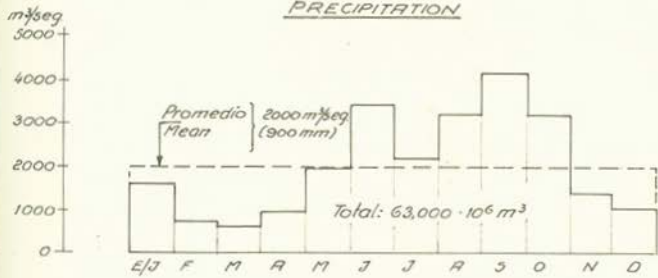
DISCHARGES AT VARIOUS POINTS IN THE RIVERS Lámina **26.**
Plate



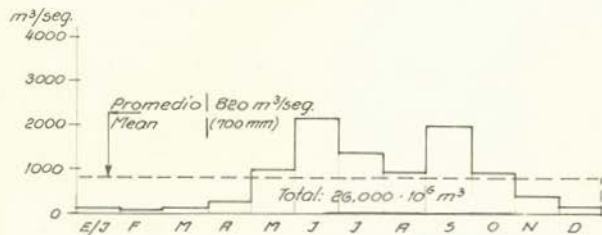
PRECIPITACION
PRECIPITATION



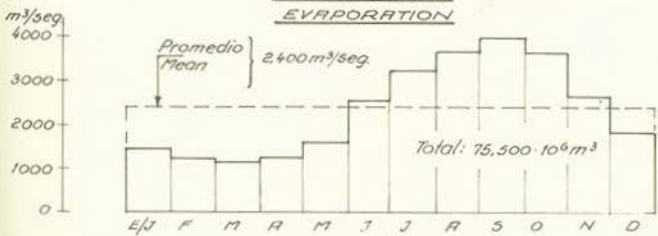
PRECIPITACION
PRECIPITATION



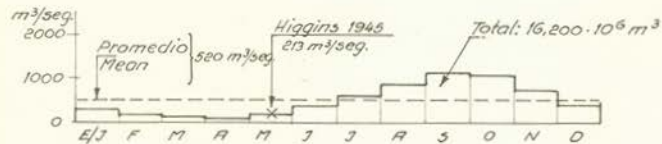
EVAPORACION
EVAPORATION



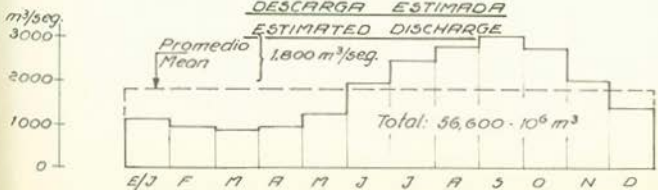
EVAPORACION
EVAPORATION



DESCARGA ESTIMADA
ESTIMATED DISCHARGE

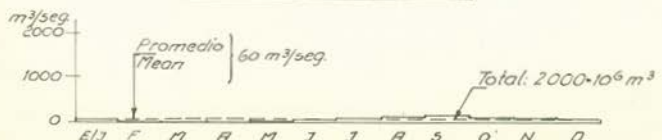


DESCARGA ESTIMADA
ESTIMATED DISCHARGE



PARTE ESTIMADA DE LA DESCARGA QUE PASA POR FRONTERA
ESTIMATED PART OF DISCHARGE PASSING FRONTERA

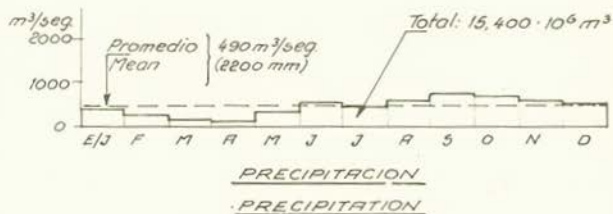
75 %



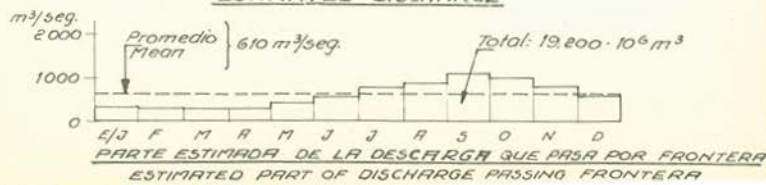
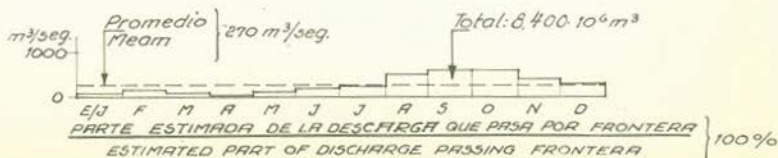
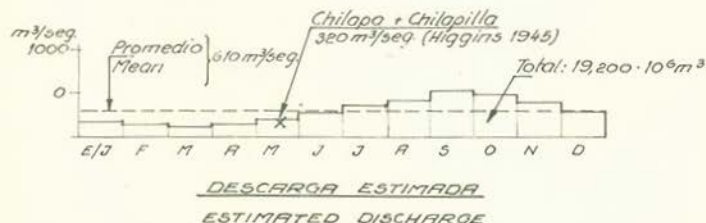
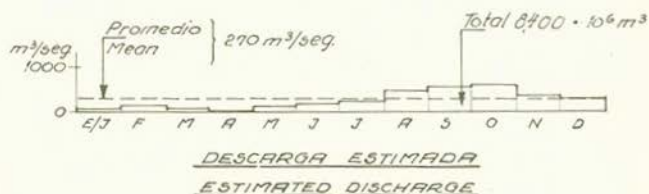
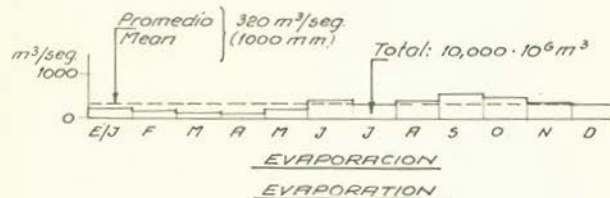
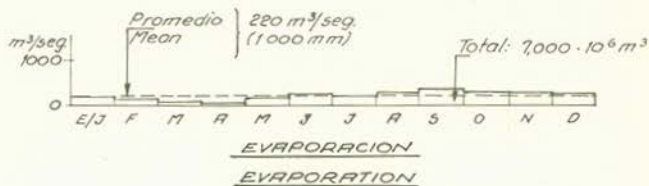
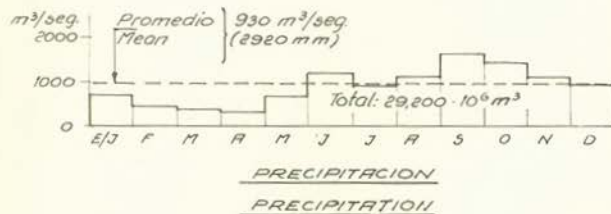
PARTE ESTIMADA DE LA DESCARGA QUE PASA POR FRONTERA
ESTIMATED PART OF DISCHARGE PASSING FRONTERA

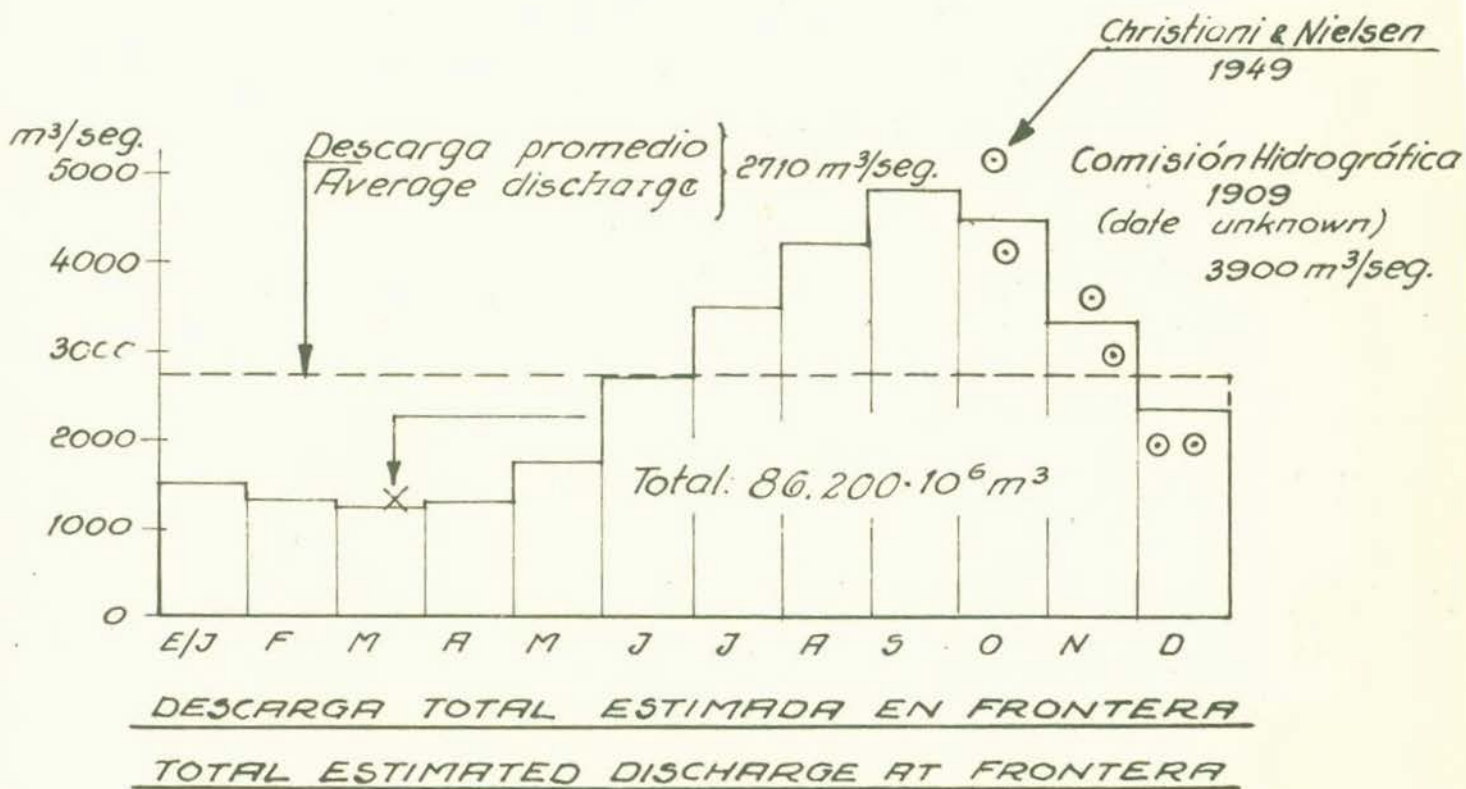
12

Cuenca No 3 (Tacotalpa)
 Area No 3
 7,000 km²



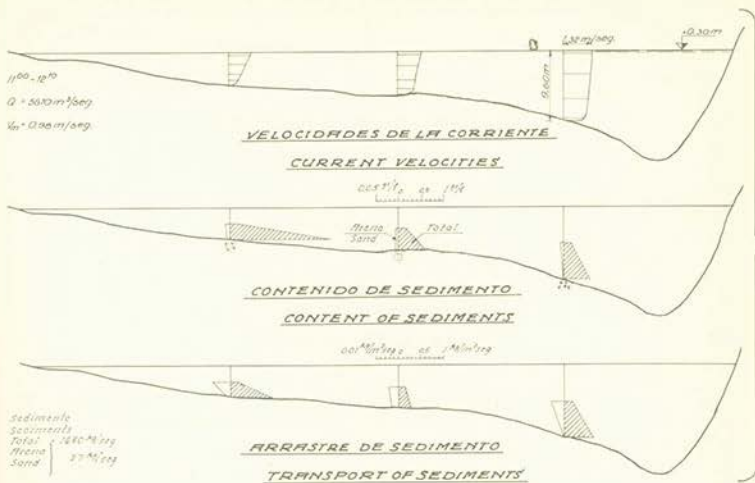
Cuenca No. 4 } Macuspana
 Area No 4 }
 10,000 km²



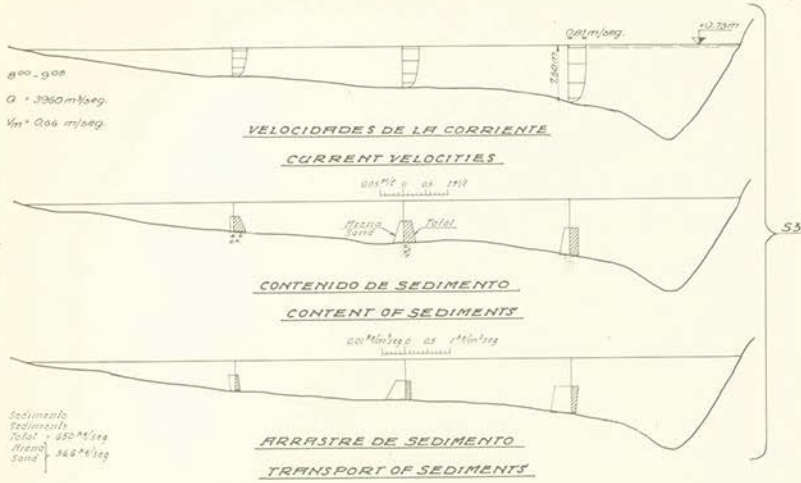


ESTIMACION DE LAS VARIACIONES ANUALES
DE LA DESCARGA EN FRONTERA

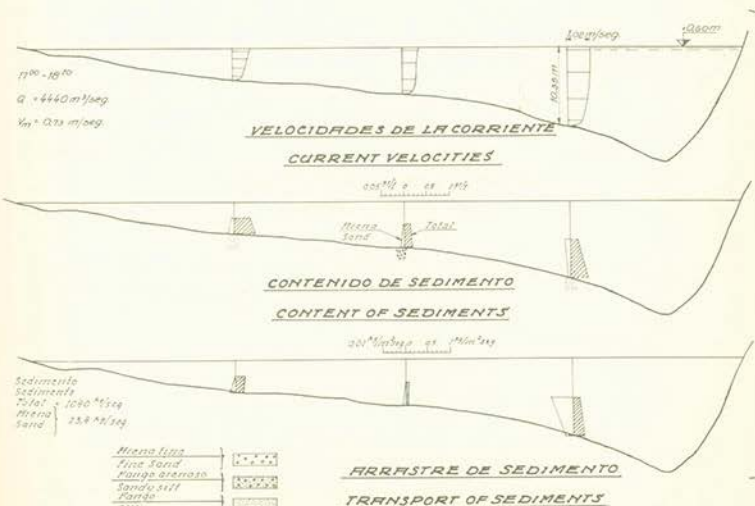
ESTIMATE OF ANNUAL VARIATIONS
IN DISCHARGE AT FRONTERA



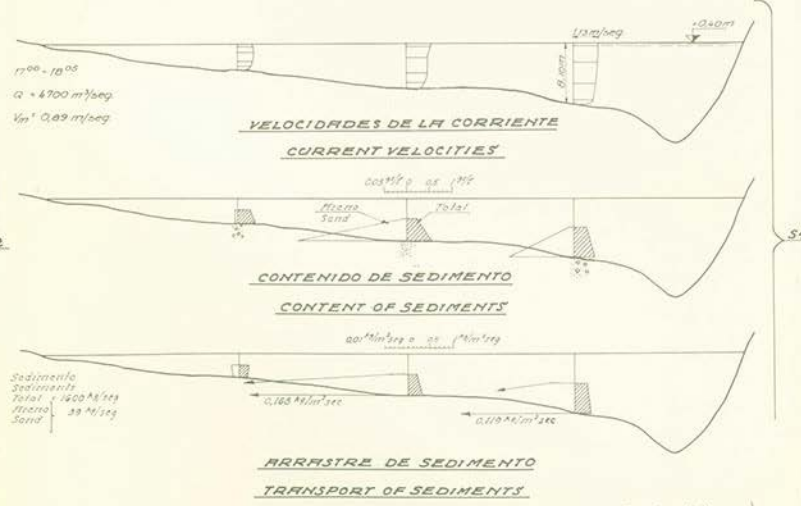
S1



S3



S2



S4



ARRASTRE DE SEDIMENTO
TRANSPORT OF SEDIMENTS

10 DE OCTUBRE
10th OF OCTOBER 1949

ARRASTRE DE SEDIMENTO
TRANSPORT OF SEDIMENTS

17 DE OCTUBRE
17th OCTOBER 1949

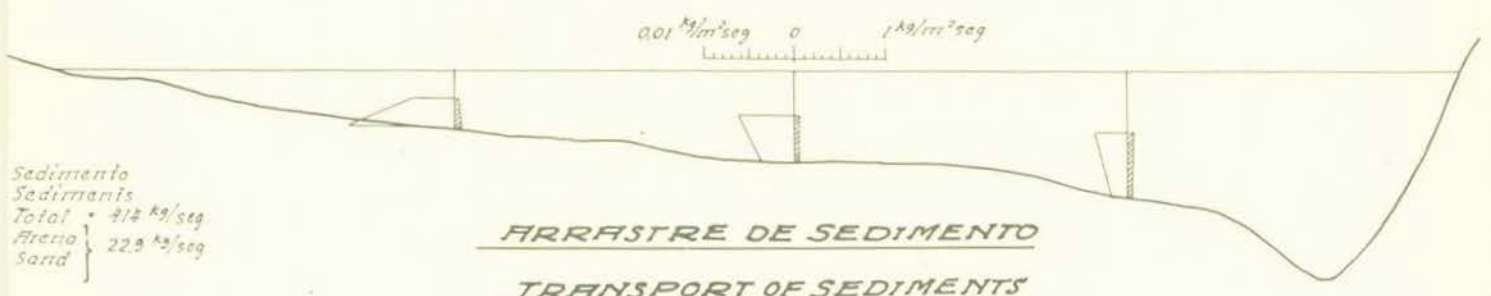


11⁰⁰ - 12⁰⁵
 $Q = 3360 \text{ m}^3/\text{seg.}$
 $V_m = 0.60 \text{ m}/\text{seg.}$

VELOCIDADES DE LA CORRIENTE
CURRENT VELOCITIES



CONTENIDO DE SEDIMENTO
CONTENT OF SEDIMENTS



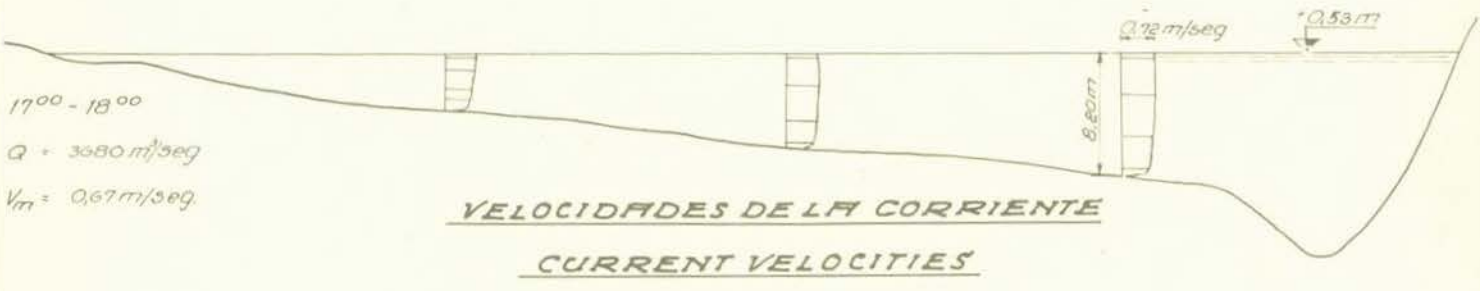
ARRASTRE DE SEDIMENTO
TRANSPORT OF SEDIMENTS

Sedimento
 Sediments
 Total = 412 kg/seg
 Arena
 Sand } 228 kg/seg

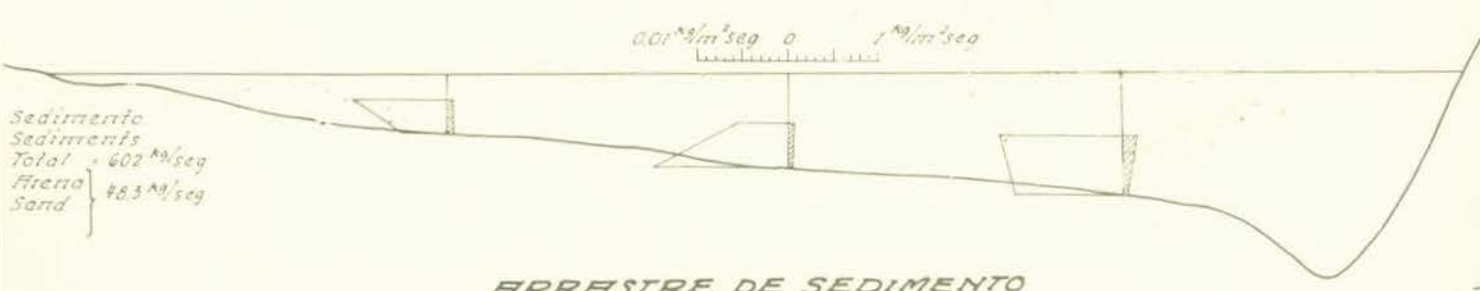
S5

17⁰⁰ - 18⁰⁰
 $Q = 3680 \text{ m}^3/\text{seg.}$
 $V_m = 0.67 \text{ m}/\text{seg.}$

VELOCIDADES DE LA CORRIENTE
CURRENT VELOCITIES



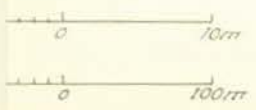
CONTENIDO DE SEDIMENTO
CONTENT OF SEDIMENTS



ARRASTRE DE SEDIMENTO
TRANSPORT OF SEDIMENTS

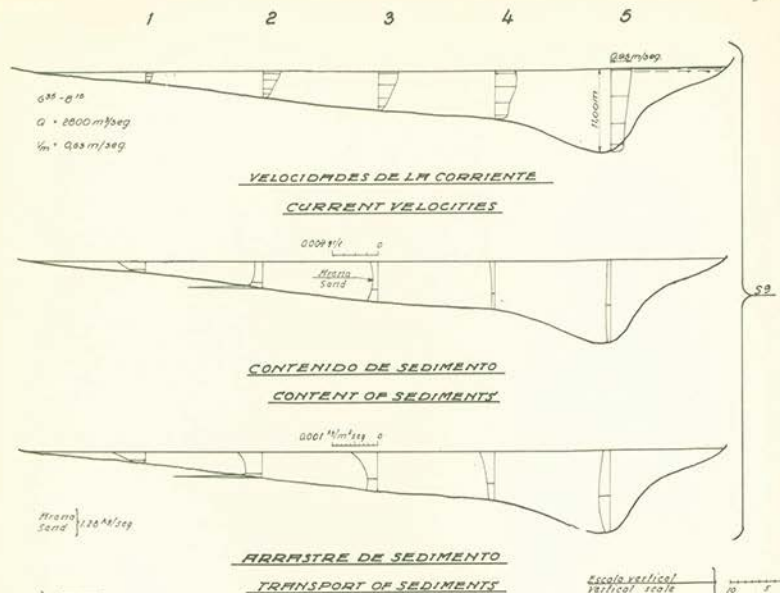
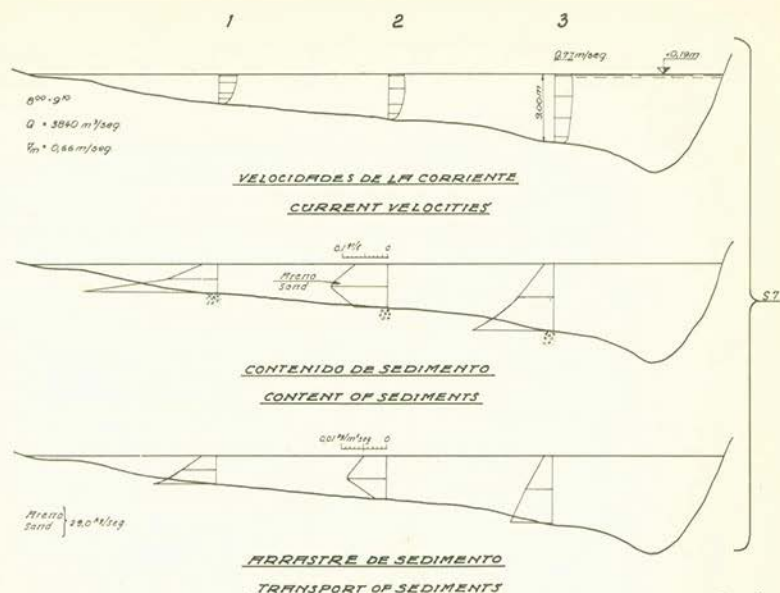
Sedimento
 Sediments
 Total = 602 kg/seg
 Arena
 Sand } 483 kg/seg

S6



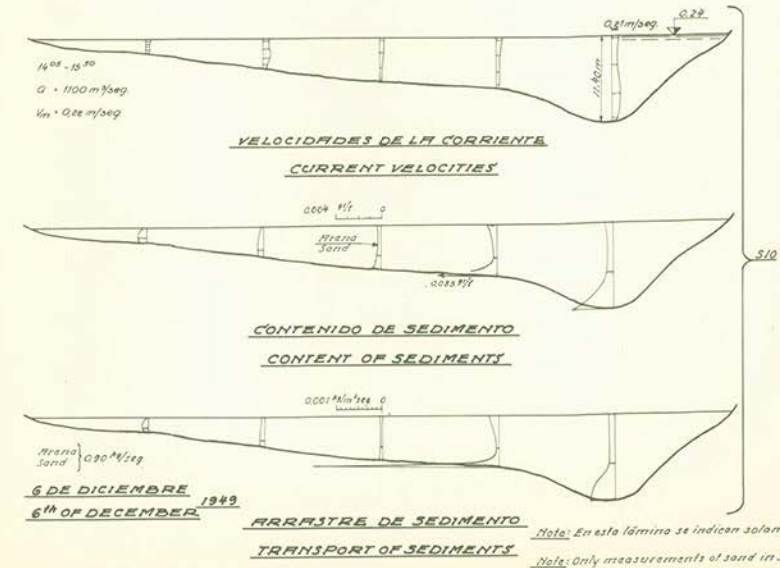
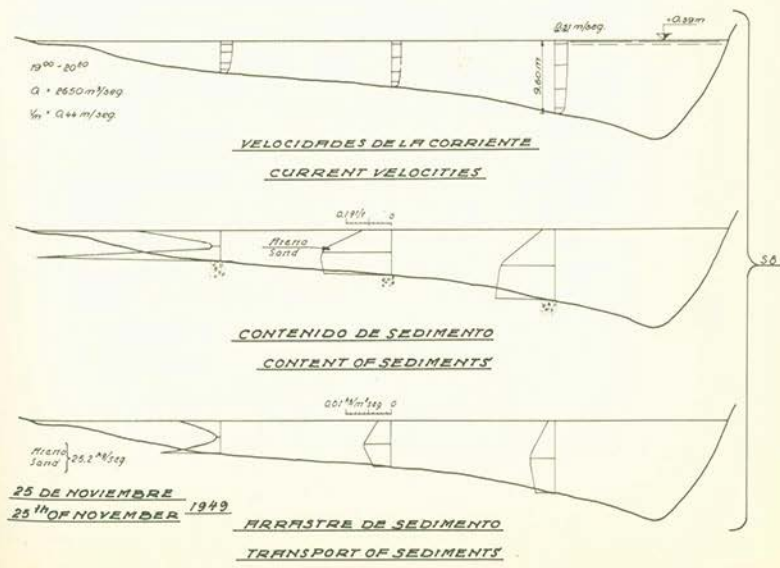
17 DE NOVIEMBRE
 17th NOVEMBER, 1949

MEDIDAS DE SEDIMENTO, CORTE A
 SEDIMENT MEASUREMENTS, SECTION A



Arena fina Fine Sand
 Arena y arcilla Silt and clay
 Arena gruesa y arcilla Sand, silt and clay

Escala vertical Vertical scale
 Escala horizontal Horizontal scale
 Corrientes currents



Nota: En esta lámina se indican solo arena.
 Note: Only measurements of sand in this

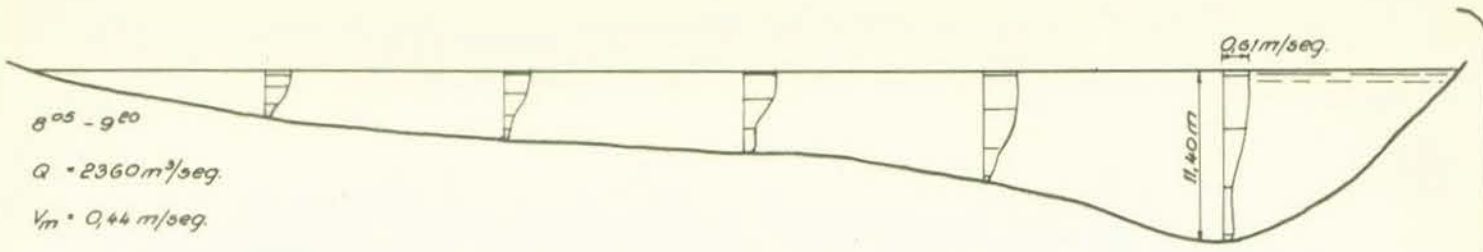
1

2

3

4

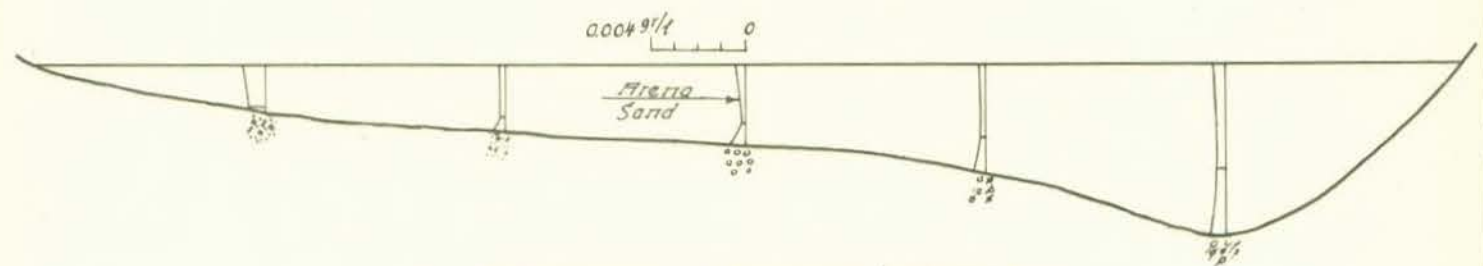
5



8⁰⁵ - 9²⁰
 $Q = 2360 \text{ m}^3/\text{seg.}$
 $V_m = 0.44 \text{ m/seg.}$

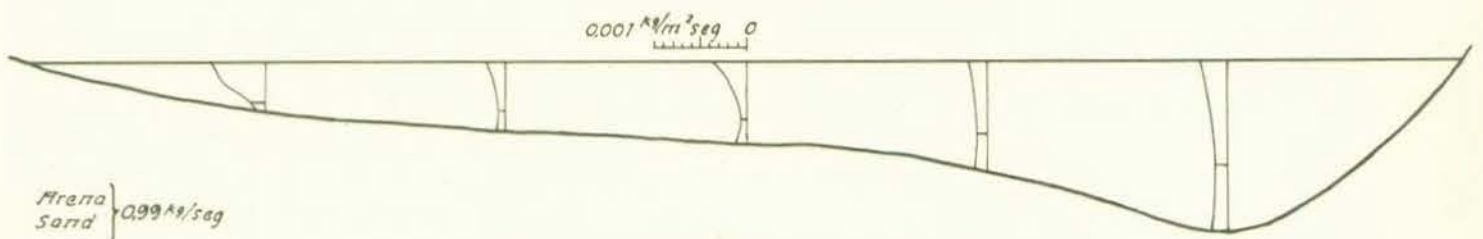
VELOCIDADES DE LA CORRIENTE

CURRENT VELOCITIES



CONTENIDO DE SEDIMENTO

CONTENT OF SEDIMENTS



Arena } 0.99 kg/seg
 Sarrd }

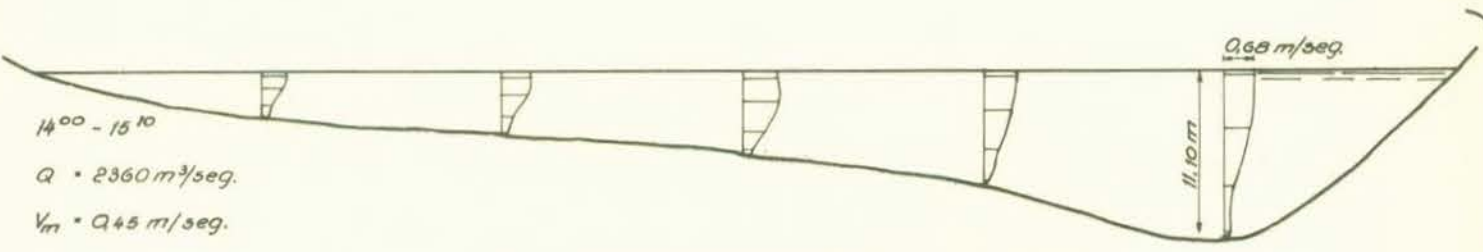
ARRASTRE DE SEDIMENTO

TRANSPORT OF SEDIMENTS

0 10 m

0 100 m

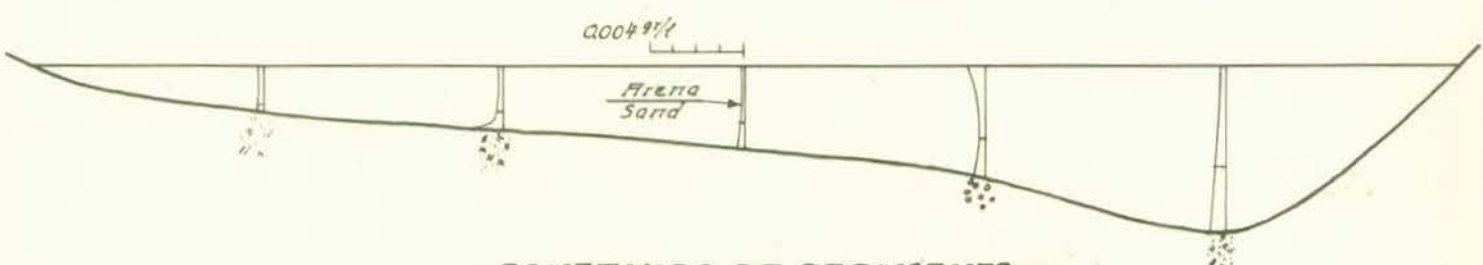
m/seg.



14⁰⁰ - 15¹⁰
 $Q = 2360 \text{ m}^3/\text{seg.}$
 $V_m = 0.45 \text{ m/seg.}$

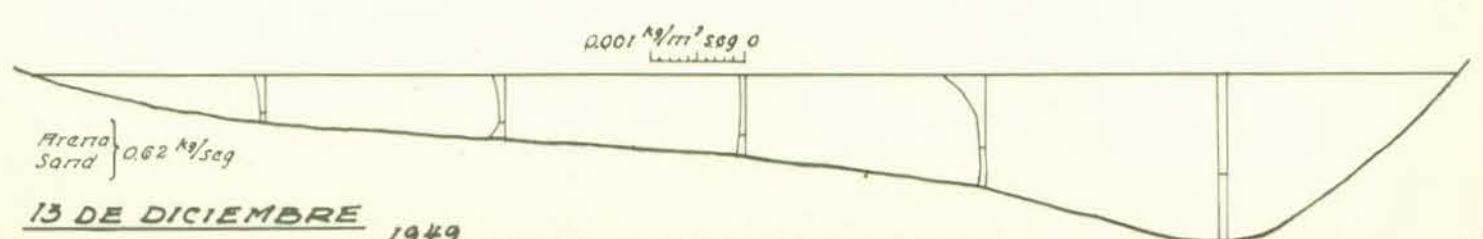
VELOCIDADES DE LA CORRIENTE

CURRENT VELOCITIES



CONTENIDO DE SEDIMENTO

CONTENT OF SEDIMENTS



Arena } 0.62 kg/seg
 Sarrd }

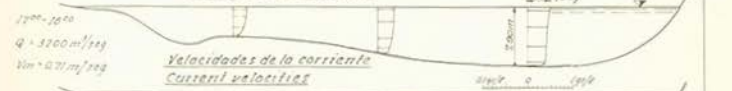
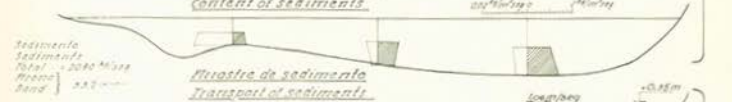
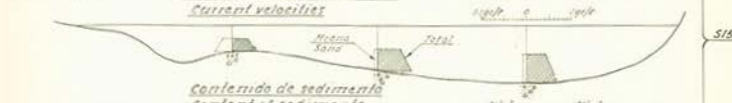
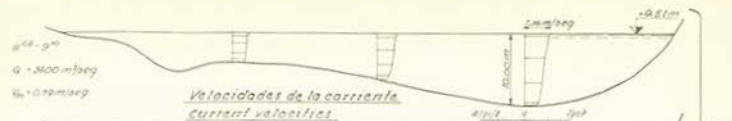
ARRASTRE DE SEDIMENTO

TRANSPORT OF SEDIMENTS

ente mediciones de arena en
 suspension.
 suspension are shown on this plane

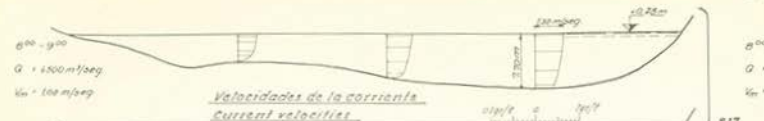
S/1

S/2



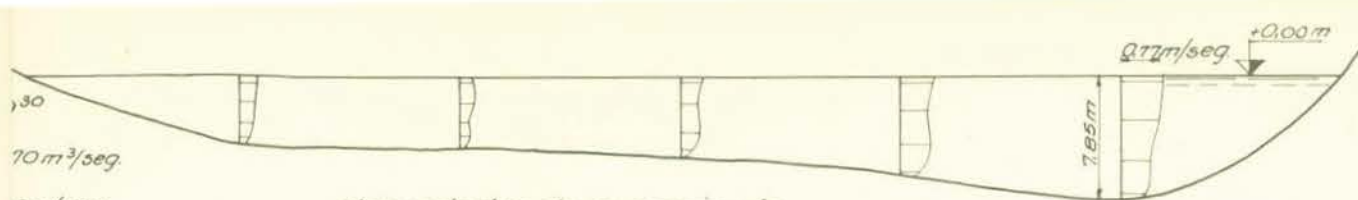
12 DE OCTUBRE 1949
12th OF OCTOBER 1949

- Arena fina Fine sand
- Arena gruesa Heavy sand
- Fango Muds
- Lodo y arcilla Silt and clay
- Arena fangosa Silt and clay
- Arena y fango Silt and clay
- Arena y fango Silt and clay

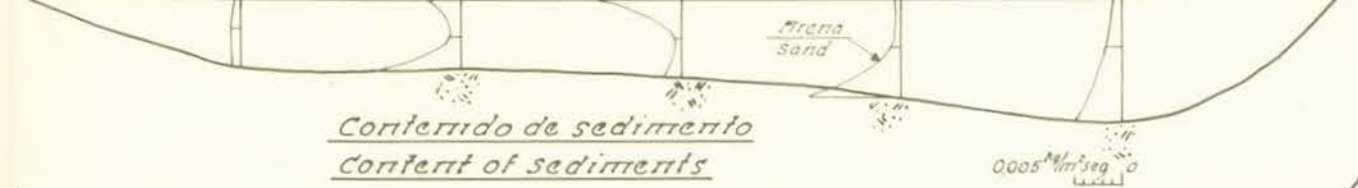


19 DE NOVIEMBRE 1949
19th OF NOVEMBER 1949





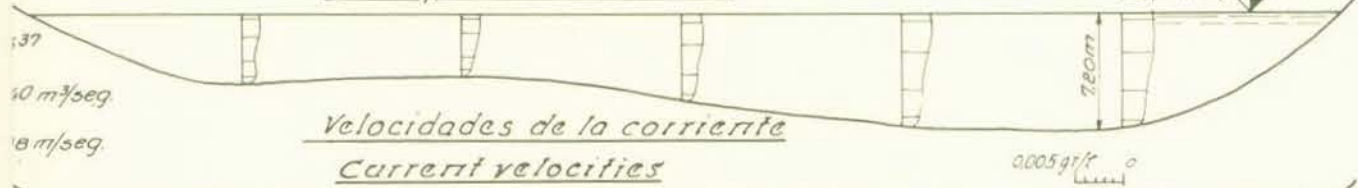
1,30
 70 m³/seg.
 3 m/seg.
Velocidades de la corriente
Current velocities



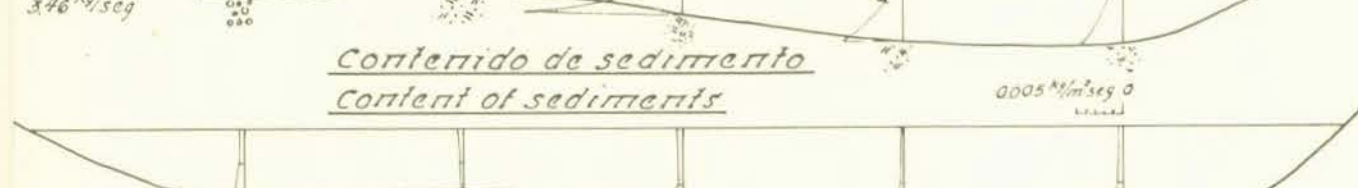
Contenido de sedimento
Content of sediments



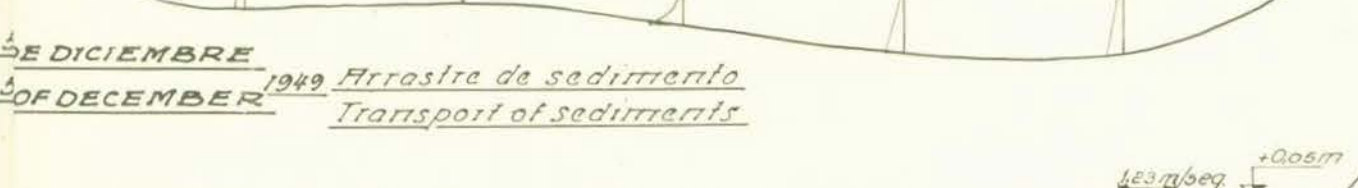
4,27 m³/seg.
Arrastre de sedimento
Transport of Sediments



1,37
 60 m³/seg.
 8 m/seg.
Velocidades de la corriente
Current velocities

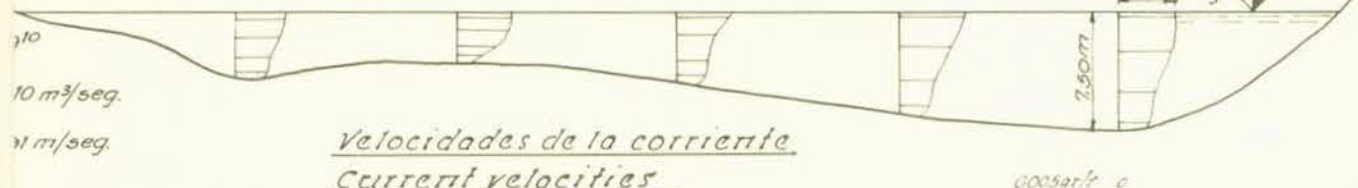


Contenido de sedimento
Content of sediments



3,46 m³/seg.
Arrastre de sedimento
Transport of sediments

5 DE DICIEMBRE 1949
 5 OF DECEMBER



1,10
 10 m³/seg.
 11 m/seg.
Velocidades de la corriente
Current velocities



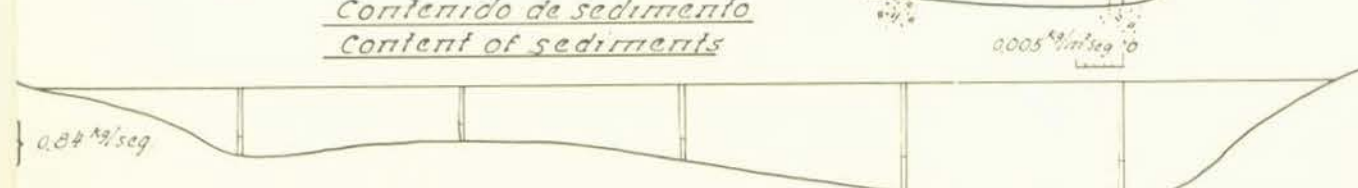
Contenido de sedimento
Content of sediments



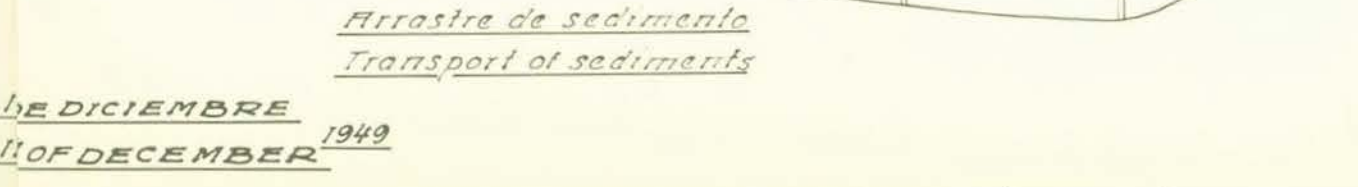
6,25 m³/seg.
Arrastre de sedimento
Transport of sediments



5,35
 50 m³/seg.
 34 m/seg.
Velocidades de la corriente
Current velocities



Contenido de sedimento
Content of sediments



0,84 m³/seg.
Arrastre de sedimento
Transport of sediments

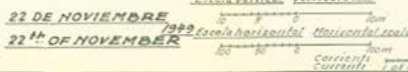
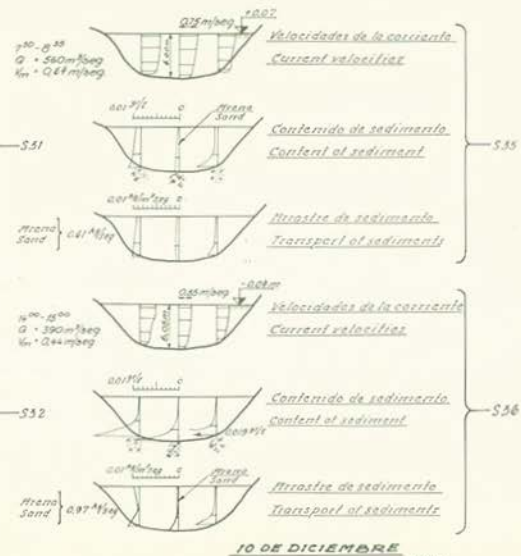
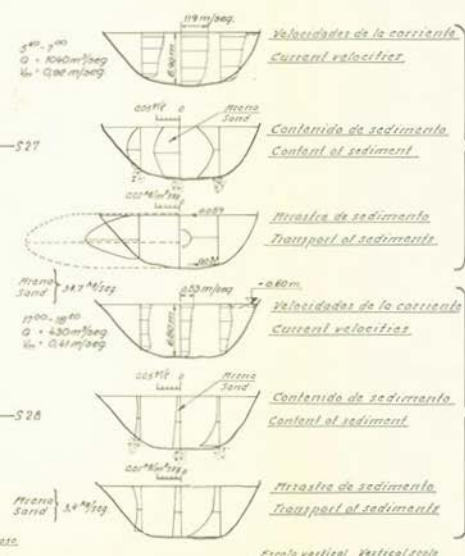
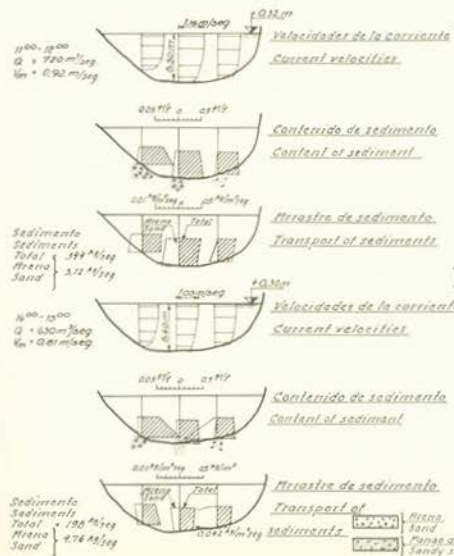
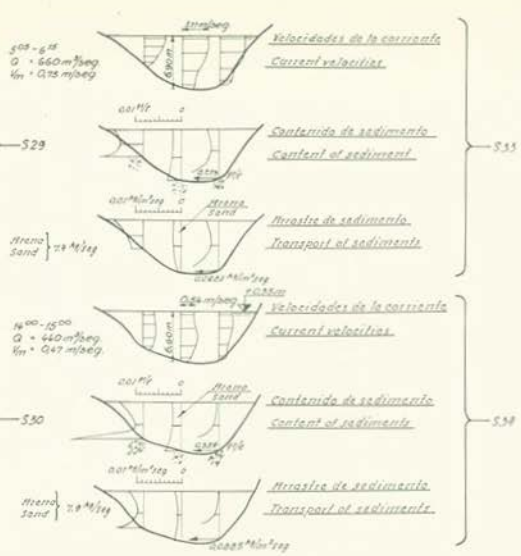
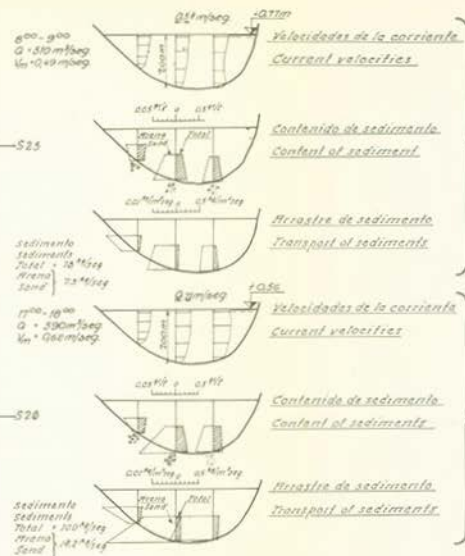
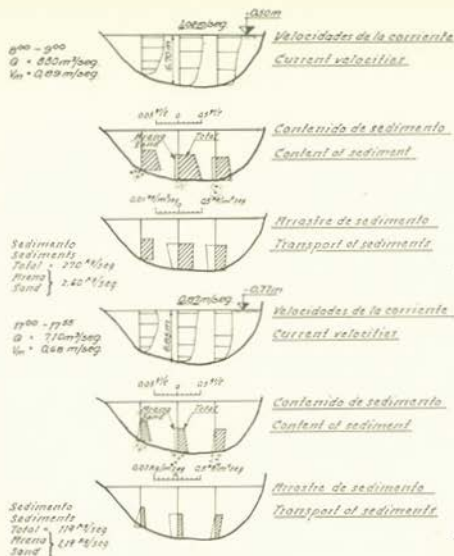
16 DE DICIEMBRE 1949
 16 OF DECEMBER

S21

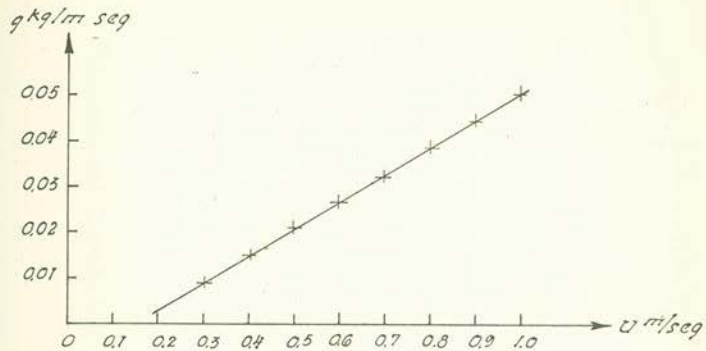
S22

S23

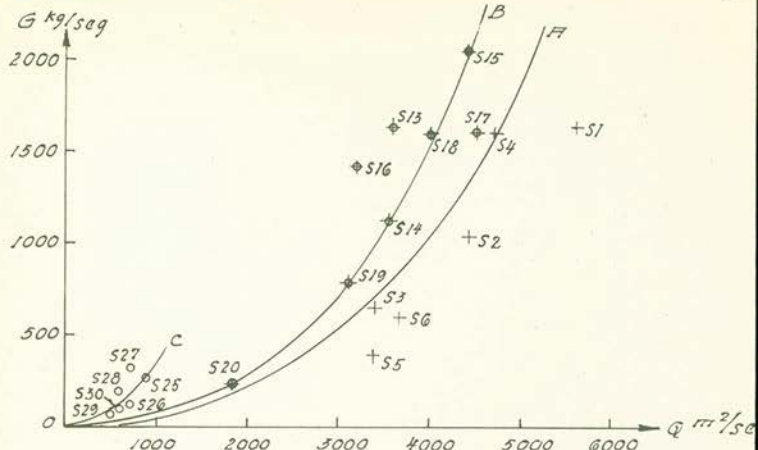
S24



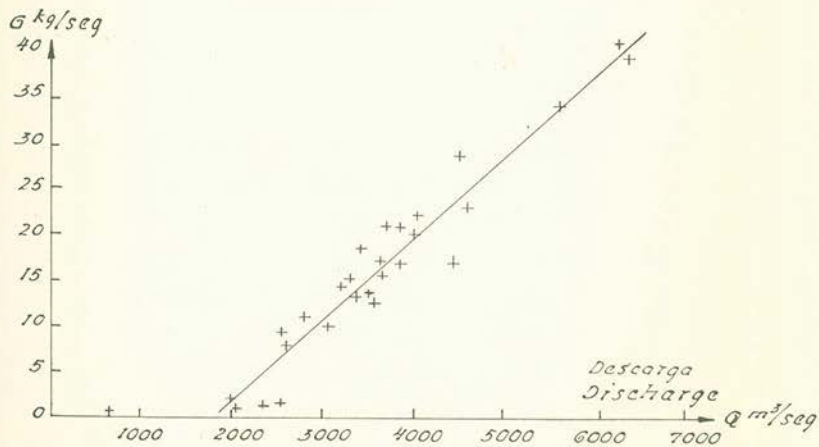
MEDIOS DE SEDIMENTO - CORTE C
SEDIMENT MEASUREMENTS - SECTION C



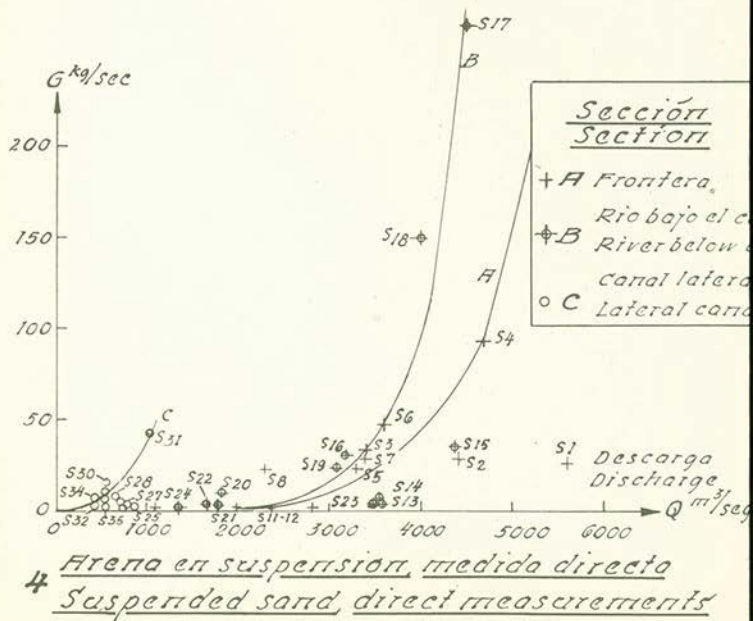
Hcarreo del lecho
Bed load



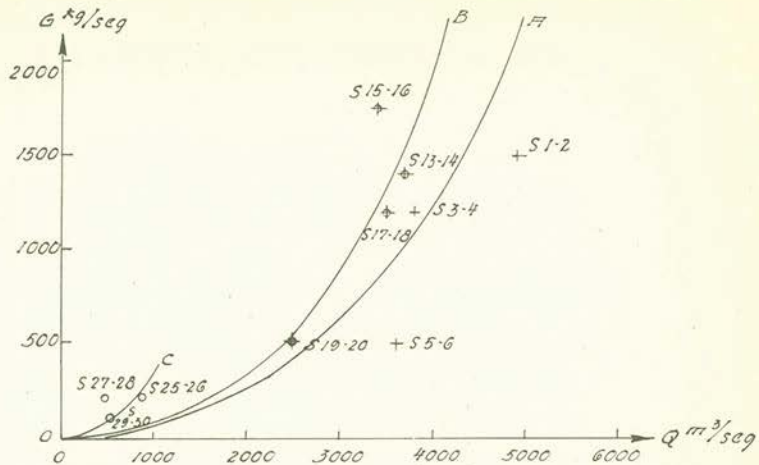
Hcarreo total en suspension medida directa
Total suspended load, direct measurements



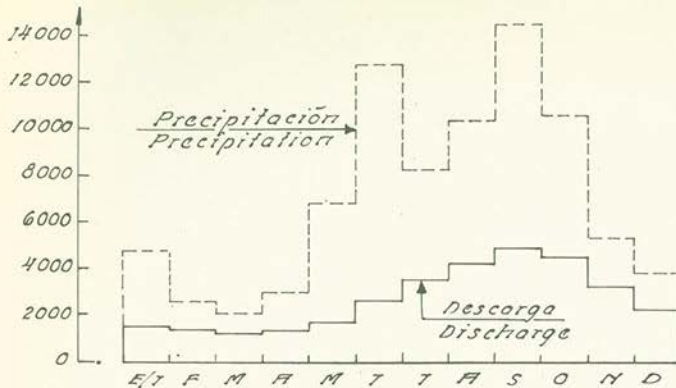
Hcarreo del lecho
Bed load



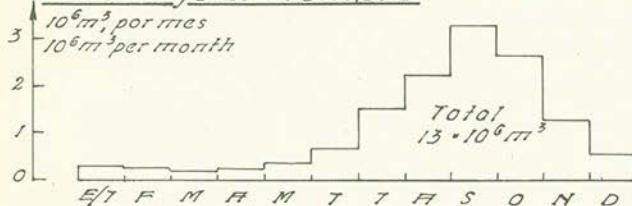
Arena en suspension, medida directa
Suspended sand, direct measurements



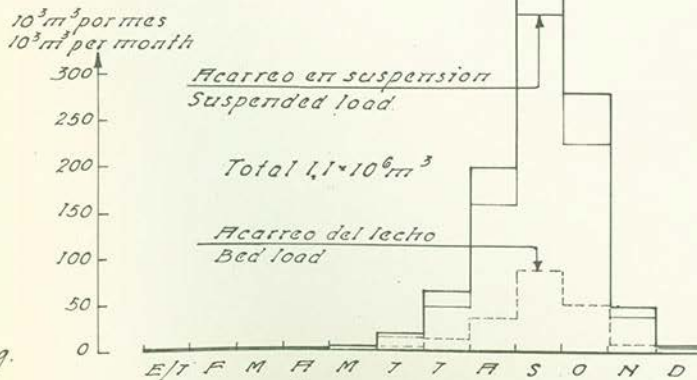
5 Acarreo total en suspensión, valores medios diarios
Total suspended load, daily mean values



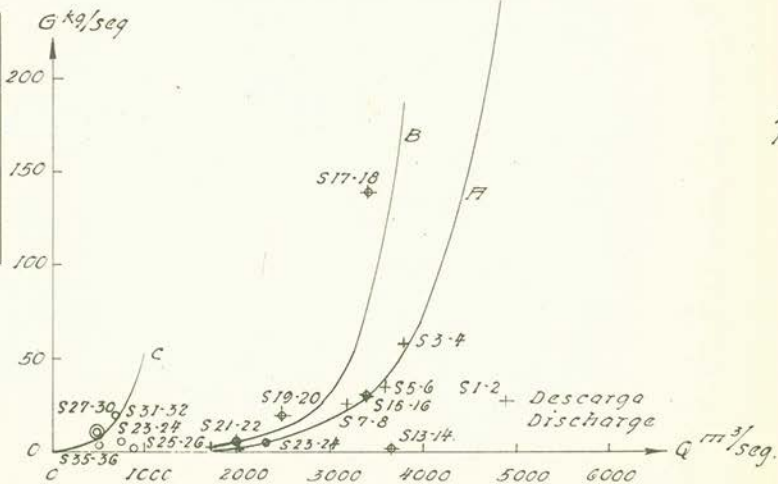
7 Descarga del Frontera
Discharge at Frontier



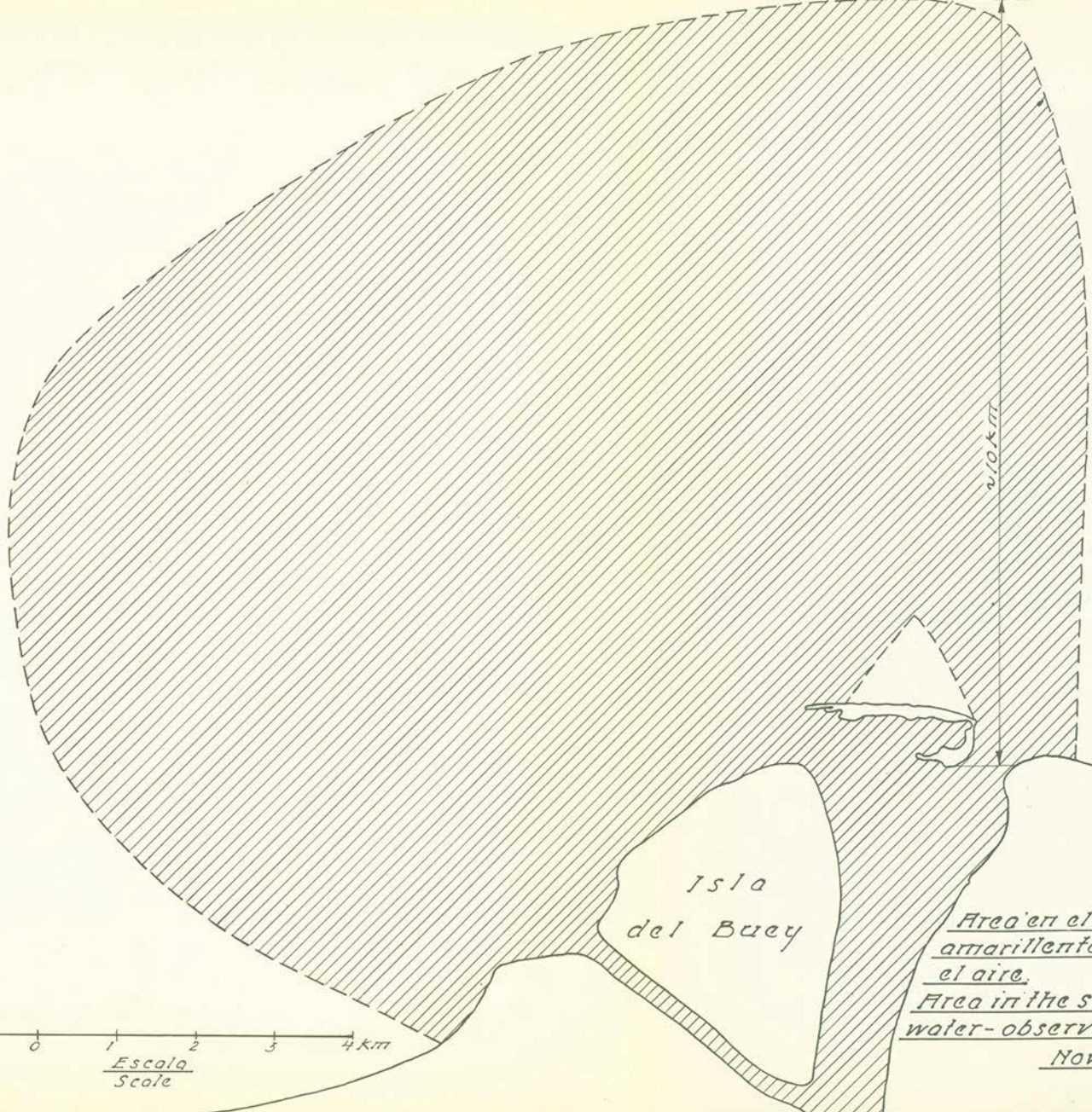
8 Material total en suspensión
Total suspended material



9 Transporte del arena
Transport of sand



6 Arena en suspensión, valores medios diarios
Sand in suspension, daily mean values



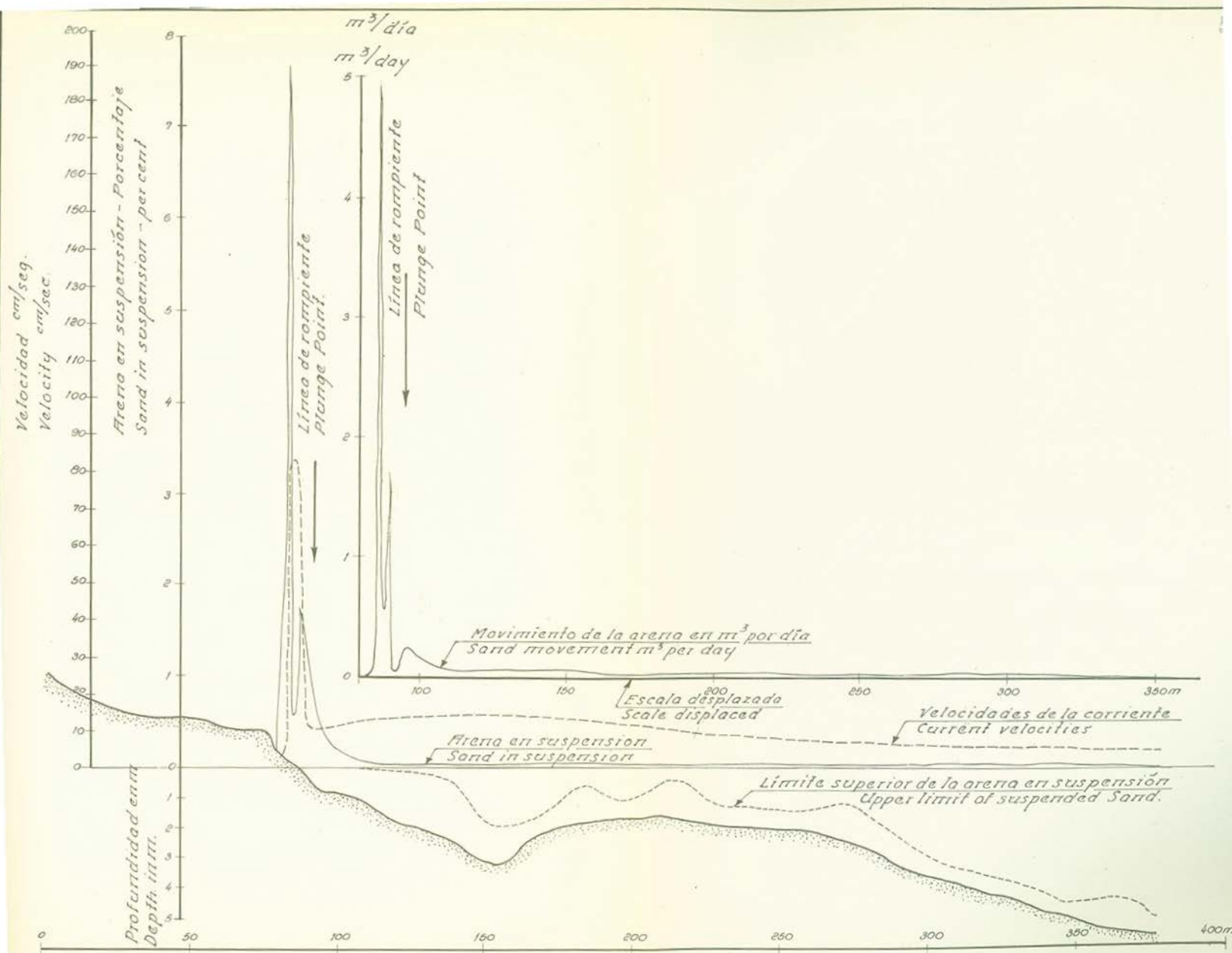
Isla
del Buey

Area en el mar con agua
amarillenta - observada desde
el aire.

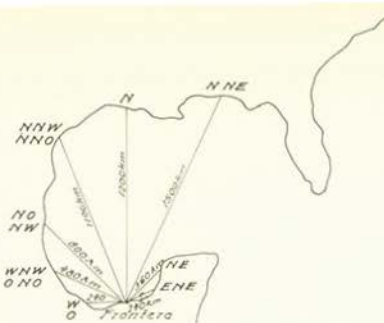
Area in the sea with yellowish
water - observed from the air.

Nov. 1949.

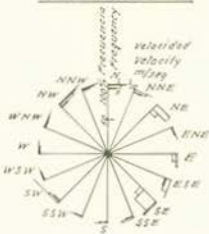
Escala
Scale



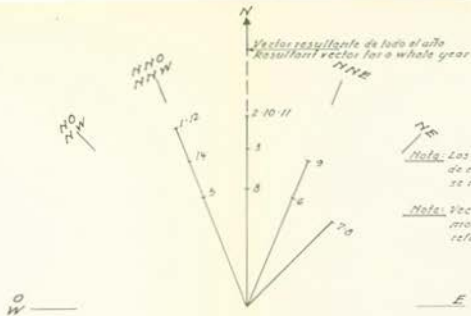
MEDIDAS DEL ACARREO LITORAL, PENSACOLA, U.S. Lámina 34.
 LITTORAL DRIFT MEASUREMENTS, Plate



DISTINCIÓN LIBRE
FREE STRETCH



WINDS 1948



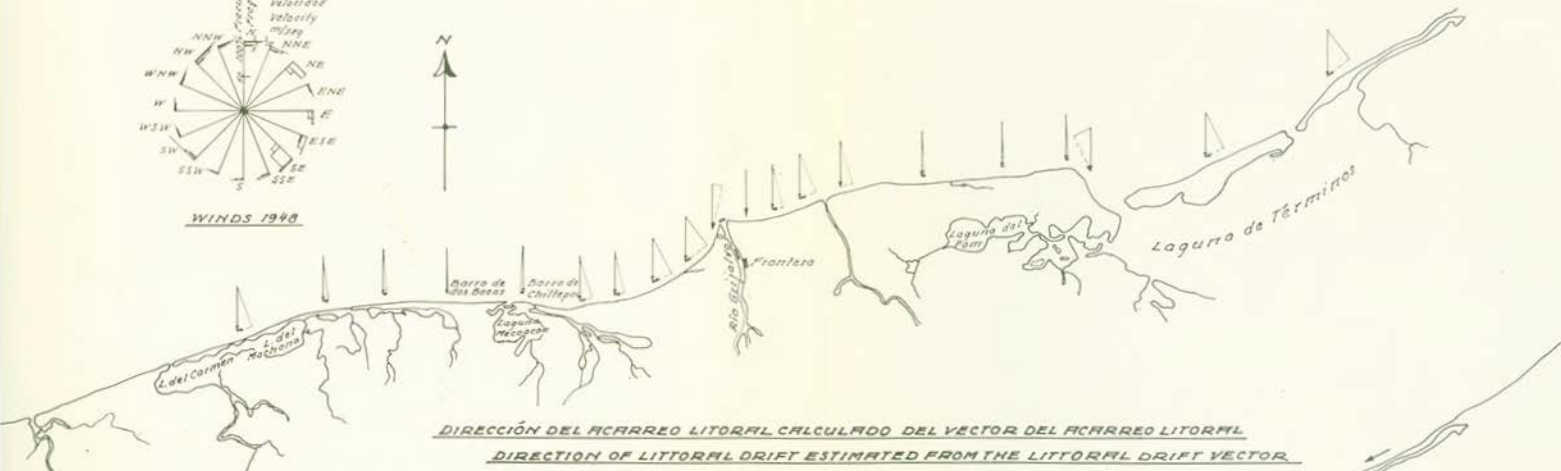
Nota: Los valores indicados son los de cada mes del año. El número se refiere al mes.

Note: Vectors are shown for each month of the year. The number refer to the month.

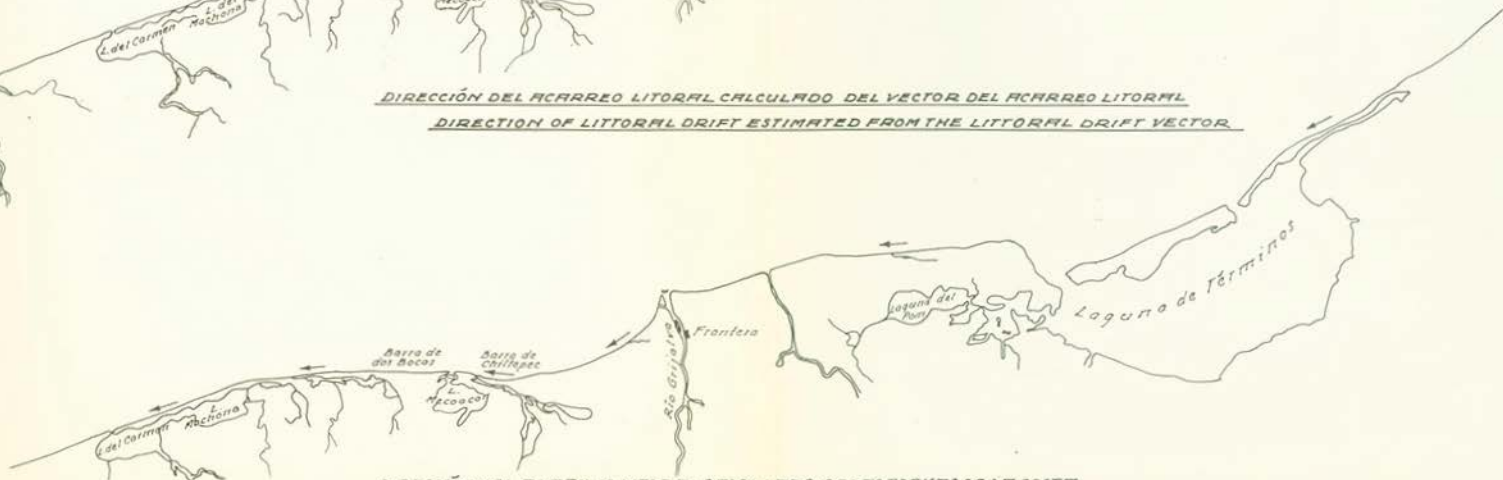


VECTORES DEL ACARREO LITORAL CALCULADOS DE LAS OBSERVACIONES DEL VIENTO 1948
LITTORAL DRIFT VECTORS CALCULATED FROM WIND OBSERVATIONS 1948.

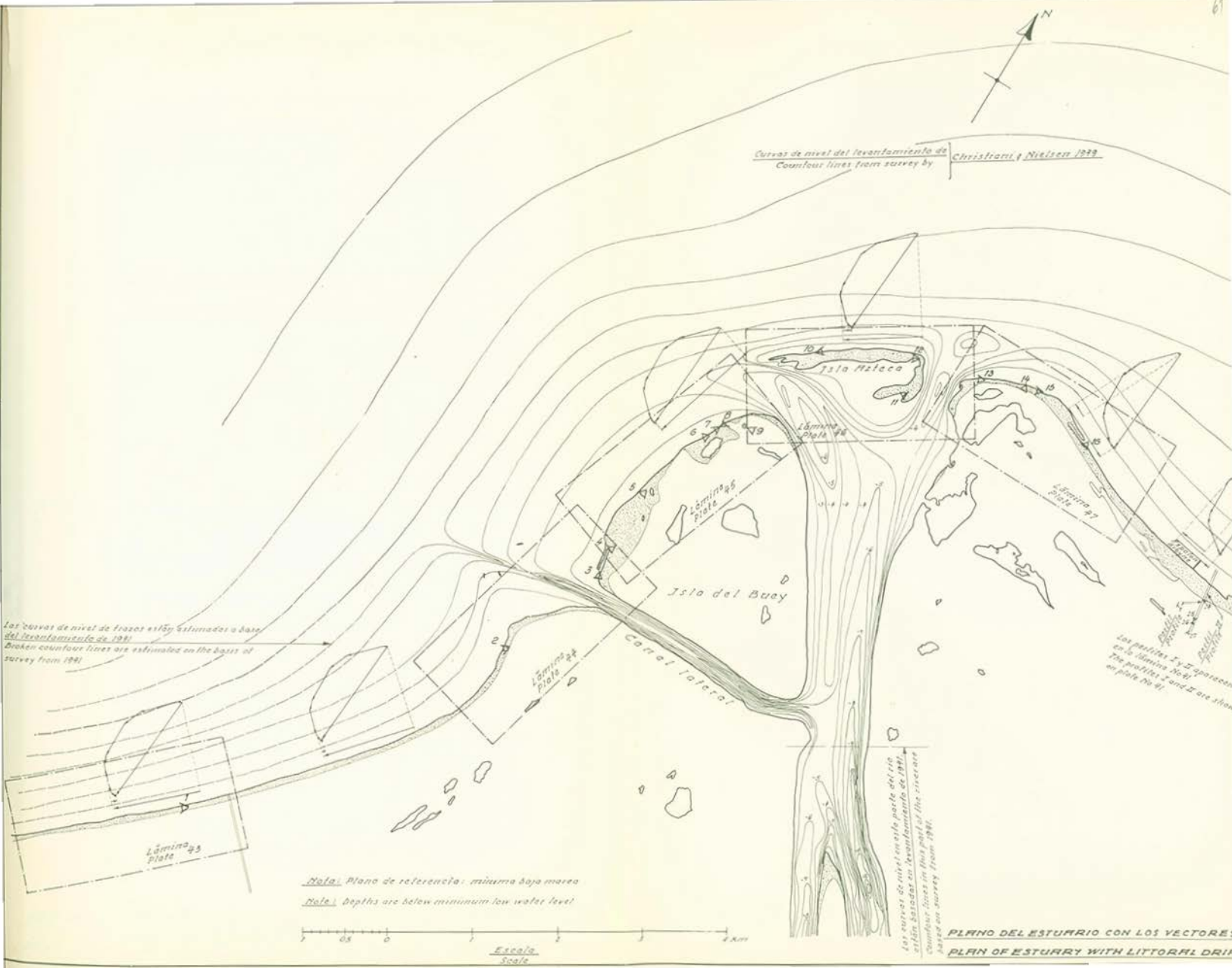
VECTORES DEL ACARREO LITORAL CALCULADOS DE LOS VIENTOS PREDOMINANTES Y MÁS FUERTES CADA MES.
LITTORAL DRIFT VECTORS ESTIMATED FROM MONTHLY PREVAILING AND STRONGEST WINDS.



DIRECCIÓN DEL ACARREO LITORAL CALCULADO DEL VECTOR DEL ACARREO LITORAL
DIRECTION OF LITTORAL DRIFT ESTIMATED FROM THE LITTORAL DRIFT VECTOR.



DIRECCIÓN DEL ACARREO LITORAL CALCULADO DE LAS FORMAS DE LA COSTA
DIRECTION OF LITTORAL DRIFT ESTIMATED FROM COASTAL FORMS.



Curvas de nivel del levantamiento de
 Contour lines from survey by Christensen & Nielsen 1928

Las curvas de nivel de trazo están estimadas a base
 del levantamiento de 1928.
 Broken contour lines are estimated on the basis of
 survey from 1928.

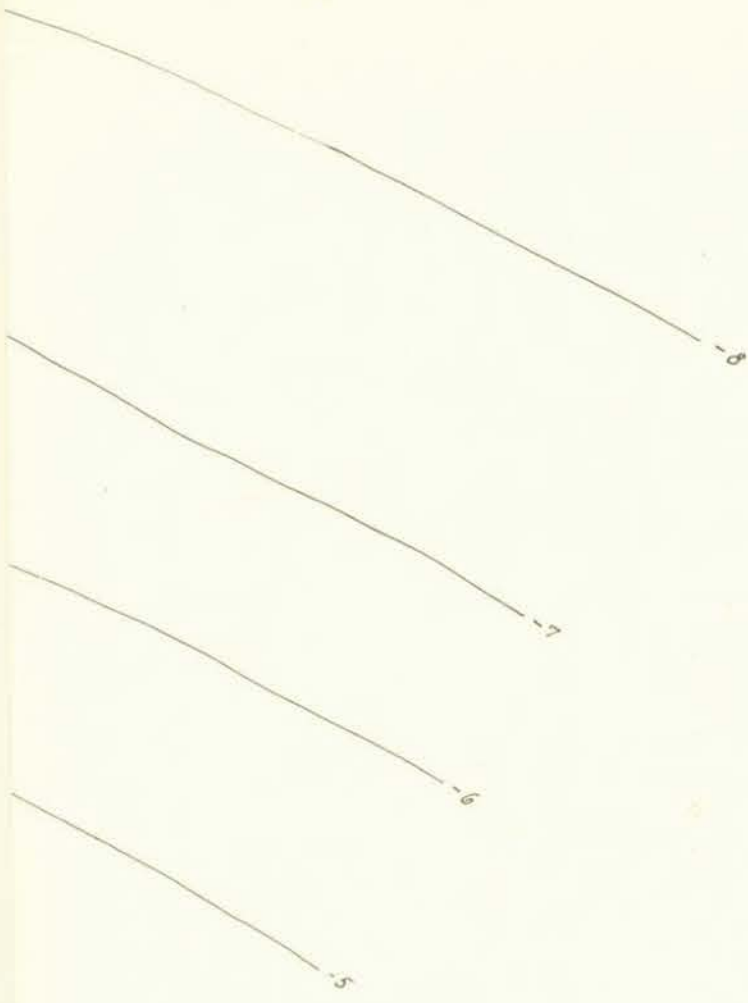
Las partes 1 y 2 aparecen
 en la Lámina No. 1.
 The profiles 1 and 2 are shown
 on plate No. 1.

Las curvas de nivel en esta parte del río
 están basadas en levantamiento de 1921.
 Contour lines in this part of the river are
 based on survey from 1921.

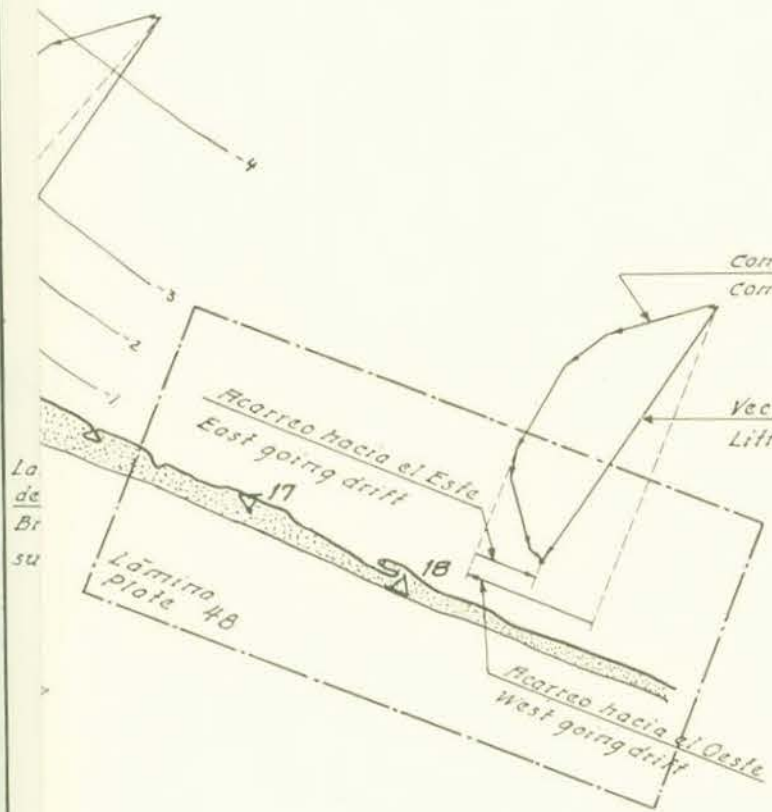
Nota: Plano de referencia: mínima baja marea
Nota: Depths are below minimum low water level

0 0.5 1 2 3 4 Km
 Escala
 Scale

PLANO DEL ESTUARIO CON LOS VECTORES DE LAS CORRIENTES
 PLAN OF ESTUARY WITH LITTORAL DRIFT



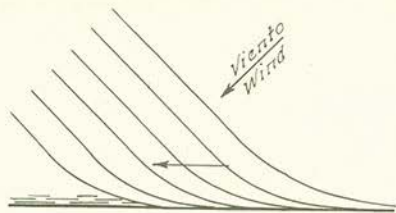
Componentes según varias orientaciones de la brújula
Components after various compass directions



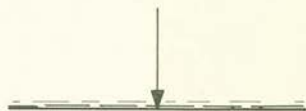
Vector de acarreo litoral (1948)
Littoral drift vector (1948)

La
de
Br
su

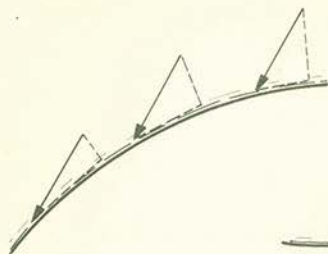
Nota: Δ Indica punto de observación de las fotos mostradas en Láminas 49, 50 y 51
— — Límite de las fotos aéreas mostradas en las dichas láminas
Note: Δ Indicates viewpoint of photos shown on Plates 49, 50 and 51
— — Limit of aerial photos shown on the mentioned plates.



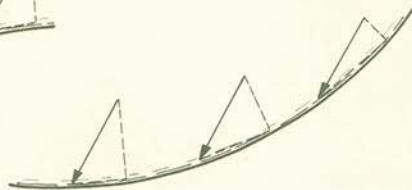
1. Deflexión de las olas
Turning of wave fronts



2. No hay acarreo litoral
No littoral drift



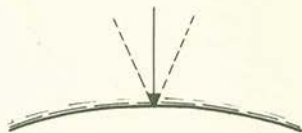
6. Erosión
Erosion



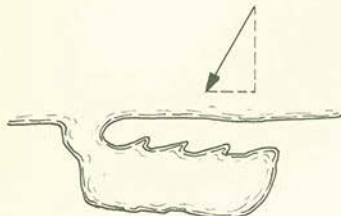
7. Sedimentación
Sedimentation



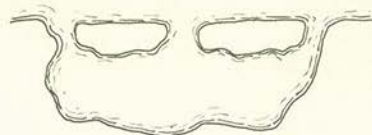
3. "Punta Cero" con sedimentación
"zero point" with sedimentation



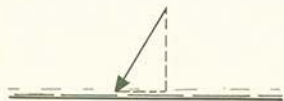
4. "Punta Cero" con erosión
"zero point" with erosion



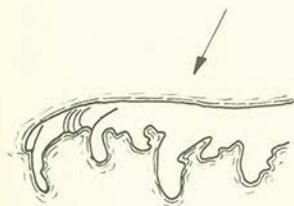
8. Laguna con espolón
Lagoon with spit



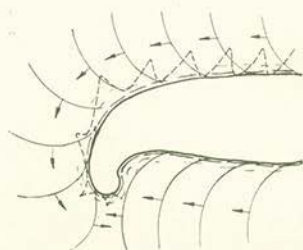
9. Laguna con Islas
Lagoon with Islands



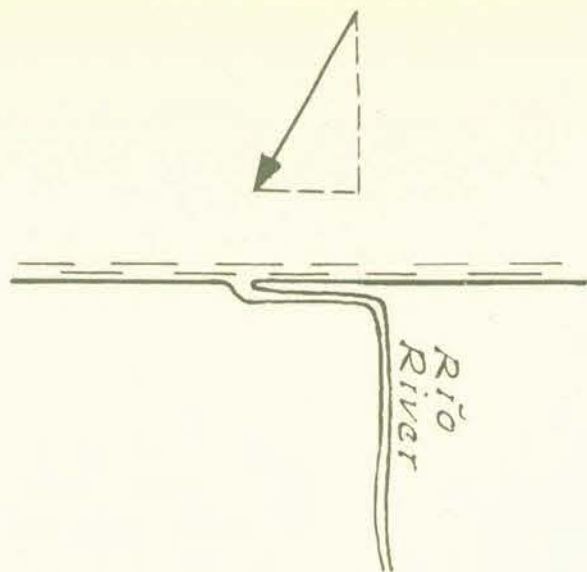
5. Acarreo
Transport



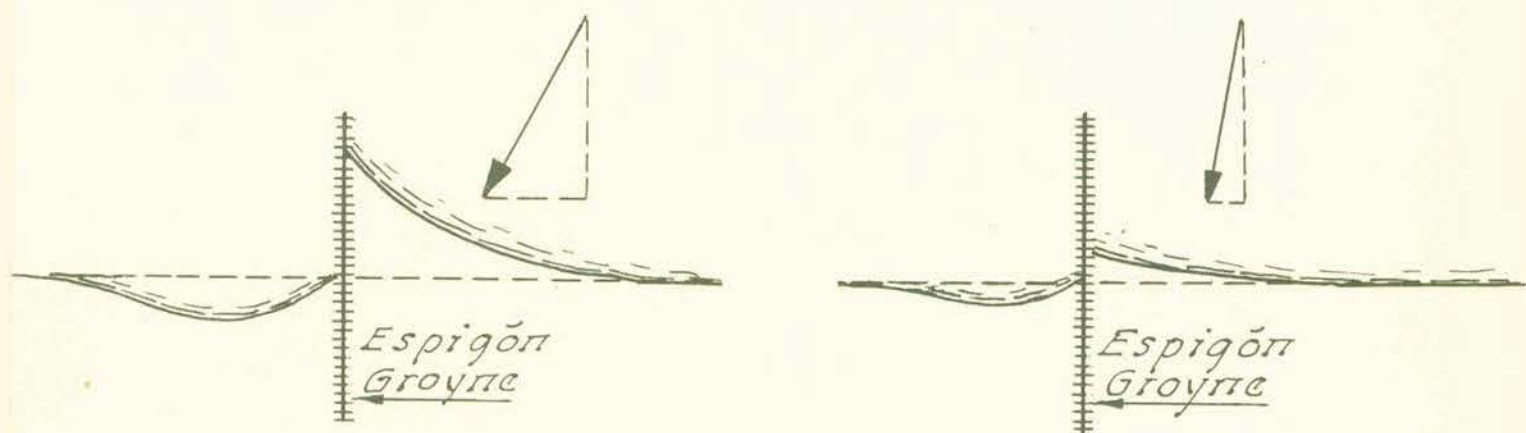
10. Lengua formada por varias lengüetas curvadas
Spit formed by several recurved spits.



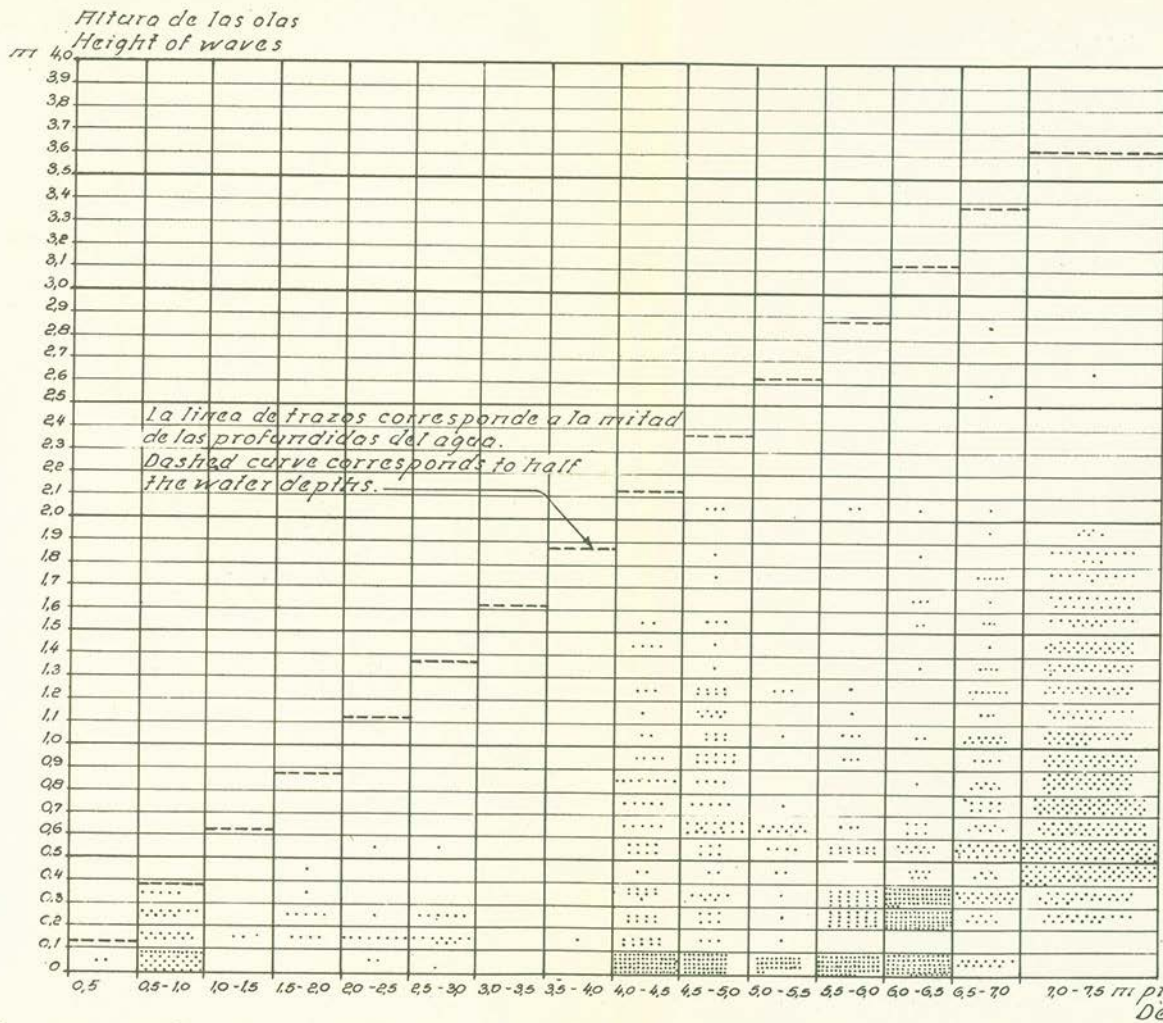
11. Lengua curvada
Recurved spit ACAR LITTO



Río en costa con acarreo litoral
 12. River on coast with littoral drift



Influencia de la dirección del vector
sobre la costa junto al espigón.
 13. Influence of direction of vector on
coast at groyne.



Nota: Cada punto corresponde a una medida. Las observaciones se hicieron en las mañanas y en las tardes del 1/4-1937 al 1/4-1940.
Note: Each dot corresponds to one measurement. Observations were made in the mornings and evenings from 1/4-1937 to 1/4-1940.

MEDIDAS DE LA ALTURA DE LAS OLAS EN PROGRESO
MEASUREMENTS OF WAVE HEIGHTS AT PROGRESO.



Isla Az...

Isla del
Buey

Rio Grijalvo

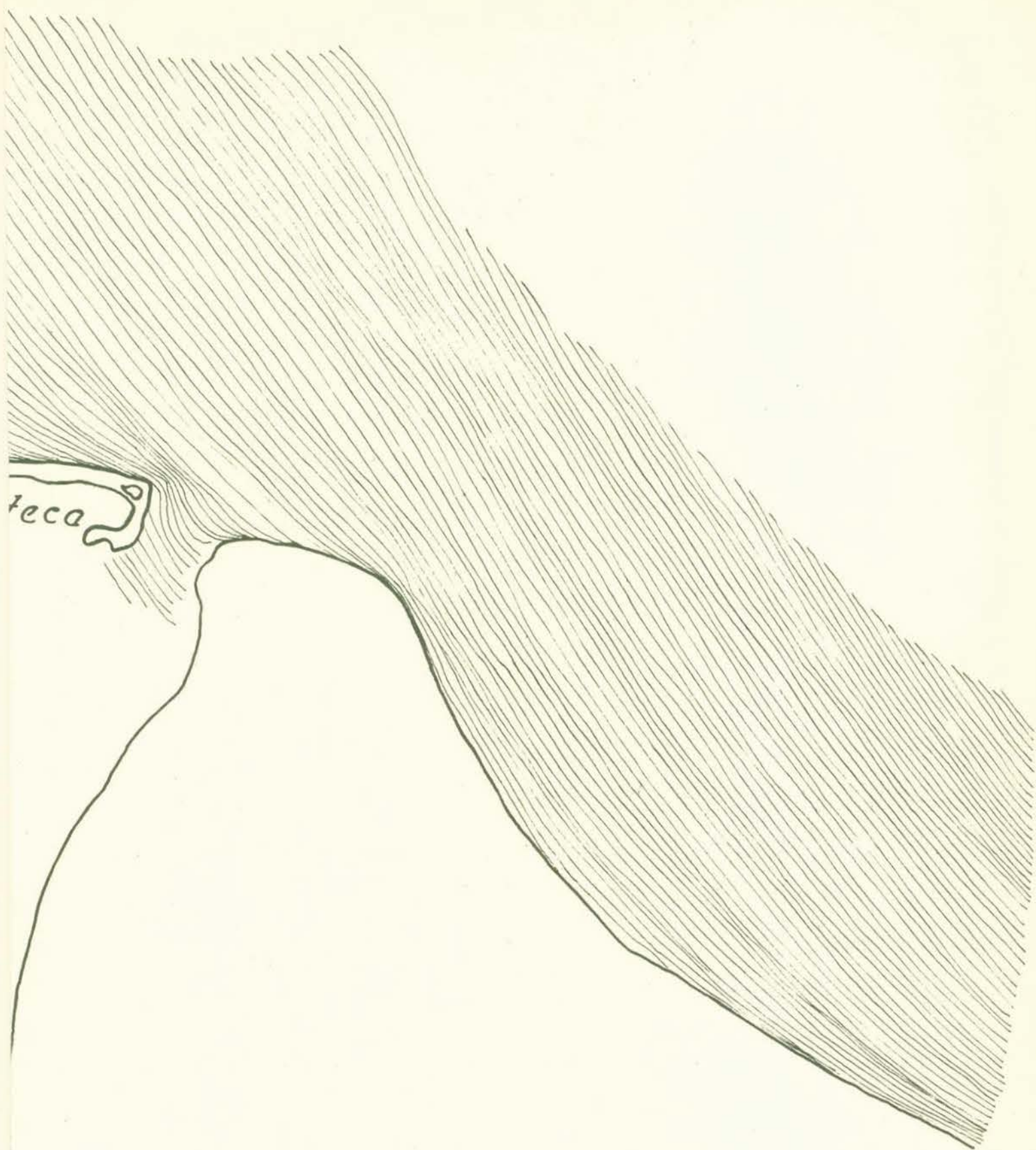
Nota: Basado en fotografías aéreas tomadas en Julio de 1949. (Las láminas Nos. 43 a 48 muestran partes del área fotografiada)

Note: Based on aerial photographs taken July 1949. (Plates No. 43 to 48 show parts of photographed area).

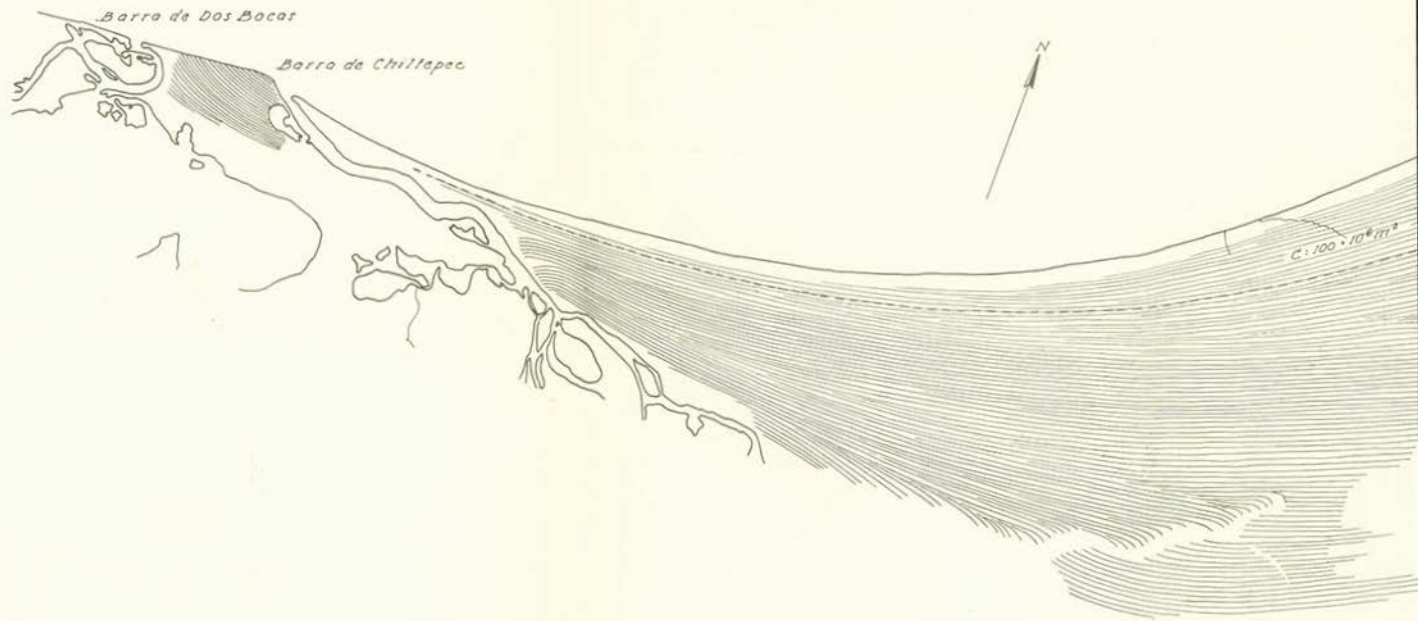
1 0 1 2 3 4 5 Km

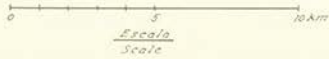
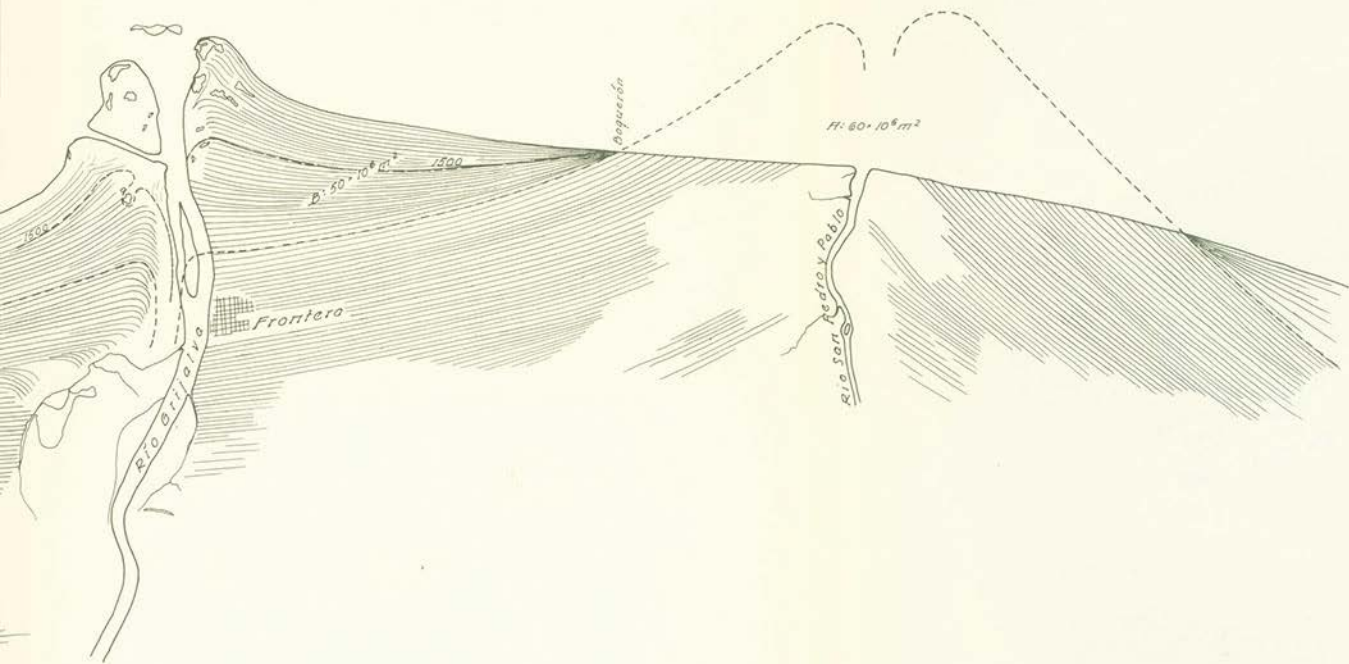
Escala
Scale

DESVIACIÓN
DEVIATION



DE LAS OLAS EN LA BOCA DEL RÍO
OF WAVES AT THE RIVER MOUTH





PLANO DEL SISTEMA DE ONDULACIONES EN LA PLAYA ANTIGUA
PLAN WITH SYSTEM OF OLD BEACH RIDGES



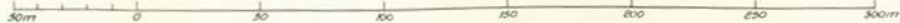
Golfo de México

PERFIL I
PROFILE I



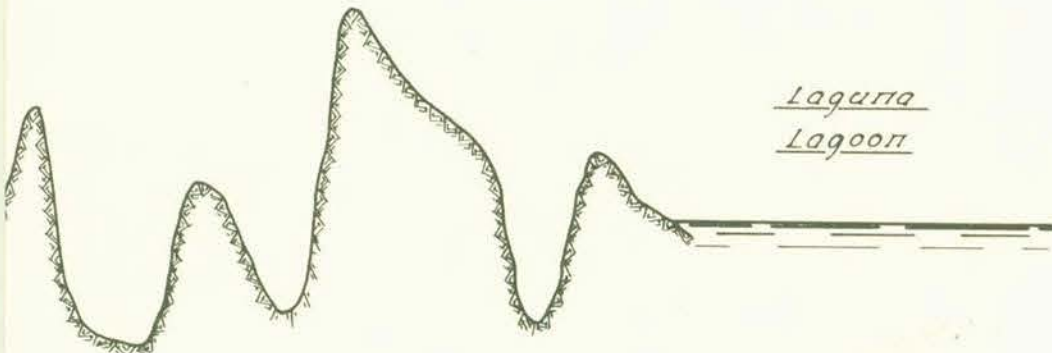
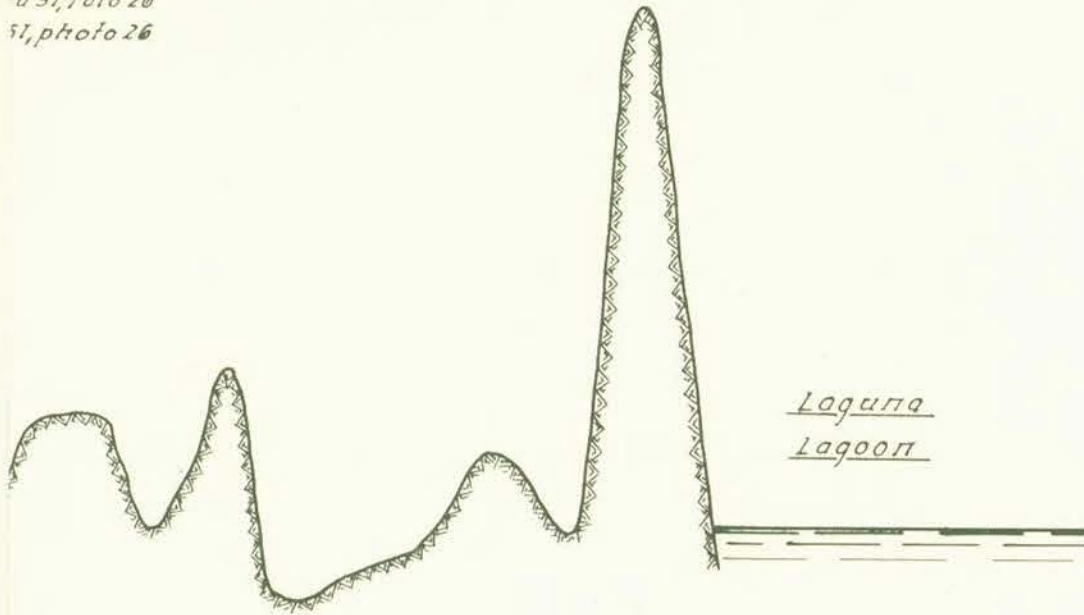
Golfo de México

PERFIL II
PROFILE II



Escala horizontal
Horizontal scale

51, foto 26
51, photo 26



Nota: Para Localización de las perfiles vease lámina No 5
Note: For Location of the profiles see plate No 5

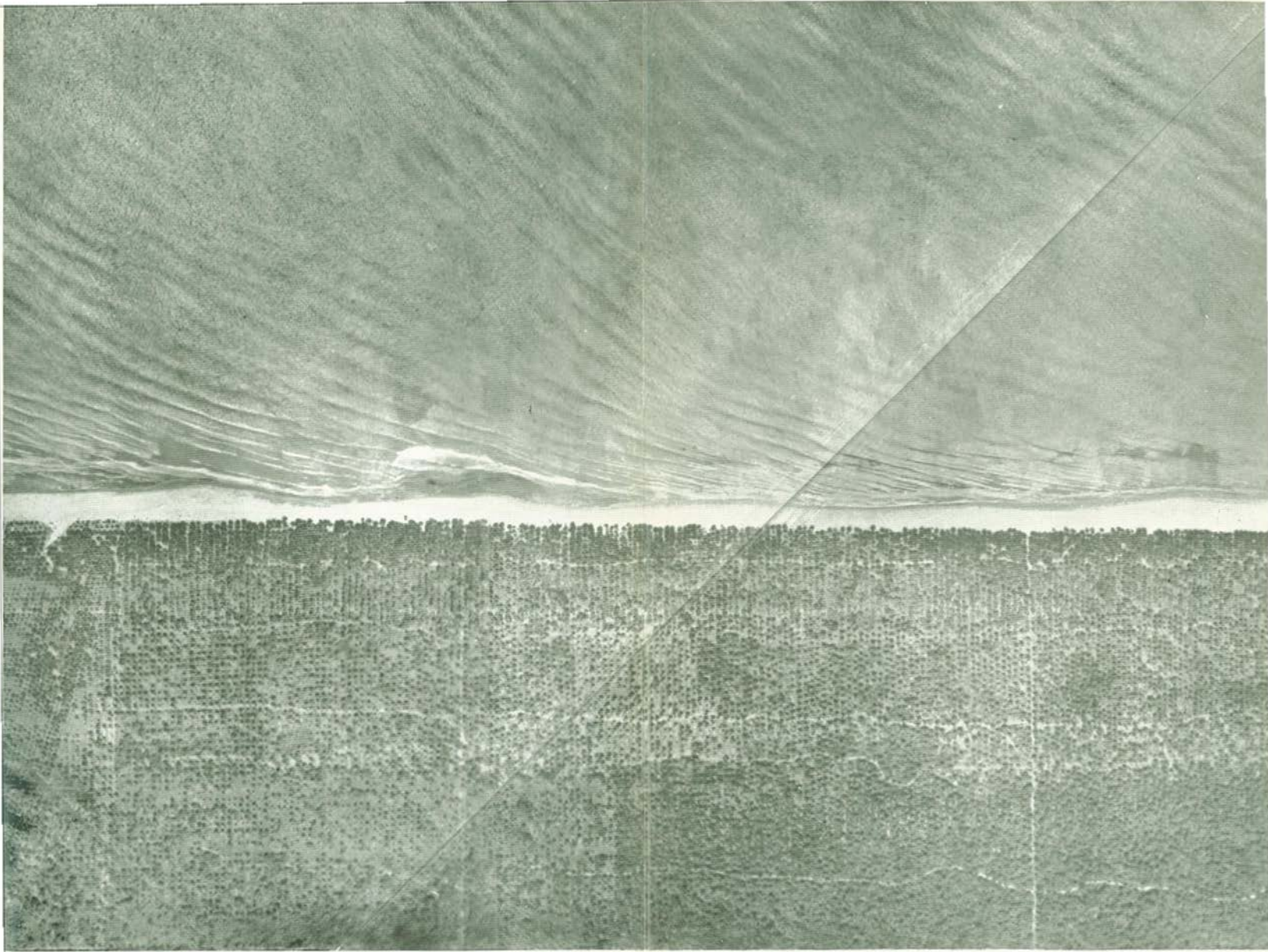
PERFILES MOSTRANDO LOS CAMELLONES DE LA PLAYA ANTIGUA
PROFILES SHOWING OLD BEACH RIDGES.



0 1000 2000 3000 4000 5000 6000 ft

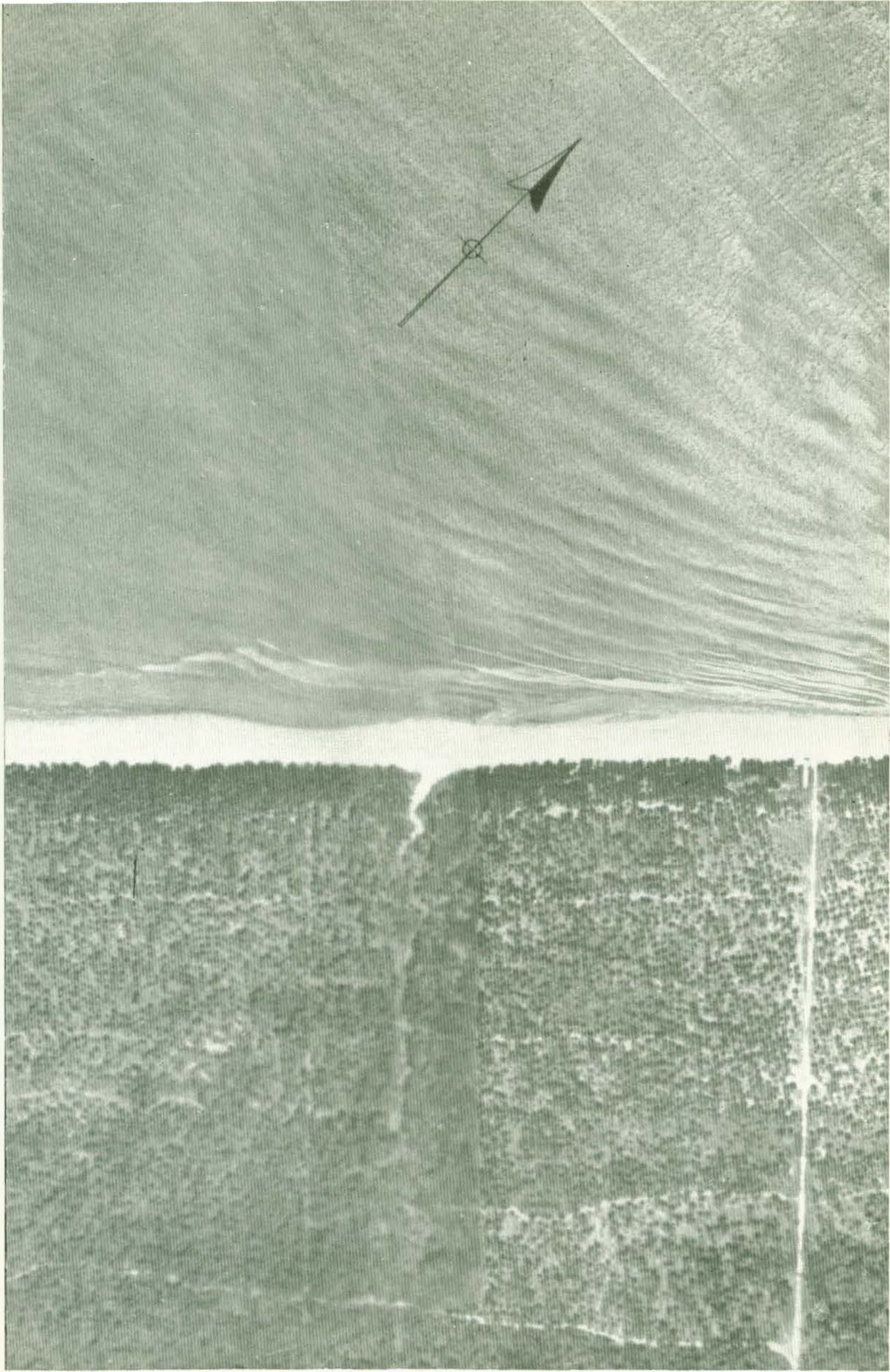


EL ESTUARRO DEL RÍO GRIJALVA Lámina 42
THE ESTUARY OF RÍO GRIJALVA Plate



0 100 200 300 400 500 600 700 800 900 1000m

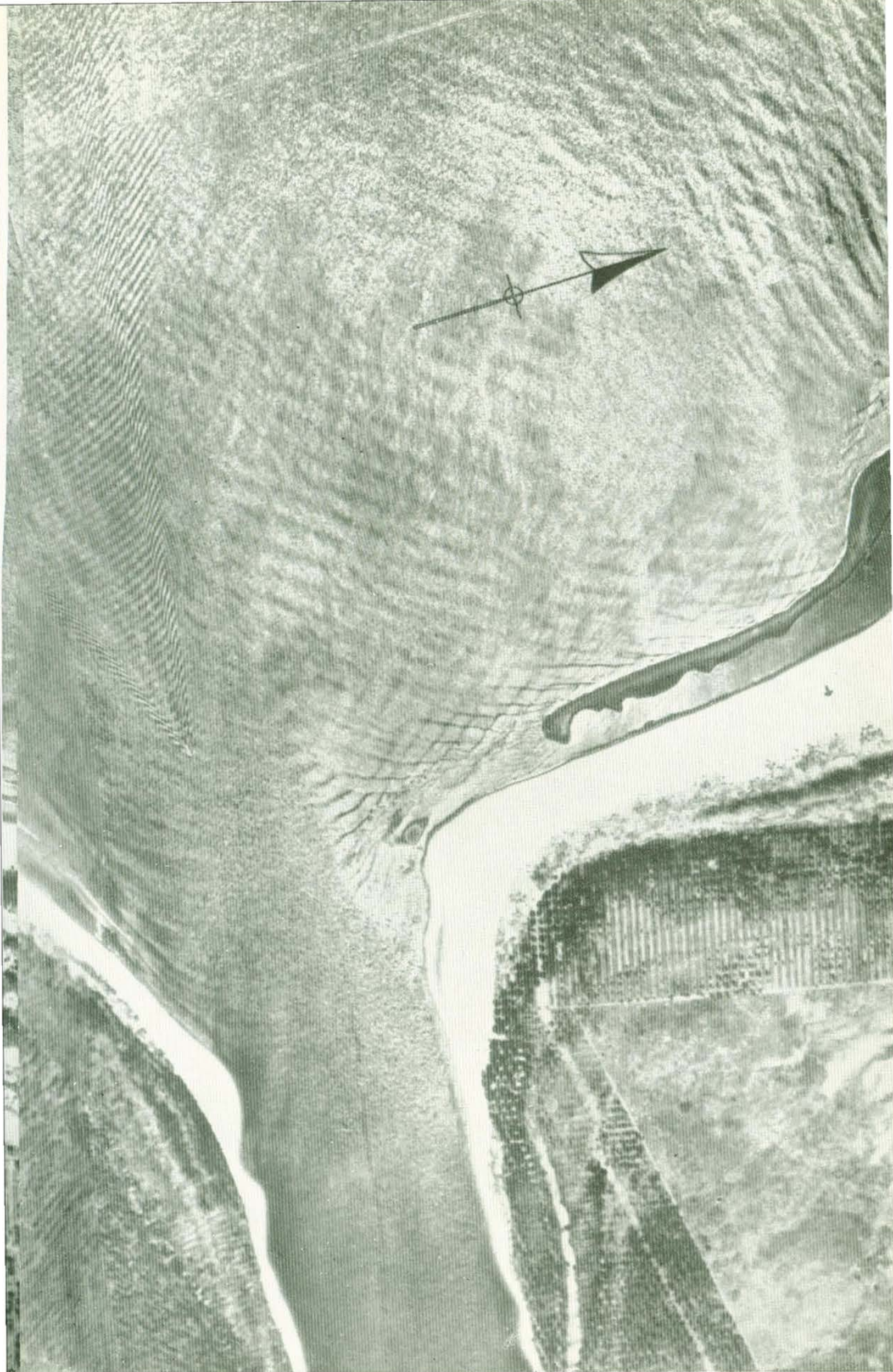
COSTA 5 A 7.5K
COAST 5 TO 7.5A



AL SUDOESTE DEL CANAL LATERAL
SOUTHWEST OF LATERAL CANAL



0 100 200 300 400 500 600 700 800 900 1000m



BOCA DEL CANAL LATERAL
MOUTH OF THE LATERAL CANAL.

Lámina 44.
Plate



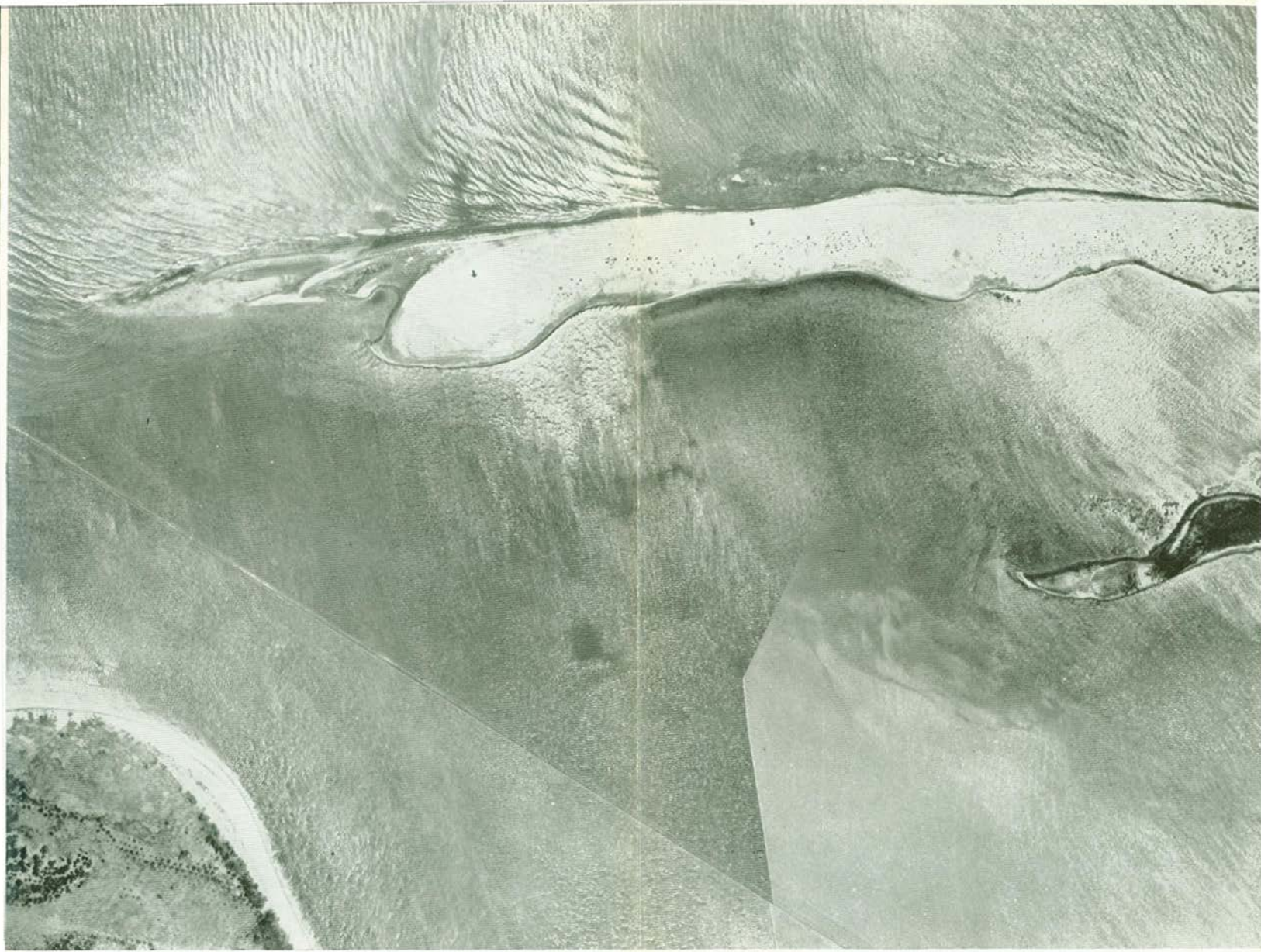
0 100 200 300 400 500 600 700 800 900 1000m

COS
WE.



LA OCCIDENTAL DE LA ISLA BUEY
WESTERN COAST OF BUEY ISLAND.

Lámina 45.
Plate

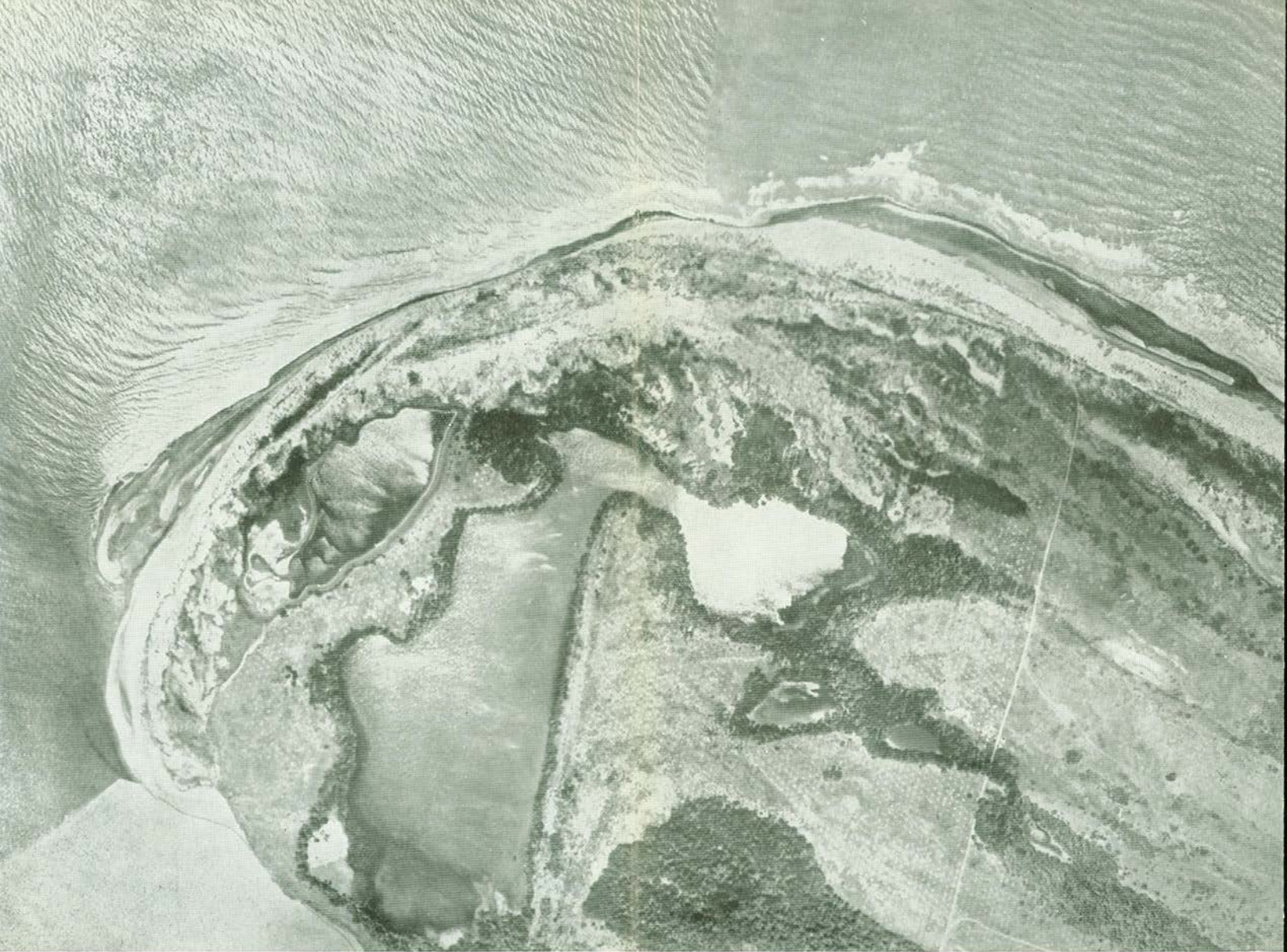


0 100 200 300 400 500 600 700 800 900 1000m



ISLA AZTECA
AZTECA ISLAND

Lamina 46.
Plate



0 100 200 300 400 500 600 700 800 900 1000m

COSTA OF 2.5
COAST O TO 2

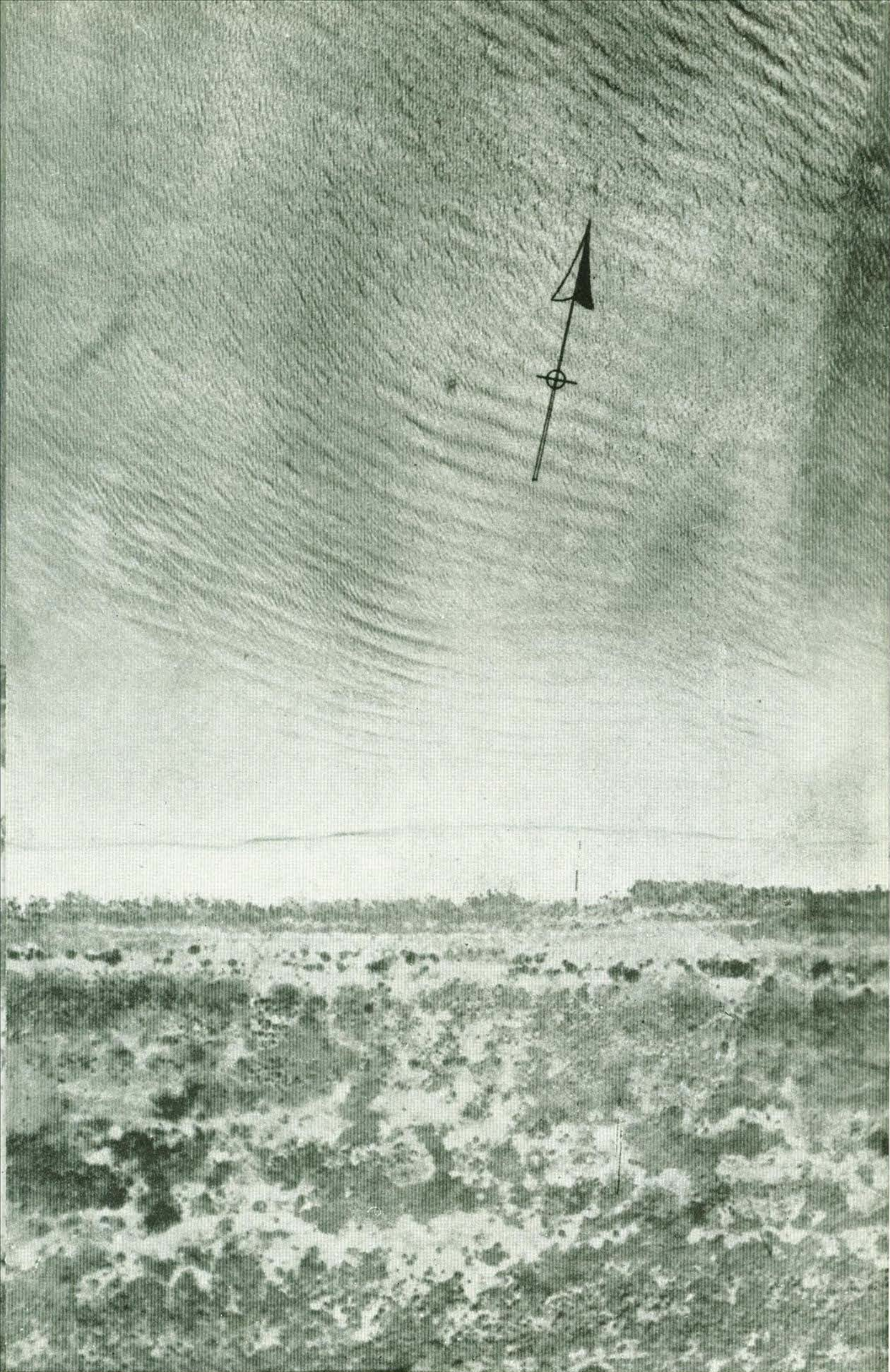


5 km AL ESTE DE LA DECEMBOCADURA 5 km EAST OF RIVER MOUTH Lámina 47.
 Plate



0 100 200 300 400 500 600 700 800 900 1000 μ m

COSTA 5 A 7.5 K
COAST 5 TO 7.5



AL ESTE DE LA DESEMBOCADURA.
EAST OF RIVER MOUTH.

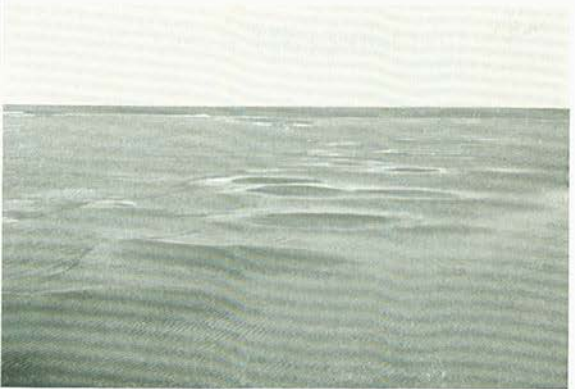
Lámina 48.
Plate 48.



1 5 km al suroeste del canal lateral
5 km southwest of Lateral canal



2 Inmediatamente al sur del canal lateral
Immediately south of Lateral canal



3 Area de poca profundidad al norte del canal lateral
Shallow area north of Lateral canal



4 500 m al norte del canal lateral
500 m north of Lateral canal



5 Laguna con caleta al lado oeste de la Isla del Buey
Lagoon with creek, west side of Isla del Buey



6 Salida de la laguna occidental al oeste de la Isla del Buey
Outlet from Lagoon, west side of Isla del Buey



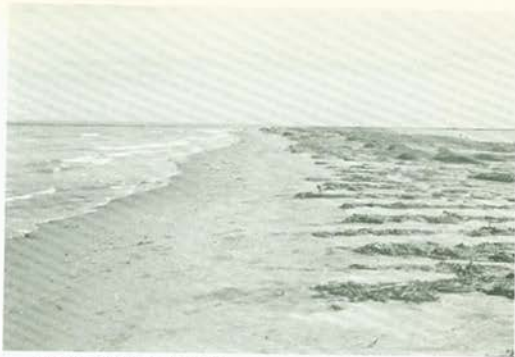
7 Costa occidental de la Isla del Buey, cerca del faro
West coast of Isla del Buey, near lighthouse



8 Costa occidental de la Isla del Buey, cerca del faro
West coast of del Buey, near lighthouse



9 Punta norte de la Isla del Buey, vista desde el faro
North end of Isla del Buey, seen from the lighthouse



10 Costa norte de la Isla Azteca
North coast of Isla Azteca



11 Lengua de tierra en la punta sureste de la Isla Azteca
Spit at south eastern end of Isla Azteca



12 Rincón noreste de la Isla Azteca
North eastern corner of Isla Azteca



13 Costa 200 m al este del río
Coast 200 m east of river



14 Vegetación fuera de la costa, 500 m al este del río
Grass off the coast 500 m east of river



15 Restos de un naufragio 1 km al este del río
Wreck 1 km east of river



16 Lengua de tierra dirigida hacia el este, 2 km al este del río
East going spit 2 km east of river



17 Barras migratorias 5 km al este del río
Migrating bars 5 km east of river



18 Lenguas de tierra dirigidas hacia el oeste, 6 km al este del río
West going spits, 6 km east of river



19 Costa al oeste de Boquerón
Coast west of Boquerón.



20 Costa con barranca al oeste de Boquerón
Coast with low cliff west of Boquerón.



21 Boca de pequeño río al oeste de Boquerón
Mouth of small river west of Boquerón.



22 Costa bajo erosión entre Boquerón y San Pedro
Coast under erosion between Boquerón y San Pedro.



23 Costa bajo erosión entre Boquerón y San Pedro
Coast under erosion between Boquerón y San Pedro.



24 Lomo cubierto de dunas en la costa
Ridge with dunes at the coast.



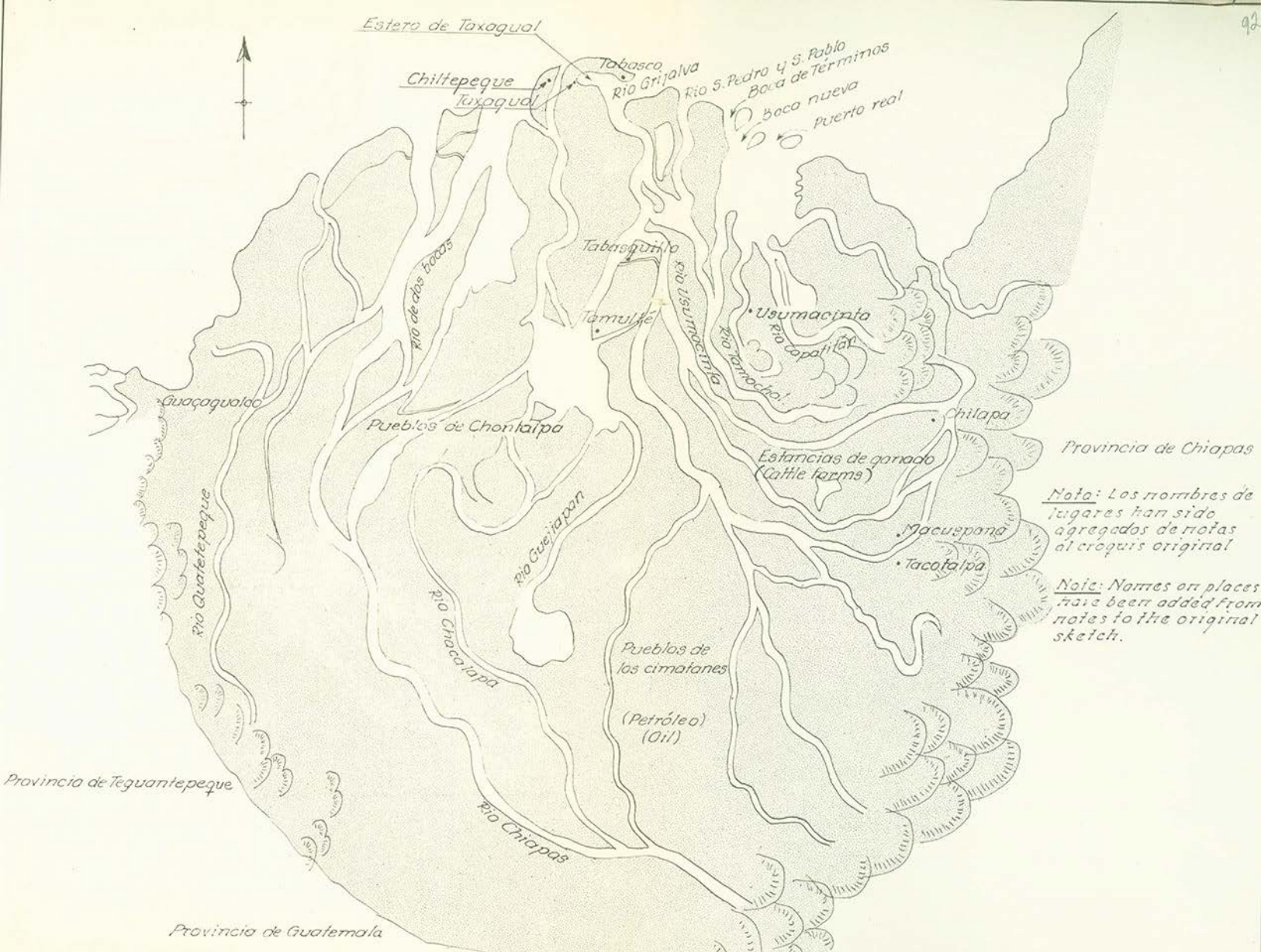
25 Lomos y surcos llenos de agua a 300 m de la playa
Ridges and water covered furrows, 300 m from the shore.



26 Igual que 25 pero mirando hacia tierra
Same as 25 but looking inland.



27 Laguna entre lomos, a 550 m de la playa
Lagoon between ridges, 550 m from the shore.



Provincia de Chiapas

Nota: Los nombres de lugares han sido agregados de rios al croquis original

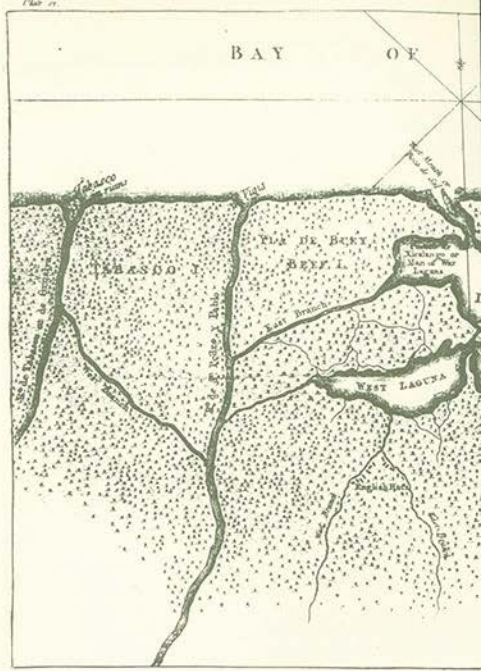
Nota: Nombres or places have been added from notes to the original sketch.



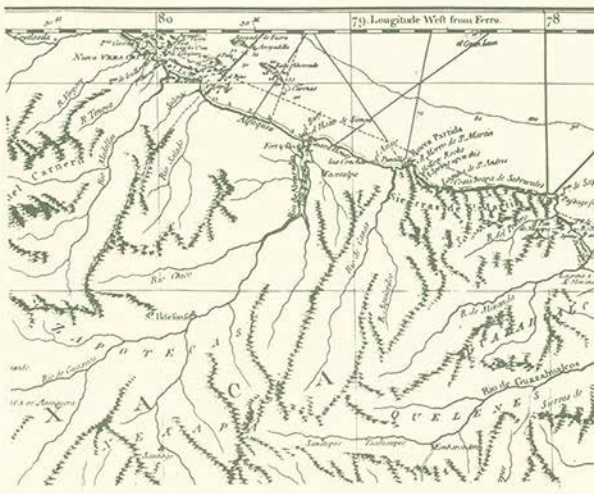
PETRUM SCHENCK 1708-15.



DOMINGO GONZALEZ CARRANZA 1718.

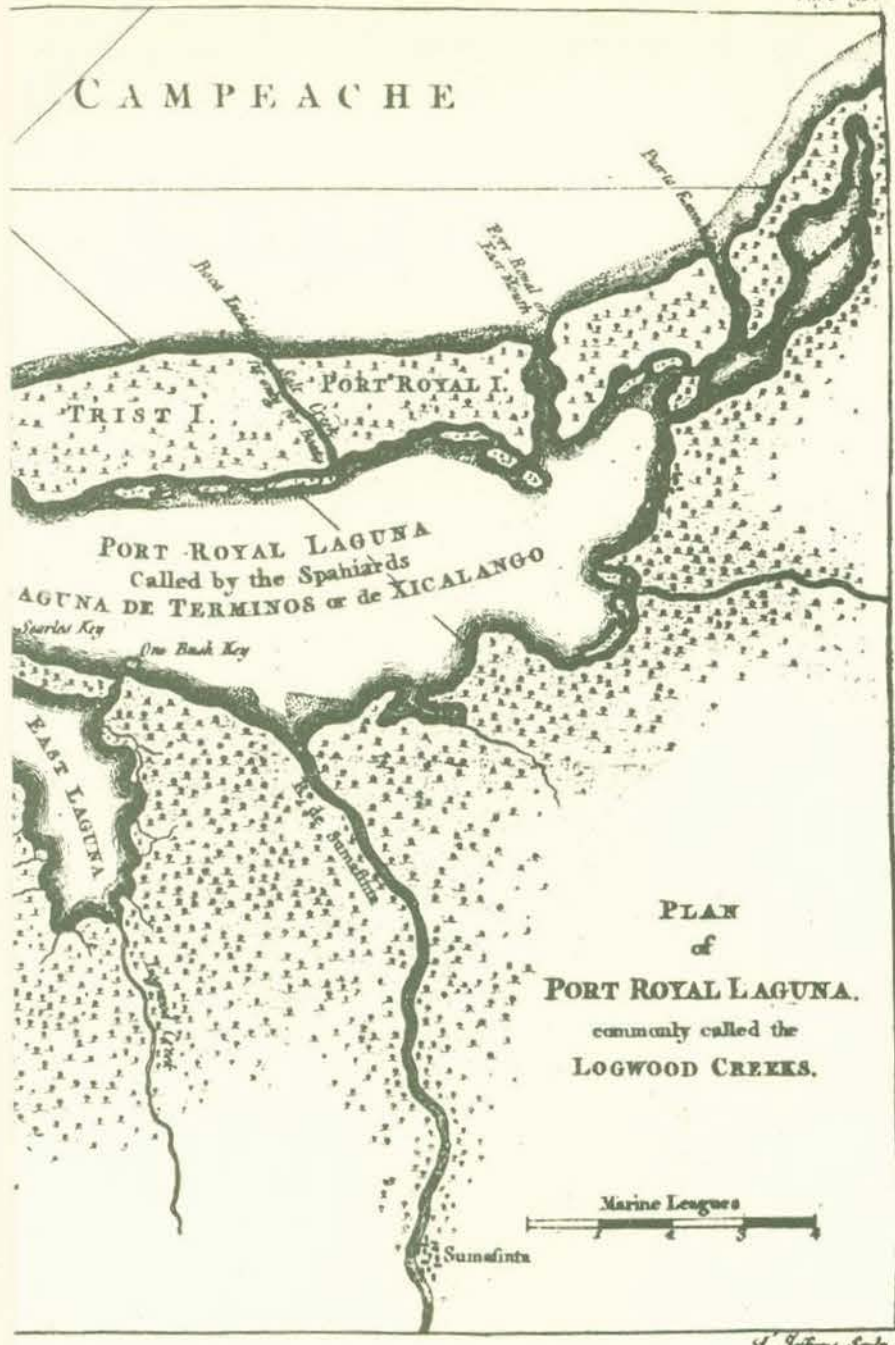


THOMAS JEFF



THOMAS JEFF

CAMPEACHE

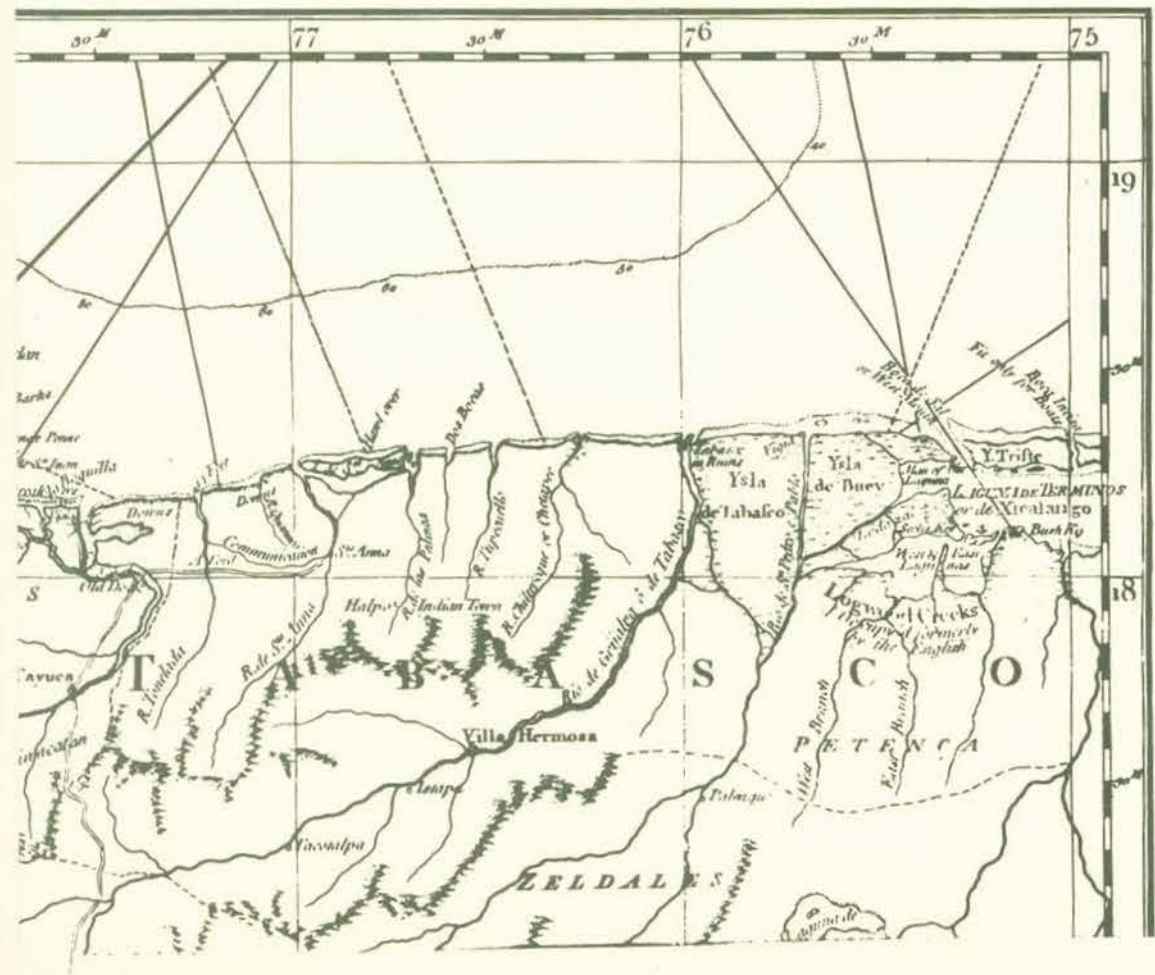


PLAN
of
PORT ROYAL LAGUNA.
commonly called the
LOGWOOD CREEKS.



J. Jefferys Sculp.

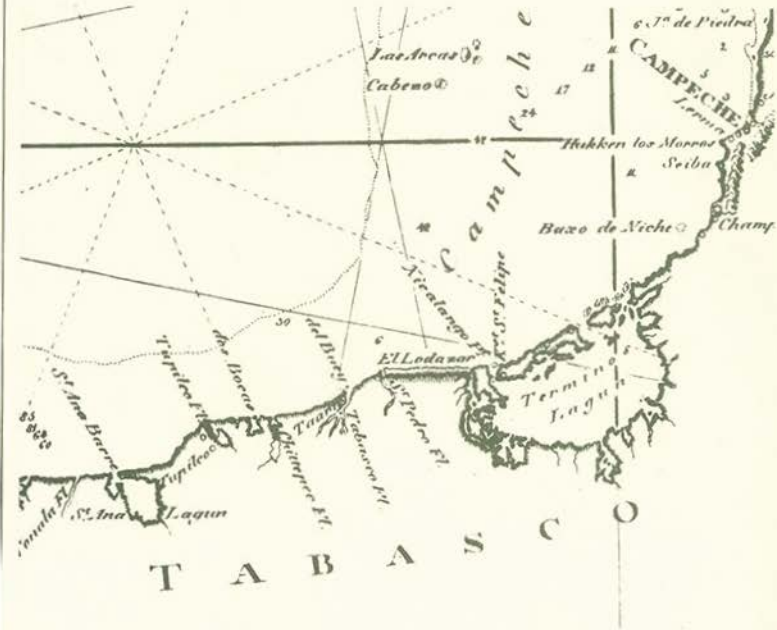
FERYS 1762



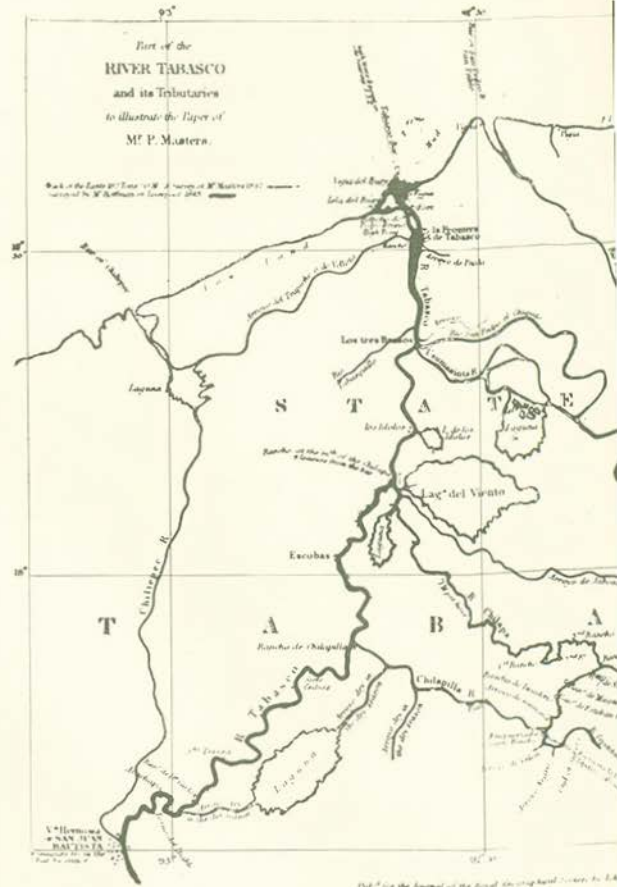
FERYS 1775

Mapas Antiguas
Old Maps

Lámina
Plate 53.

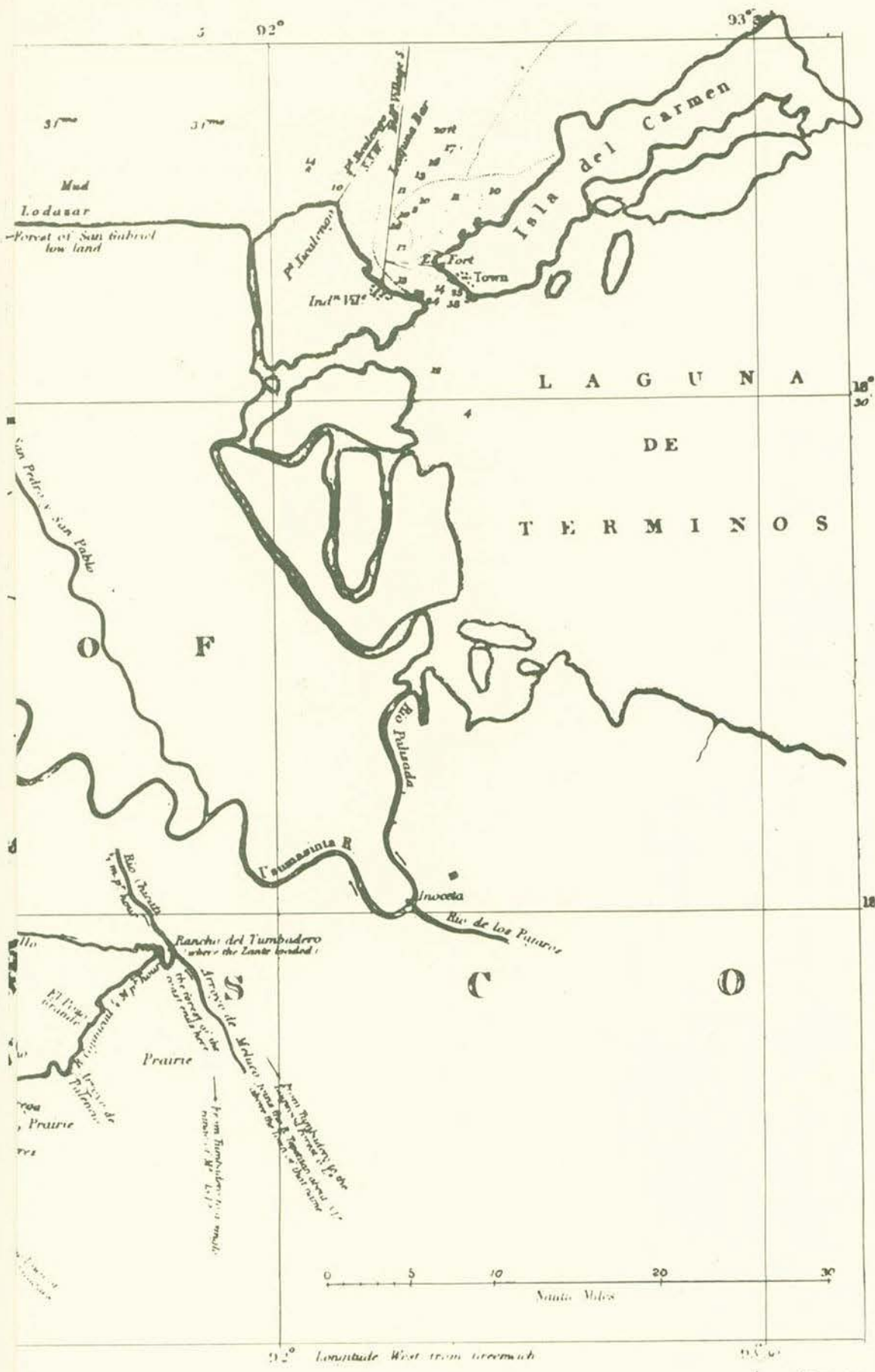


DANISH MARINE CHART 1819.



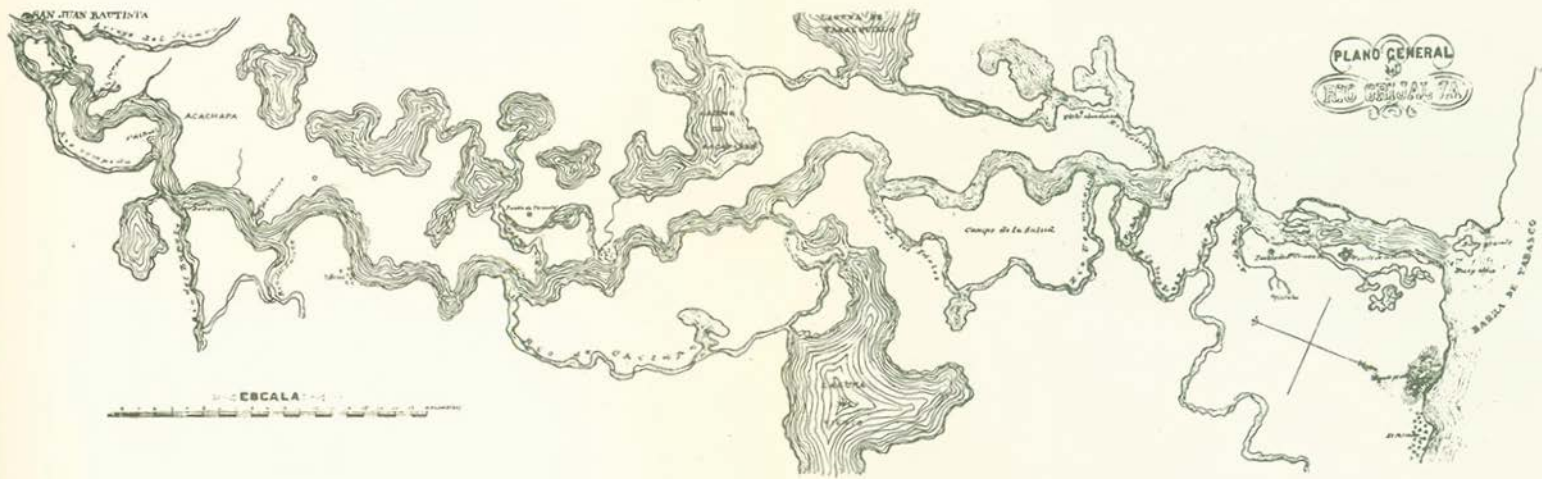
Part of the Journal of the Royal Geographical Society for 1819.

PETER MASTERS



Maria Thrale's London 1819

STERS 1844.



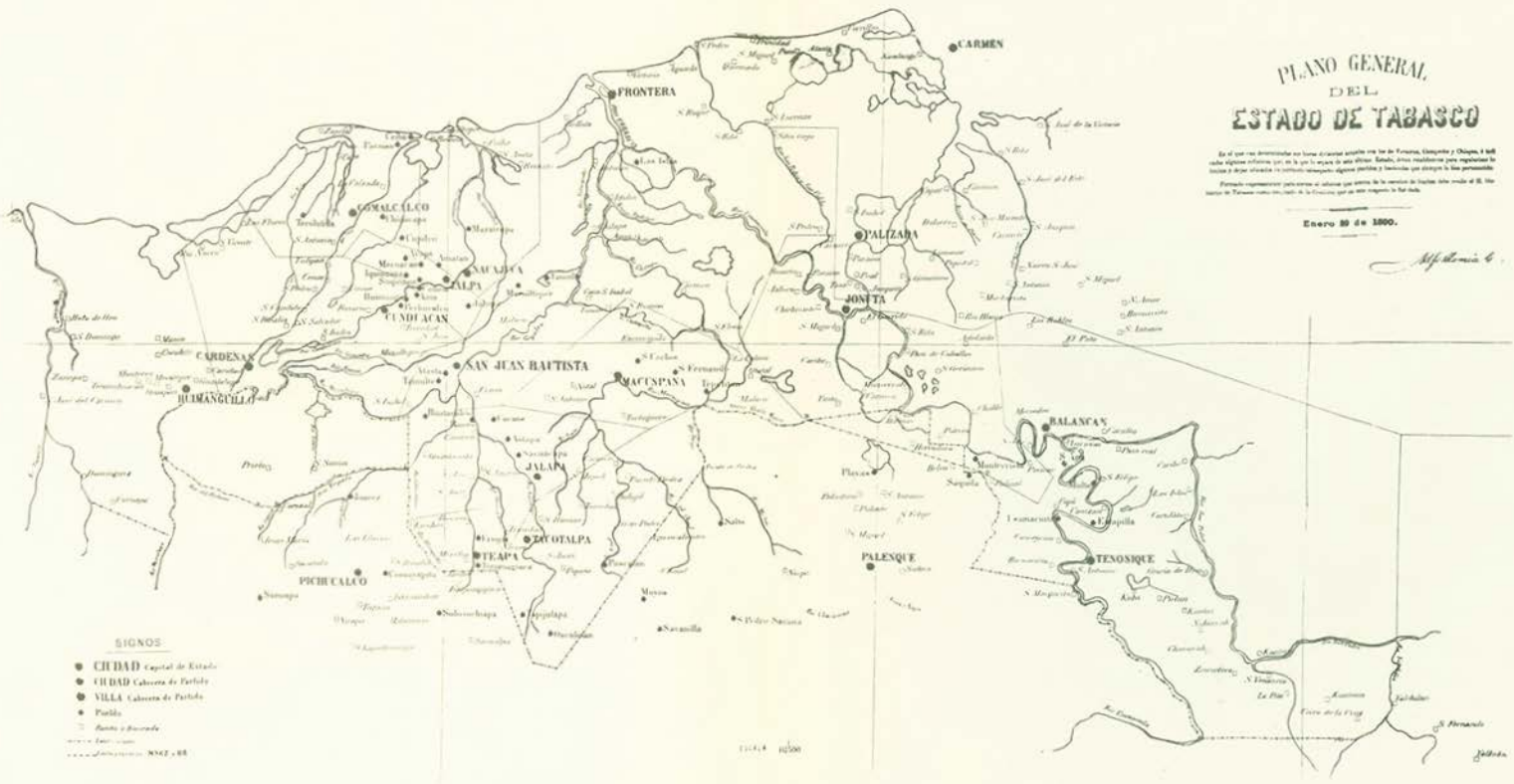
R. MAHERO 1864.

PLANO GENERAL DEL ESTADO DE TABASCO

Es el que se describe en forma de cuadro según los de Frontera, Compostela y Chiapas, y del resto algunas ciudades que de lo que se componen de este Estado. Señala, como usualmente para representar la forma y el lugar de cada una de ellas, y como se componen de las mismas, y también que están en la línea perpendicular. Formado especialmente para servir de alfileres que sirven de la medida de Tabasco, como se ve en el plano de Tabasco, como se ve en el plano que se ve en el plano que se ve en el plano.

Enero 25 de 1890.

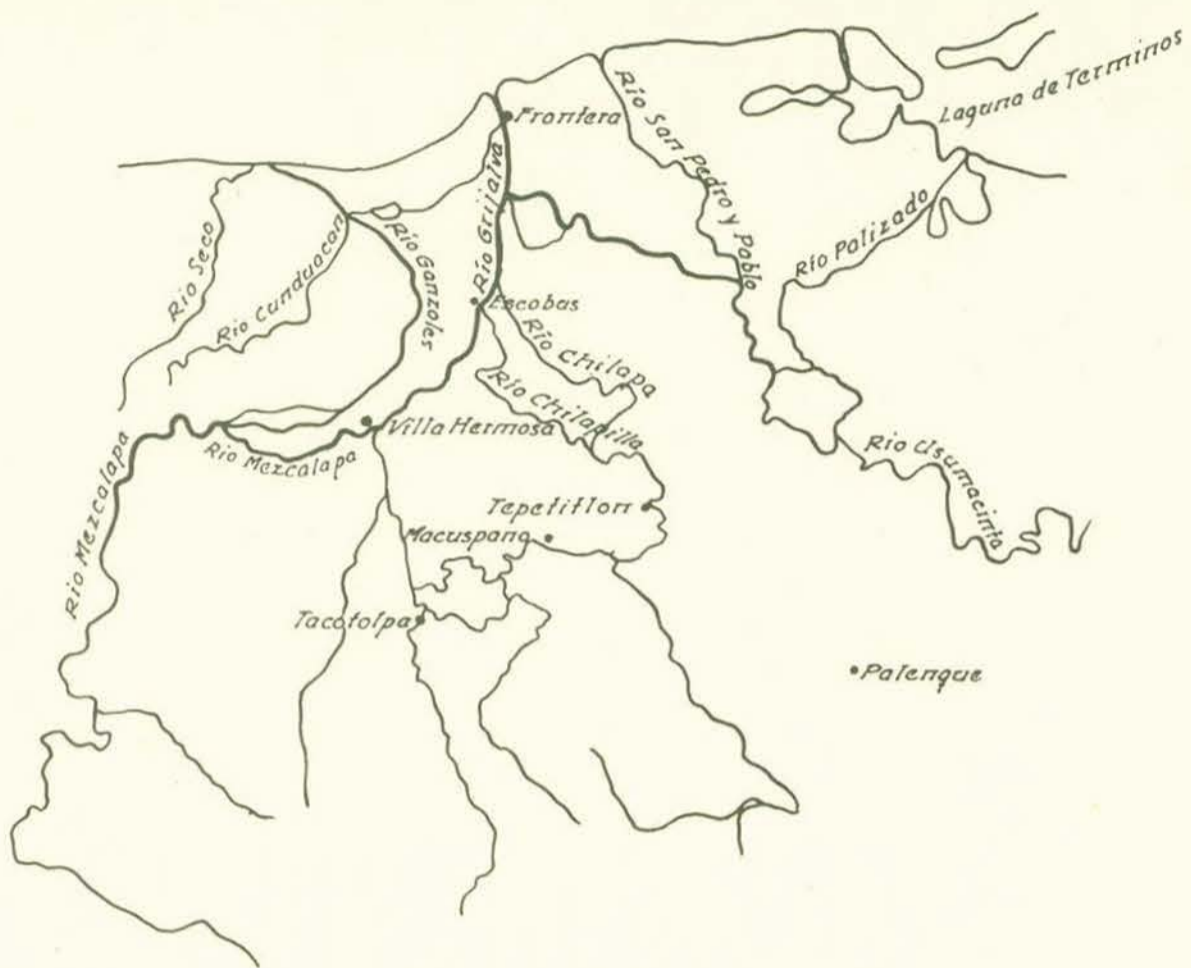
Adolfo Flomía G.



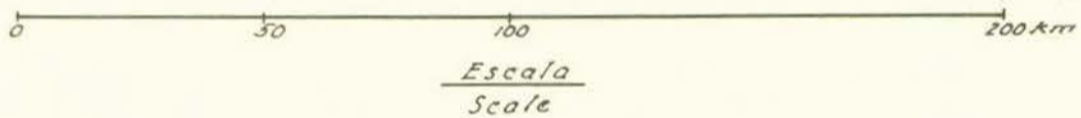
- SIGNOS**
- CIUDAD Capital de Estado
 - CIUDAD Cabecera de Partido
 - VILLA Cabecera de Partido
 - PUEBLO
 - Puerto o Baranca
 - Límite
 - N.º 27, 28

1:100,000

ADOLFO FLOMÍA G. 1890.



SITUACIÓN ENTRE 1770 y 1900
SITUATION BETWEEN 1770 and 1900



Nota: Los croquis no pretenden ser correctos en cada detalle

Note: The sketches do not pretend to be correct in all details

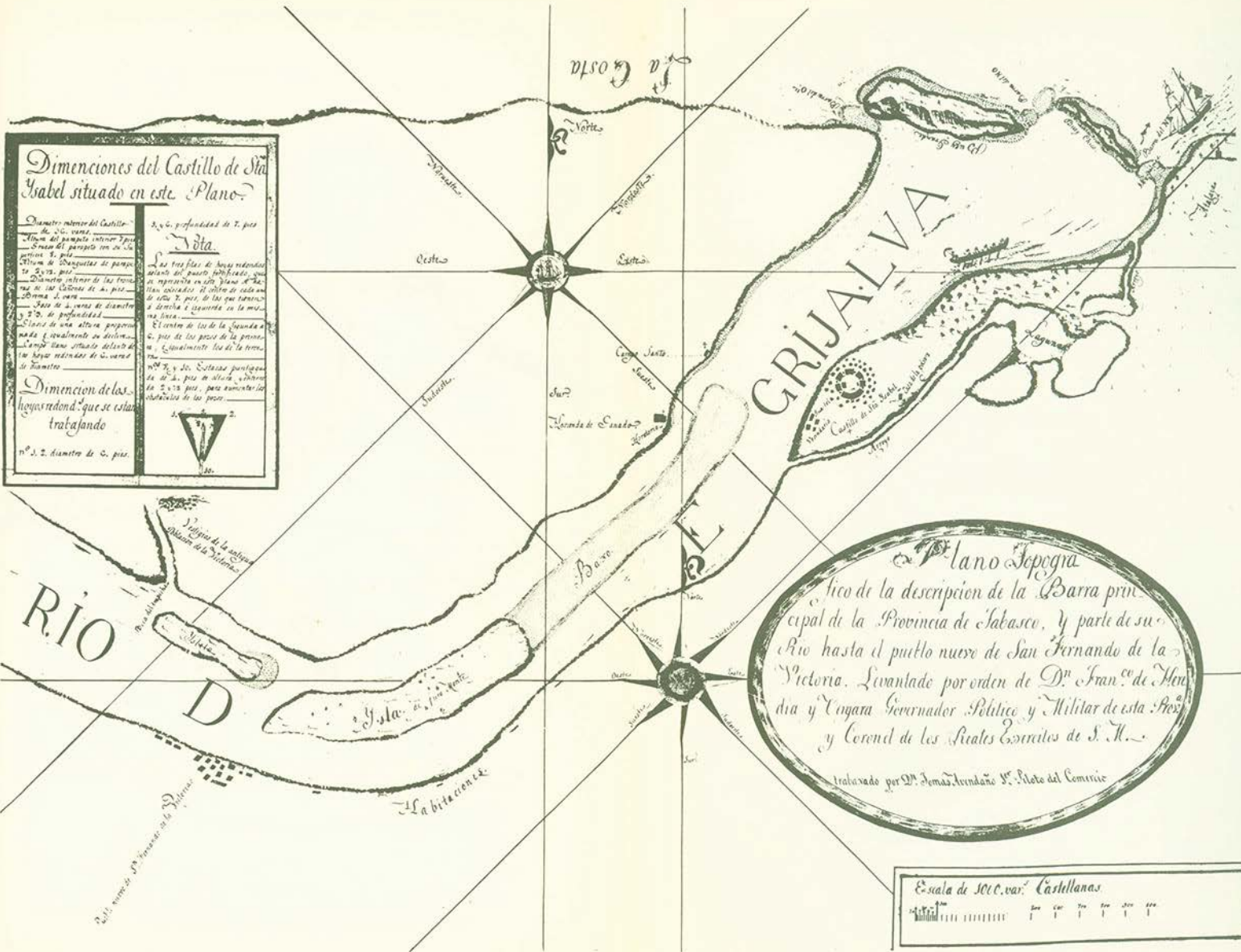
CAMBIOS EN EL CURSO DE LOS RÍOS
CHANGES IN THE COURSE OF THE RIVERS.

Dimensiones del Castillo de Sta. Isabel situado en este Plano.

Diámetro interior del Castillo de 200 varas.
Forma del parapeto interior 3000.
Grueso del parapeto con su altura 8 pies.
Altura de las torres de parapeto 20 varas.
Diámetro interior de las torres 100 varas.
Grueso de las torres de 40 pies.
Diámetro de una torre 200.
Grueso de la vena de diamante 20.
Profundidad 10.
Sierra de una altura proporcional y igualmente su declive.
El castillo tiene situado dentro de sus torres un estanque de 100 varas de diámetro.

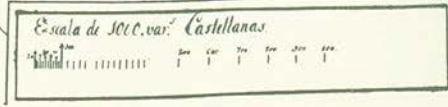
Nota
 Las tres flechas de Armas señaladas alante del punto fortificado que se representa en este Plano de Sta. Isabel, significan el número de cada una de las 30 piezas de las que componen la batería, y se cuenta en la misma línea.
 El centro de las de la segunda a 60 pies de los picos de la primera, y igualmente los de la tercera a 60 pies de los de la segunda.
 El castillo tiene situado dentro de sus torres un estanque de 100 varas de diámetro.

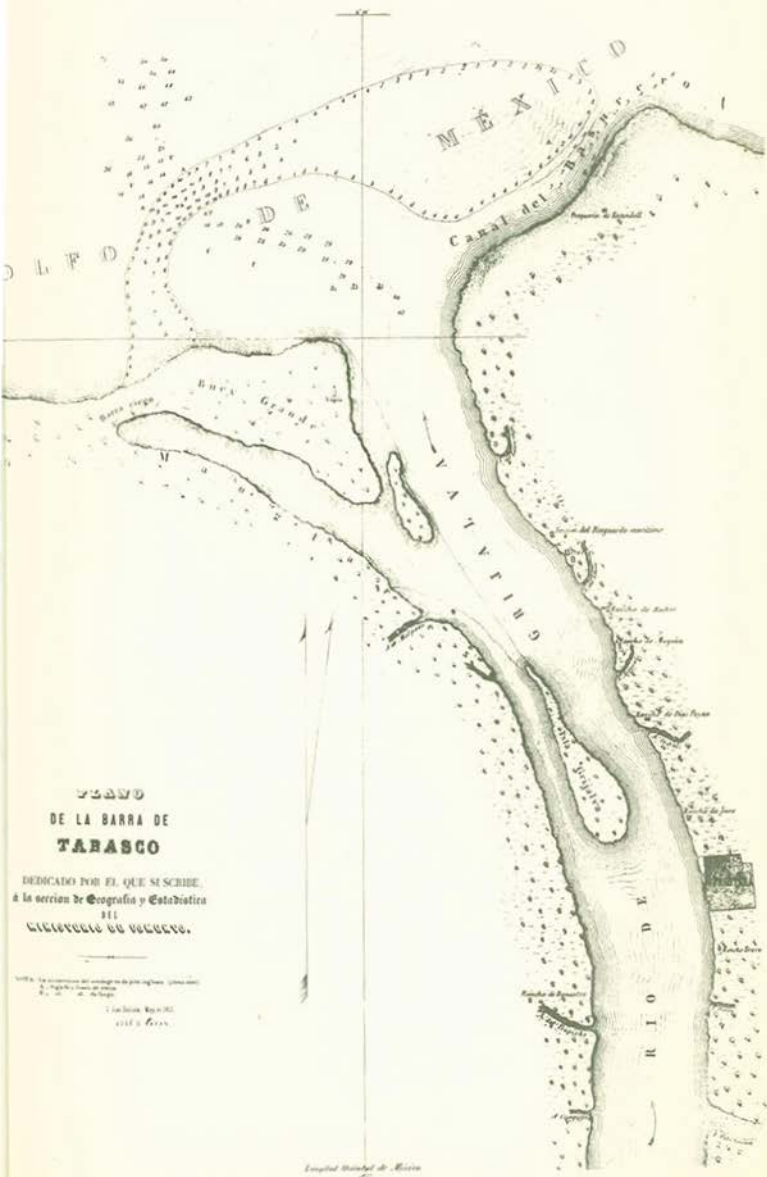
Dimencion de las torres redondas que se están tratándose
 n.º 1. 2. diámetro de 60 pies.

**Plano Topogra-
 fico de la descripción de la Barra principal de la Provincia de Tabasco, y parte de su Rio hasta el pueblo nuevo de San Fernando de la Victoria. Levantado por orden de D.º Fran.º de Mendoza y Cuzco Gobernador Político y Militar de esta Pro-
 y Coronel de los Reales Ejércitos de S. M.**

Tratado por D.º Tomas Avendaño, S.º Ayudante del Comandante



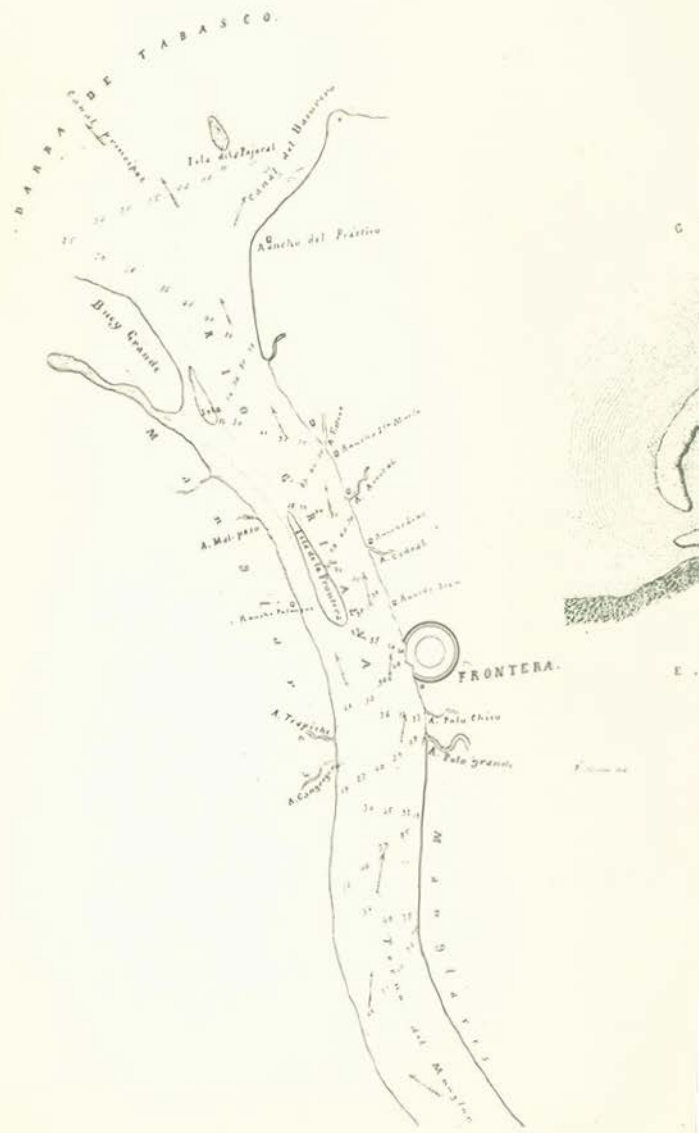


PLANO
DE LA BARRA DE
TABASCO

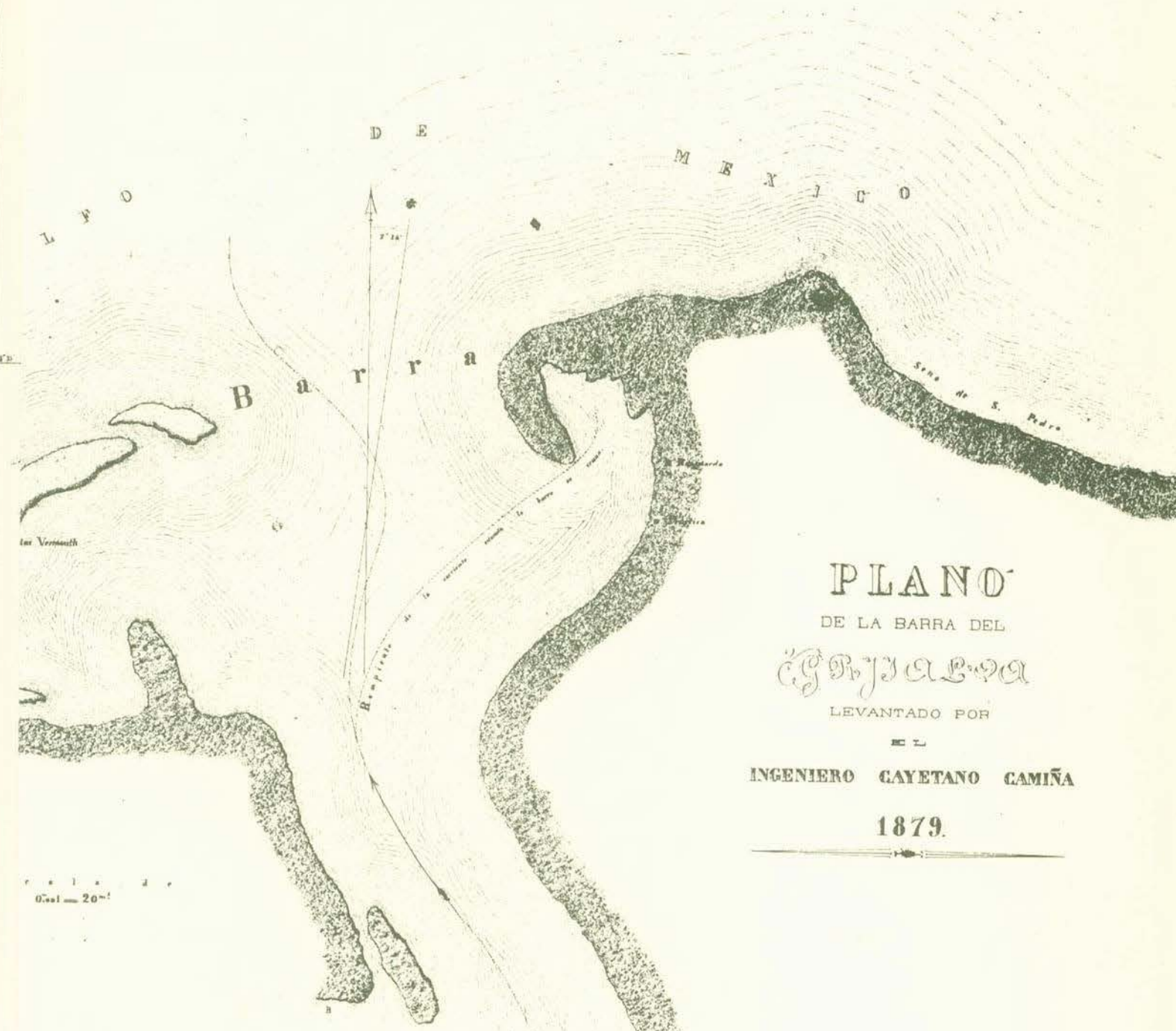
DEDICADO POR EL QUE SUSCRIBE,
A LA SOCIEDAD DE GEOGRAFIA Y ESTADISTICA
DE LA CIUDAD DE VERACRUZ.

Escuela Nacional de Artes

JOSÉ D. PAYÁN 1861.



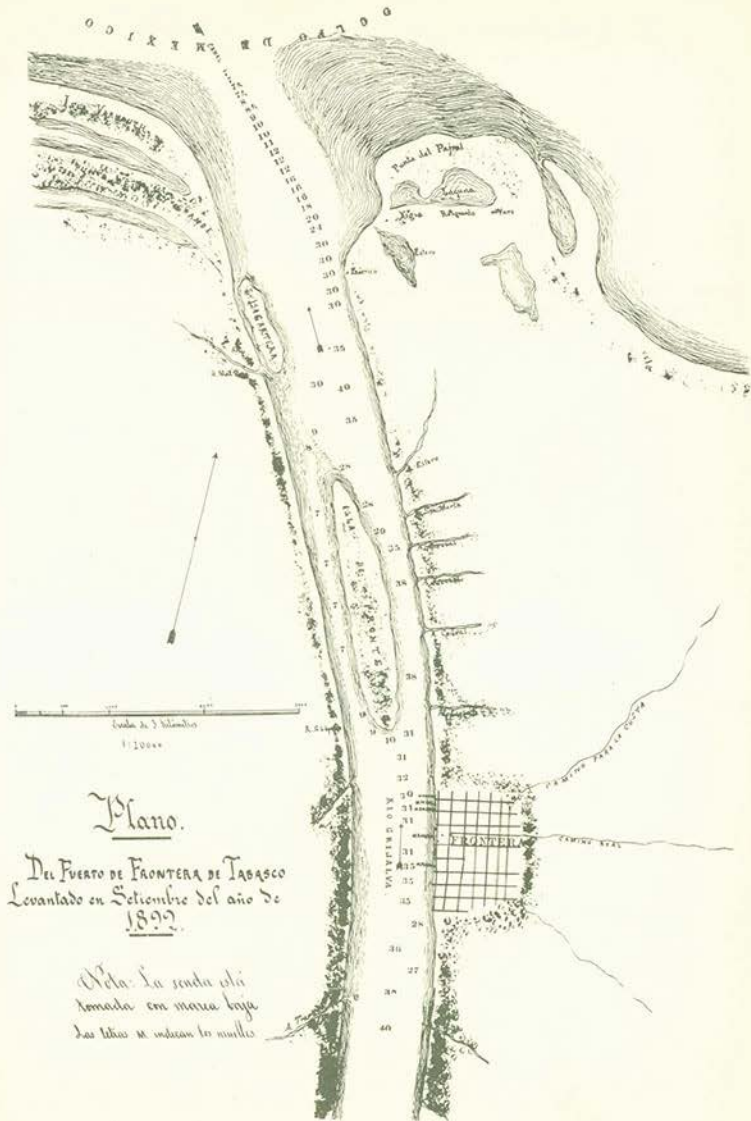
JOSÉ D. PAYÁN 1868.



PLANO
 DE LA BARRA DEL
 COAHUILA
 LEVANTADO POR
 EL
 INGENIERO CAYETANO CAMIÑA
 1879.

JNG. CAYETANO CAMIÑA 1879.

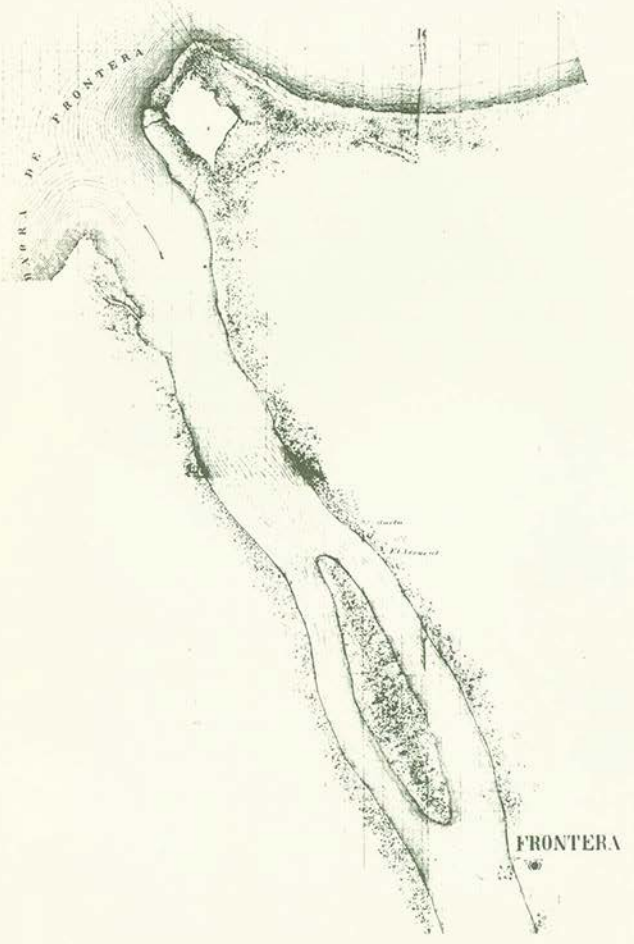
GOLFO DE MEXICO



Plano.
 Del Puerto de Frontera de Tabasco
 Levantado en Setiembre del año de
1892.

Nota: La escala está tomada en marea baja las líneas se indican los muelles

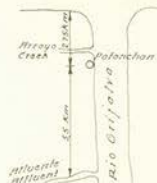
PUERTO DE FRONTERA 1892.



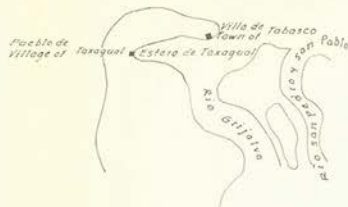
F. A. MOLL 1893.



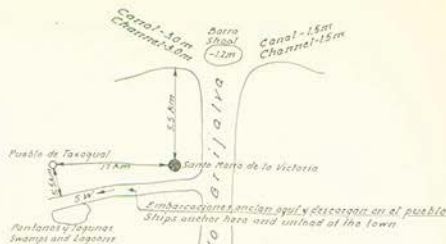
BASEADO EN DESCRIPCIÓN HECHA POR ANTONIO DE SOLIS
BASED ON DESCRIPTION BY ANTONIO DE SOLIS
 1518



BASEADO EN DESCRIPCIÓN HECHA POR BERNAL DÍEZ DEL CASTILLO
BASED ON DESCRIPTION BY BERNAL DÍEZ DEL CASTILLO
 1519



BASEADO EN UN CROQUIS DE MELCHOR ALFARO
BASED ON SKETCH BY MELCHOR ALFARO
 1579



BASEADO EN UNA DESCRIPCIÓN EN RELACIÓN DE LA VILLA DE SANTA MARÍA DE LA VICTORIA
BASED ON DESCRIPTION IN RELATION OF LA VILLA DE SANTA MARÍA DE LA VICTORIA
 1579



BASEADO EN EL MAPA DE JEFFERYS
BASED ON MAP MADE BY JEFFERYS
 1775



BASEADO EN UN MAPA DE SOLIS HISTORIA DE MEXICO
BASED ON MAP IN SOLIS HISTORIA DE MEXICO
 1783



BASEADO EN EL MAPA HECHO POR MIGUEL DE CASTRO Y ARROL
BASED ON MAP BY MIGUEL DE CASTRO Y ARROL
 1803



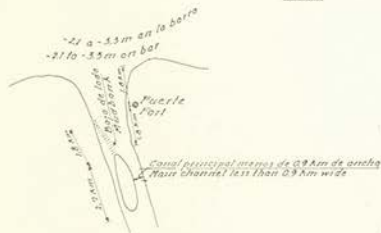
BASEADO EN EL MAPA DE TOMÁS AVENDAÑO
BASED ON MAP BY TOMÁS AVENDAÑO
 1814-17



BASEADO EN UN MAPA DE GEORGE FOOT
BASED ON MAP BY GEORGE FOOT
 1809 (Situación ~ 1830)



BASEADO EN DESCRIPCIÓN HECHA POR CALIXTO DÍEZ
BASED ON DESCRIPTION BY CALIXTO DÍEZ
 1836

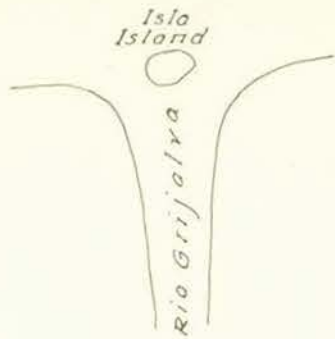


BASEADO EN DESCRIPCIÓN HECHA POR BARNETT
BASED ON DESCRIPTION BY CAPTAIN BARNETT
 1840-1850



BASEADO EN DESCRIPCIÓN HECHA POR MÜHNLENFORDT
BASED ON DESCRIPTION BY MÜHNLENFORDT
 1849

BASE
 DETE
 BASE
 DETE



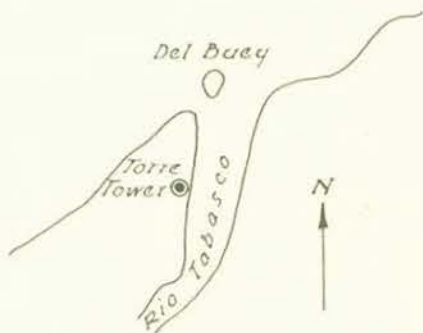
BASADO EN EL MAPA DE ANDRADE
BASED ON MAP BY ANDRADE

1704



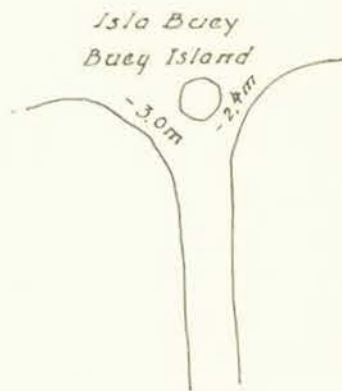
BASADO EN UN MAPA PUBLICADO POR THOMAS JEFFERYS
BASED ON MAP PUBLISHED BY THOMAS JEFFERYS

1762.



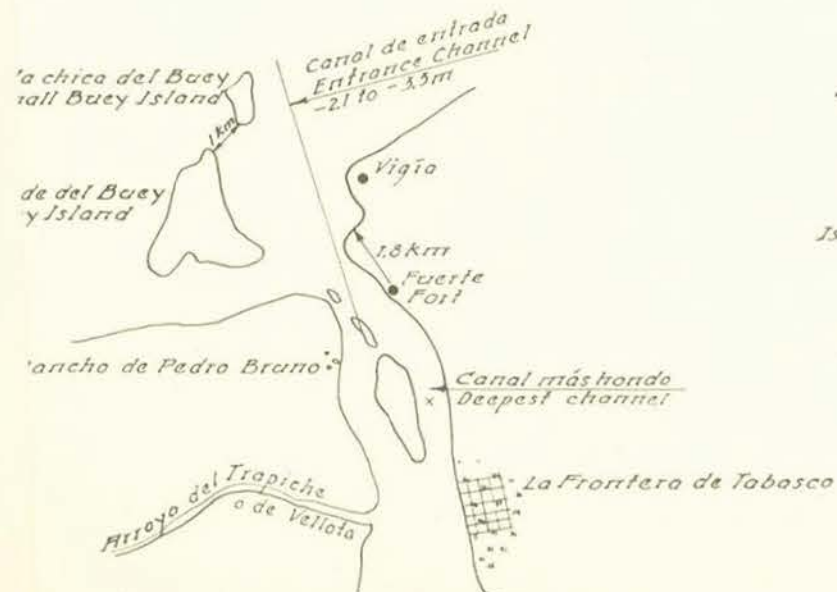
BASADO EN CARTA MARINA DANESA
BASED ON DANISH MARINE CHART

1819



BASADO EN UNA DESCRIPCIÓN EN
BASED ON DESCRIPTION IN

1825



DO EN CROQUIS Y DESCRIPCIÓN HECHOS POR
R MASTERS.

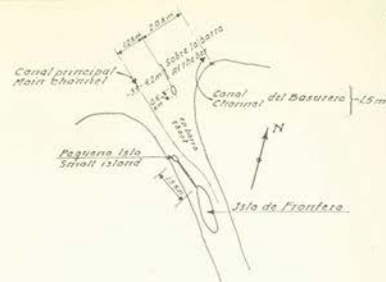
BASED ON SKETCH AND DESCRIPTION MADE BY
R MASTERS

alrededor de 1844 about 1844



BASADO EN UN MAPA DE JUAN OROZCO
BASED ON MAP BY JUAN OROZCO

1845

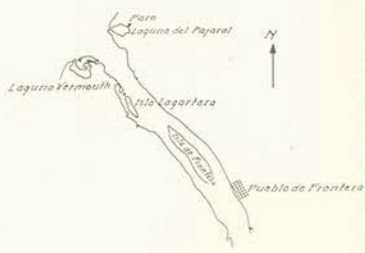
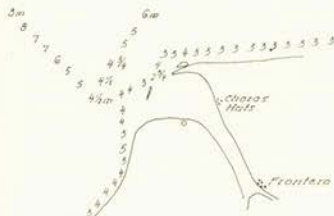


BASEADO EN DESCRIPCIÓN Y CROQUIS HECHO POR HELLER.
BASED ON DESCRIPTIONS AND SKETCH BY HELLER.
1847

BASEADO EN CROQUIS HECHO POR JOSÉ D. PRYÁN.
BASED ON SKETCH BY JOSÉ D. PRYÁN.
1861

BASEADO EN MAPA HECHO POR JOSÉ D. PRYÁN.
BASED ON MAP BY JOSÉ D. PRYÁN.
1866

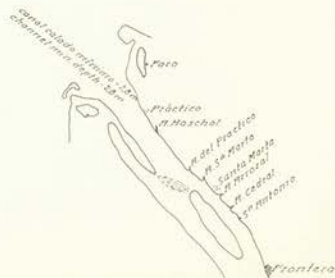
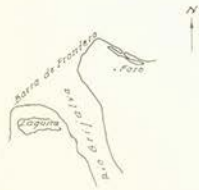
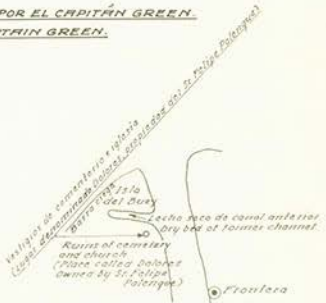
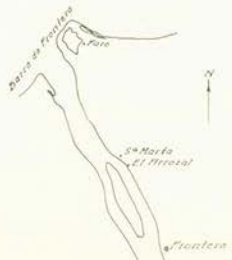
BASEADO EN DESCRIPCIÓN EN CUBAS DICCIONARIO GEOGRÁFICO HISTÓRICO Y BIOGRÁFICO.
BASED ON DESCRIPTION IN CUBAS DICCIONARIO GEOGRÁFICO HISTÓRICO Y BIOGRÁFICO.
1880
(Situación - 1870)
Situation



BASEADO EN CROQUIS HECHO POR EL CAPITÁN GREEN.
BASED ON SKETCH BY CAPTAIN GREEN.
1874

BASEADO EN MAPA HECHO POR EL INGENIERO CAYETANO GAMÍNIA.
BASED ON MAP BY CAYETANO GAMÍNIA.
1879

BASEADO EN UN MAPA DE WILLARD S. ISHAM.
BASED ON MAP BY WILLARD S. ISHAM.
1889

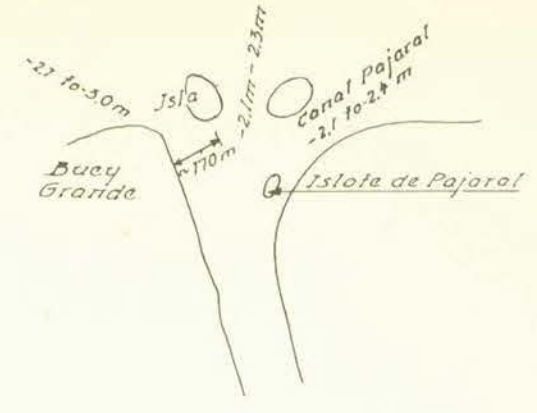
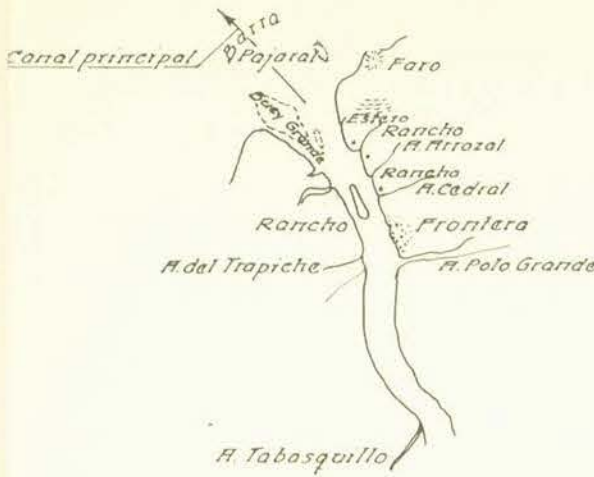


BASEADO EN UN MAPA DE A. R. MOLL.
BASED ON MAP BY A. R. MOLL.
1893

DESCRIPCIÓN HECHA POR ROVIROSI.
DESCRIPTION BY ROVIROSI.
1895

BASEADO EN CROQUIS HECHO POR J. M. TAMBORREL.
BASED ON SKETCH BY J. M. TAMBORREL.
1894

BASEADO EN LEVANTAMIENTO HECHO POR JOSÉ TAMBORREL.
BASED ON SURVEY BY JOSÉ TAMBORREL.
1902

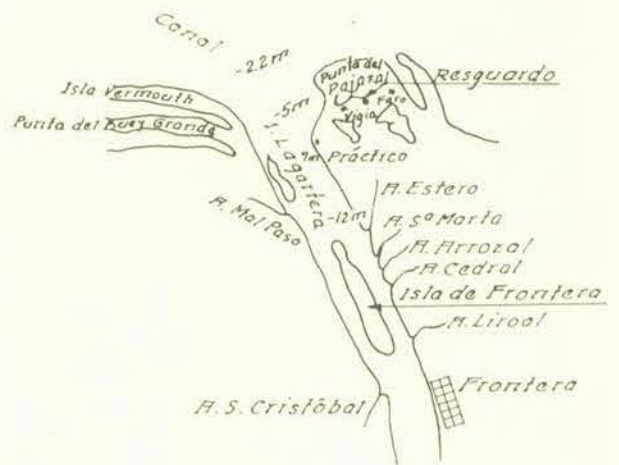
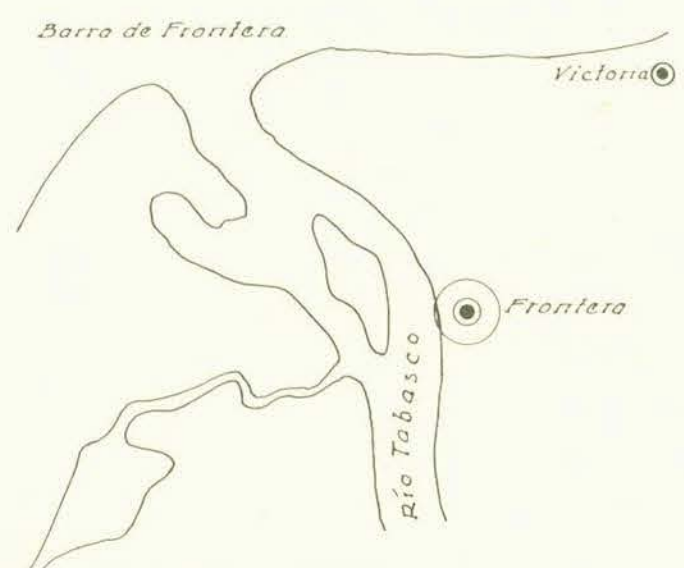


BASADO EN UN CROQUIS PUBLICADO POR PEDRO F. GONZÁLEZ
BASED ON SKETCH PUBLISHED BY PEDRO F. GONZÁLEZ

BASADO EN DESCRIPCIÓN HECHA POR GIL Y SAENZ.
BASED ON DESCRIPTION BY GIL Y SAENZ.

1906
 (Situación 1870-1880)
 Situation

1872

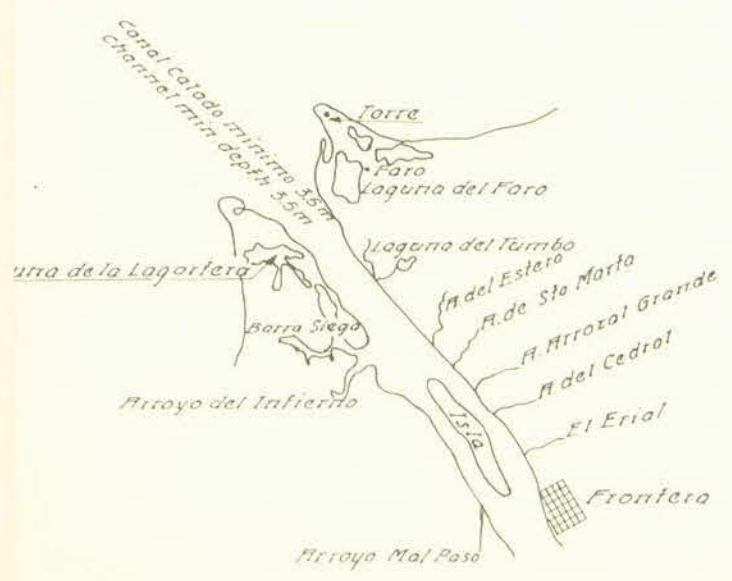


BASADO EN UN MAPA DE ADOLFO FLOMÍA.
BASED ON MAP BY ADOLFO FLOMÍA.

BASADO EN UN CROQUIS.
BASED ON SKETCH.

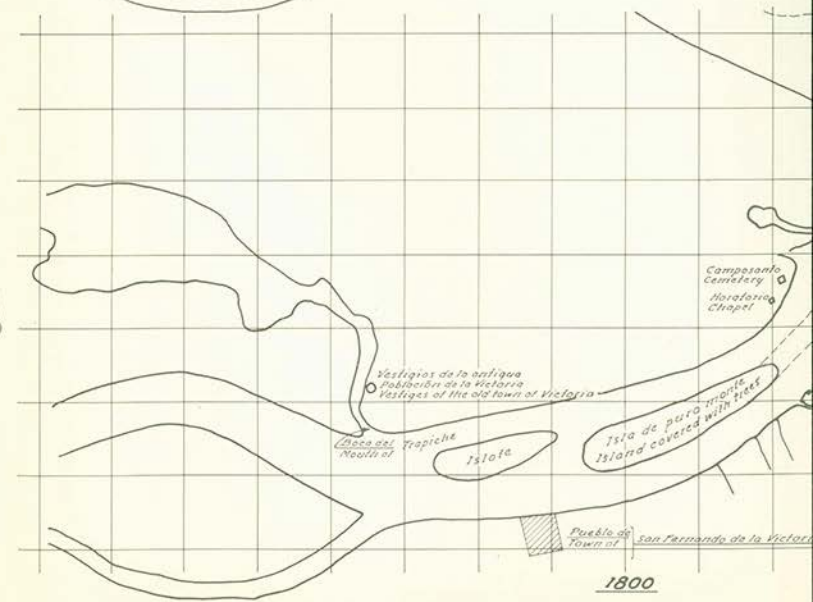
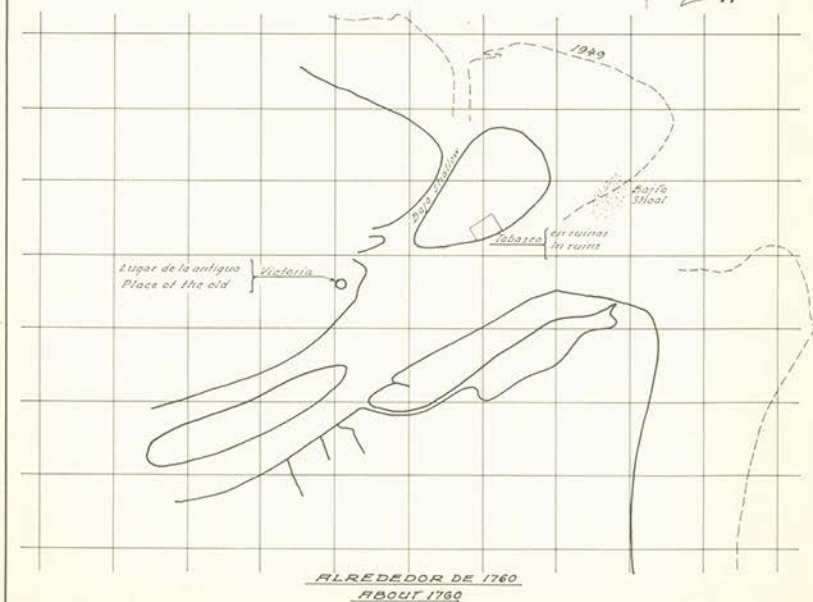
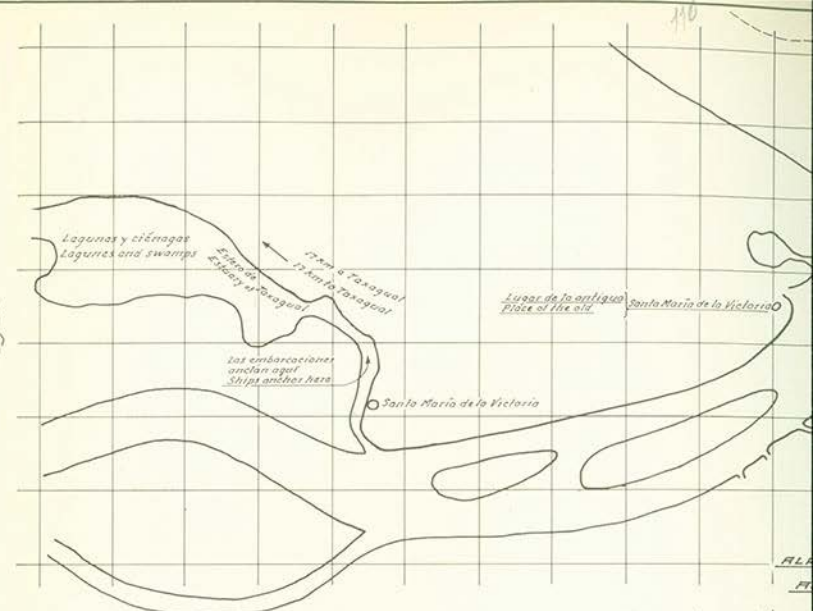
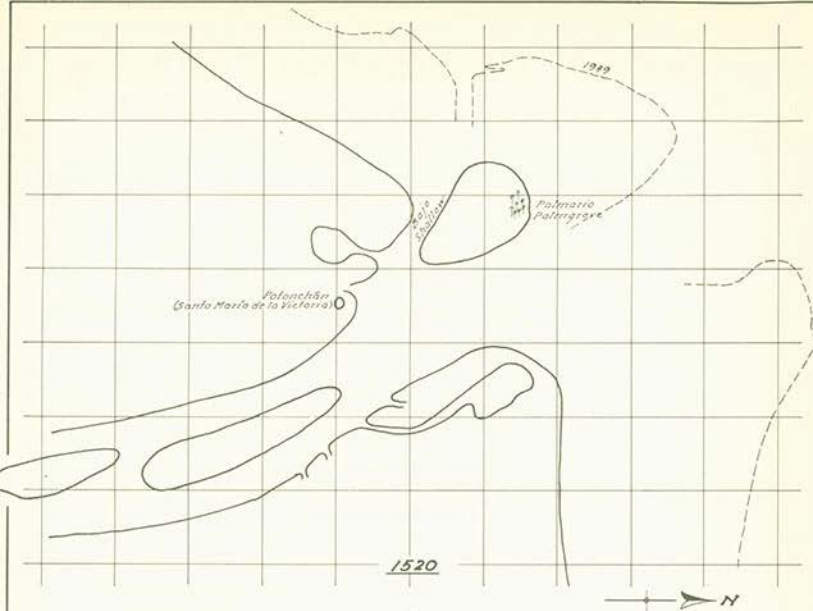
1890

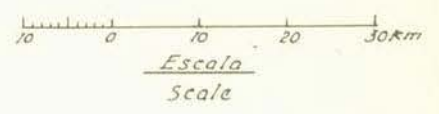
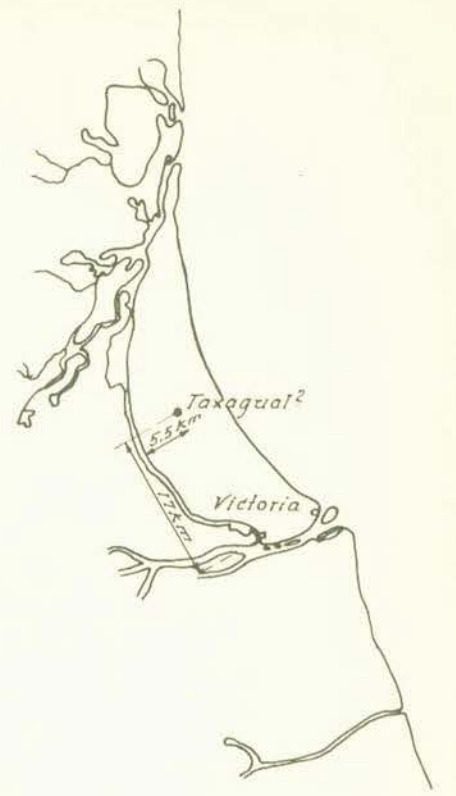
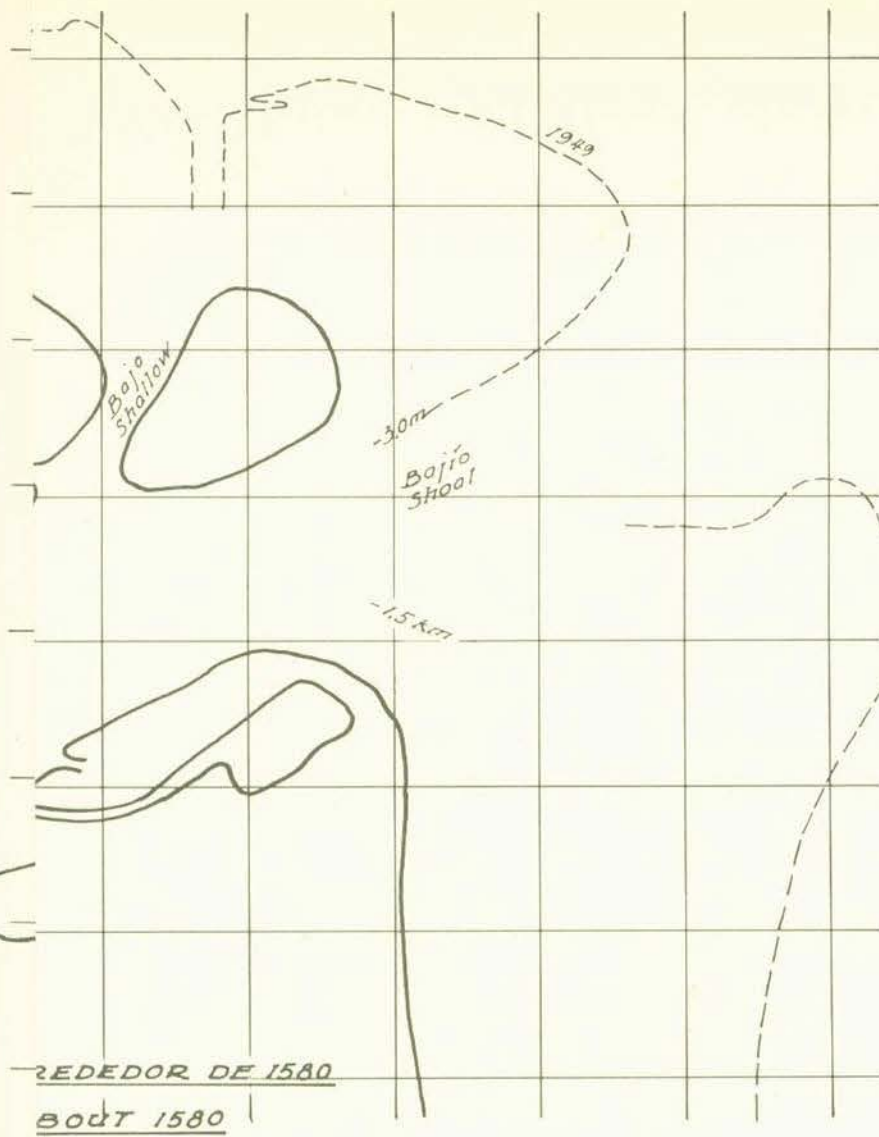
1892



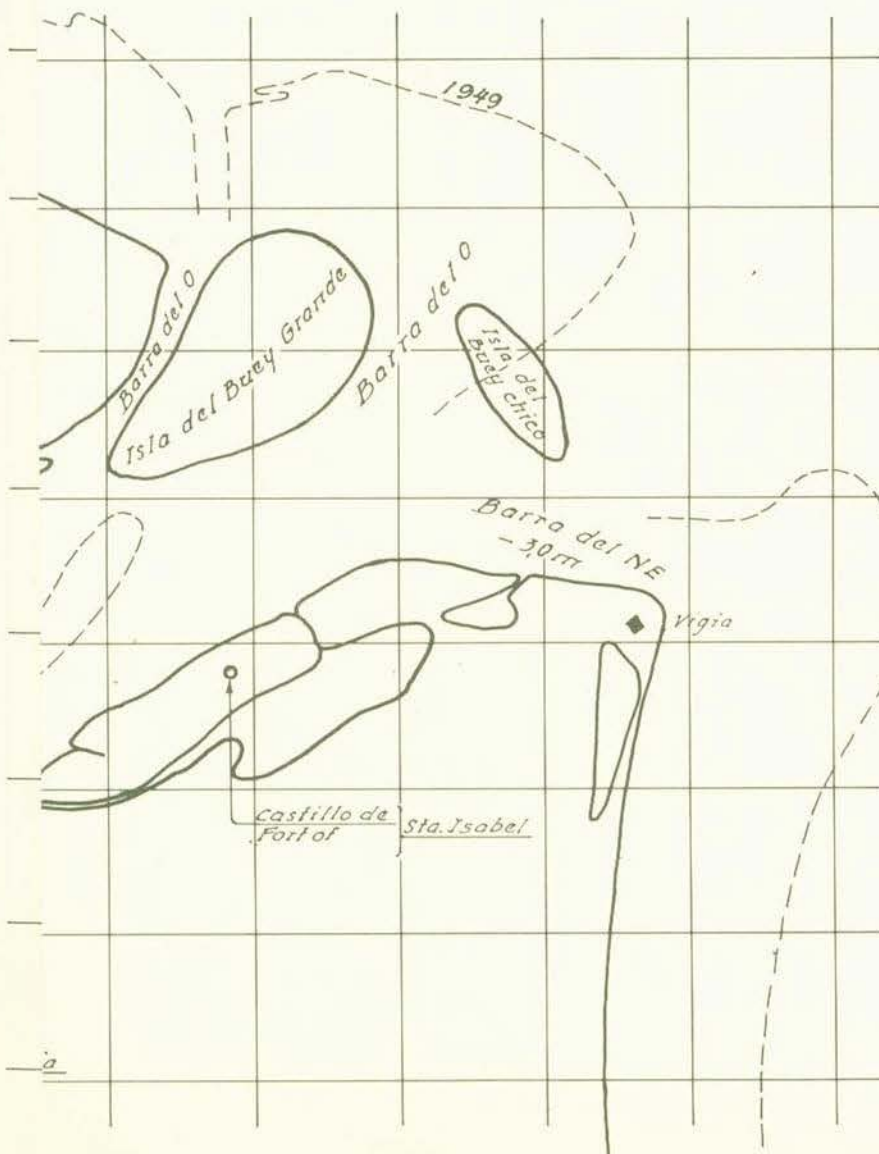
BASADO EN LEVANTAMIENTOS HECHOS POR
BASED ON SURVEYS BY:

COMISIÓN HIDROGRÁFICA 1909
NORTH AMERICAN DREDGING CO 1911.



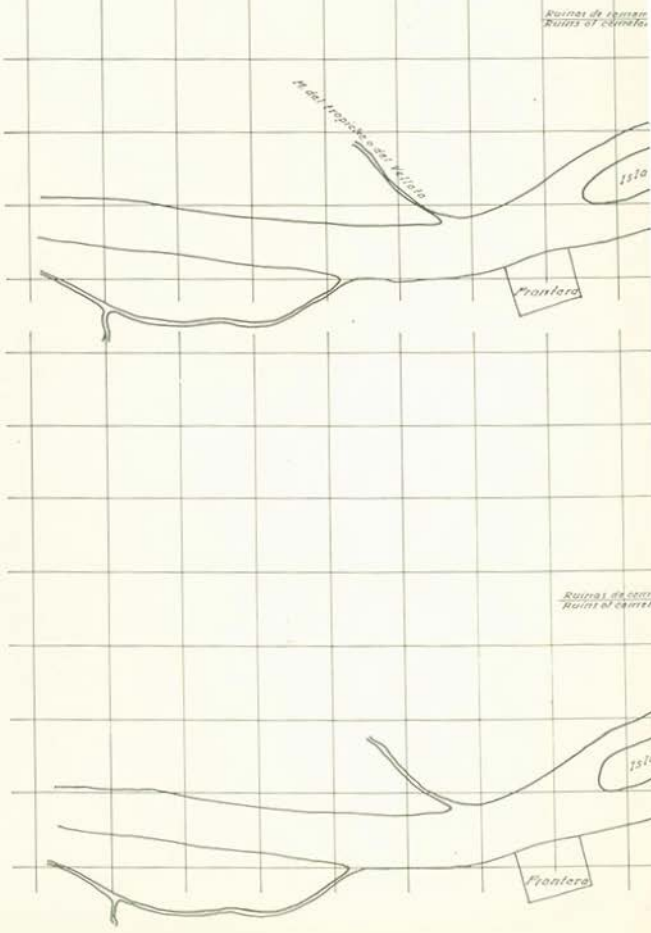
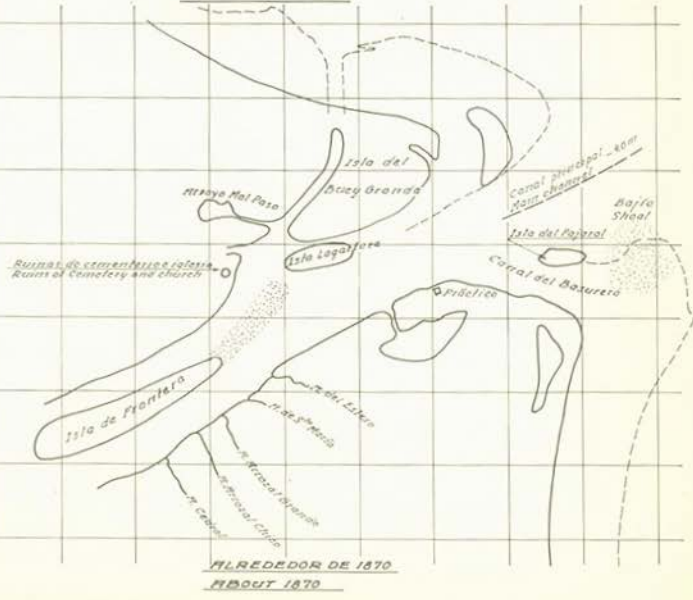
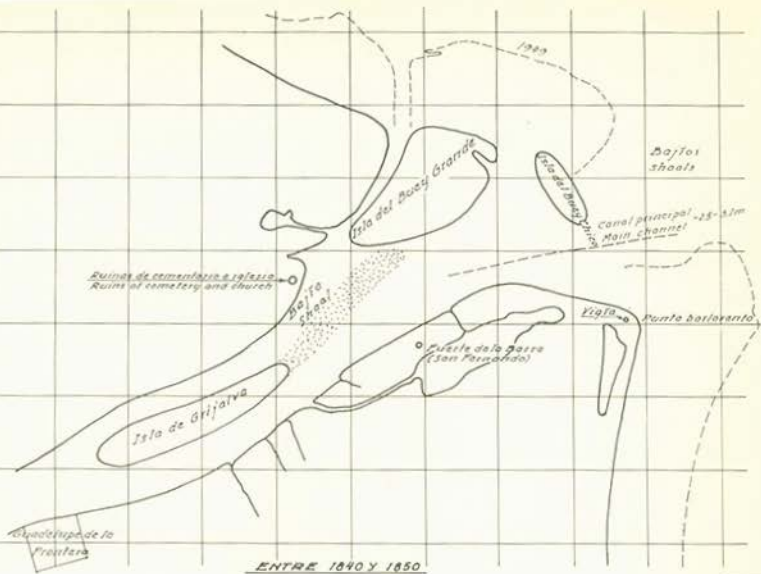


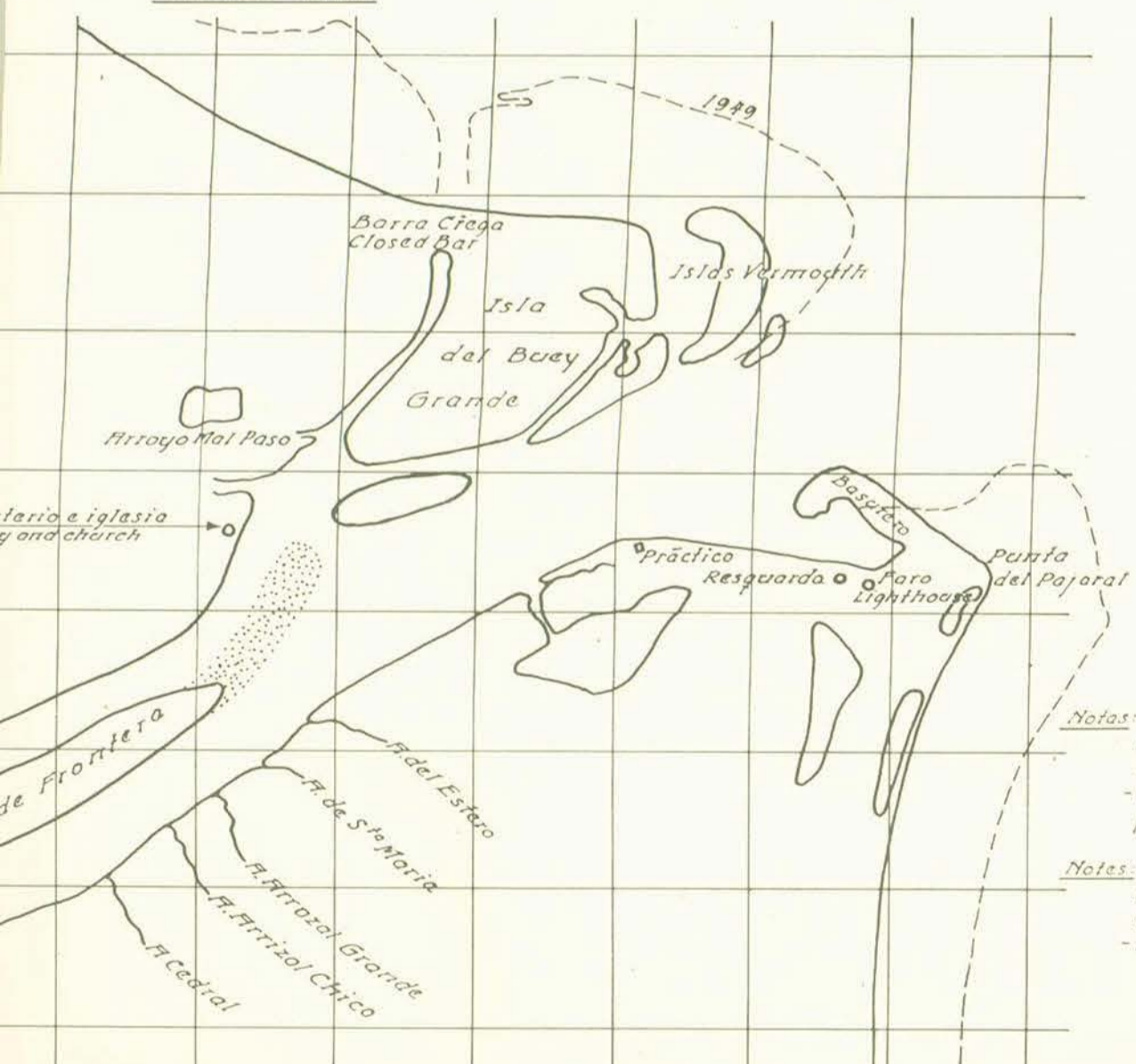
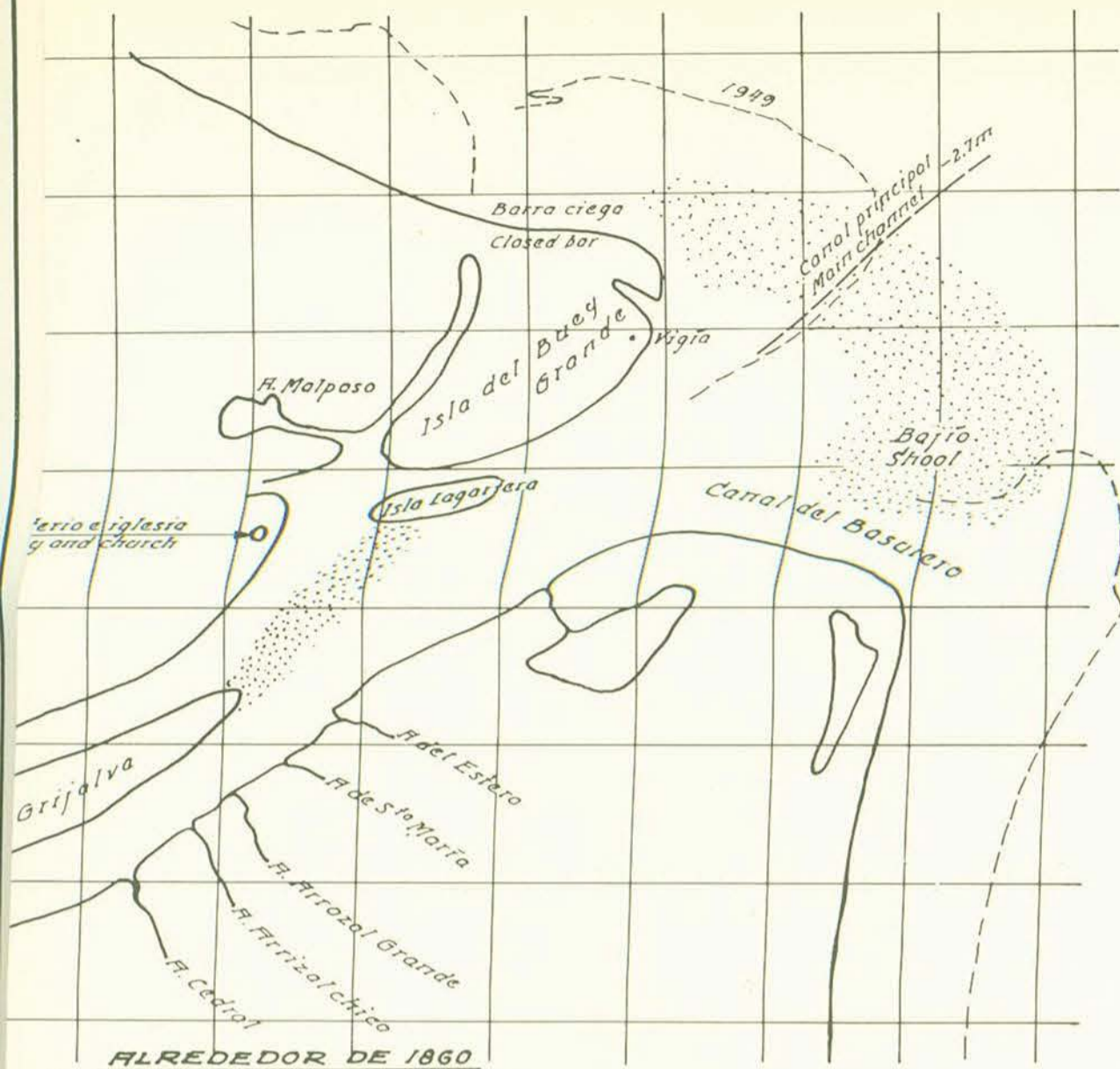
REDEDOR DE 1580
BOYT 1580



Notas: Los planos están estimados sobre la base de los croquis de las láminas Nos. 62 y 63. Cada cuadrado mide 1 km. por lado

Notes: The plans are estimated on the basis of the sketches on the plates No. 62 and 63. Side length in squares: 1 km.

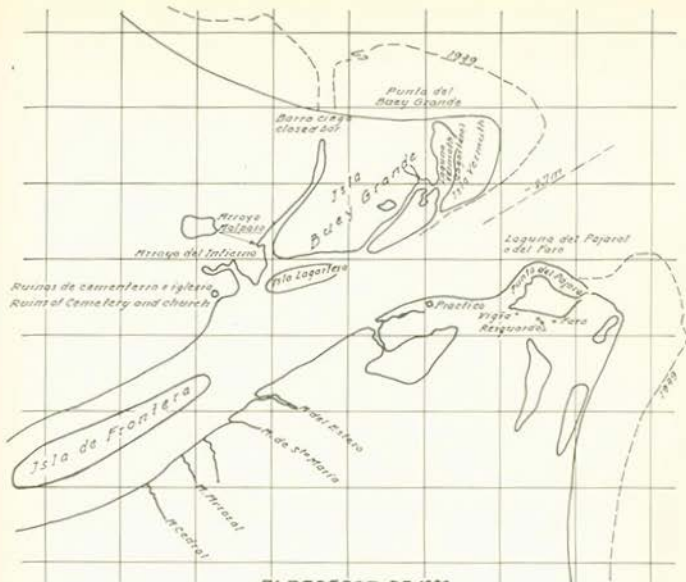




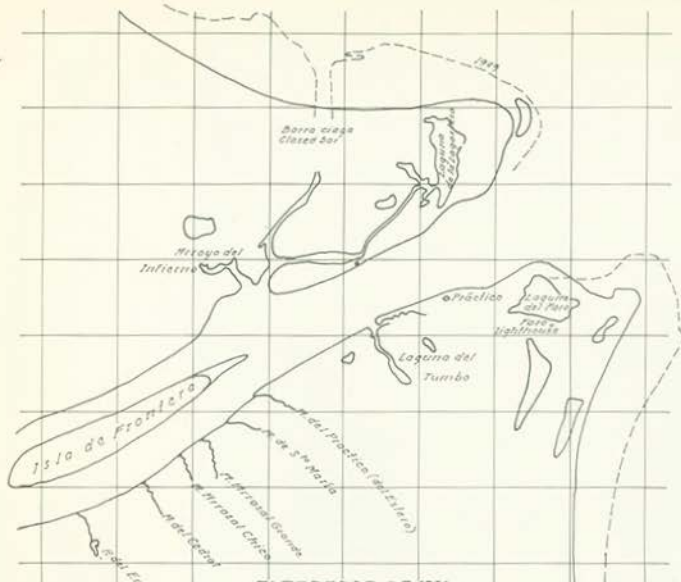
Notas: Los planos están estimados sobre la base de los croquis de las láminas Nos. 62 y 63 - Cada cuadrado mide 1 Km. por lado

Notes: The plans are estimated on the basis of the sketches on the plates Nos. 62 and 63 - Side length in squares: 1 Km

LA DESEMBOCADURA DESDE 1840 HASTA 1880
THE RIVER MOUTH FROM 1840 TO 1880



ALREDEDOR DE 1890
ABOUT 1890

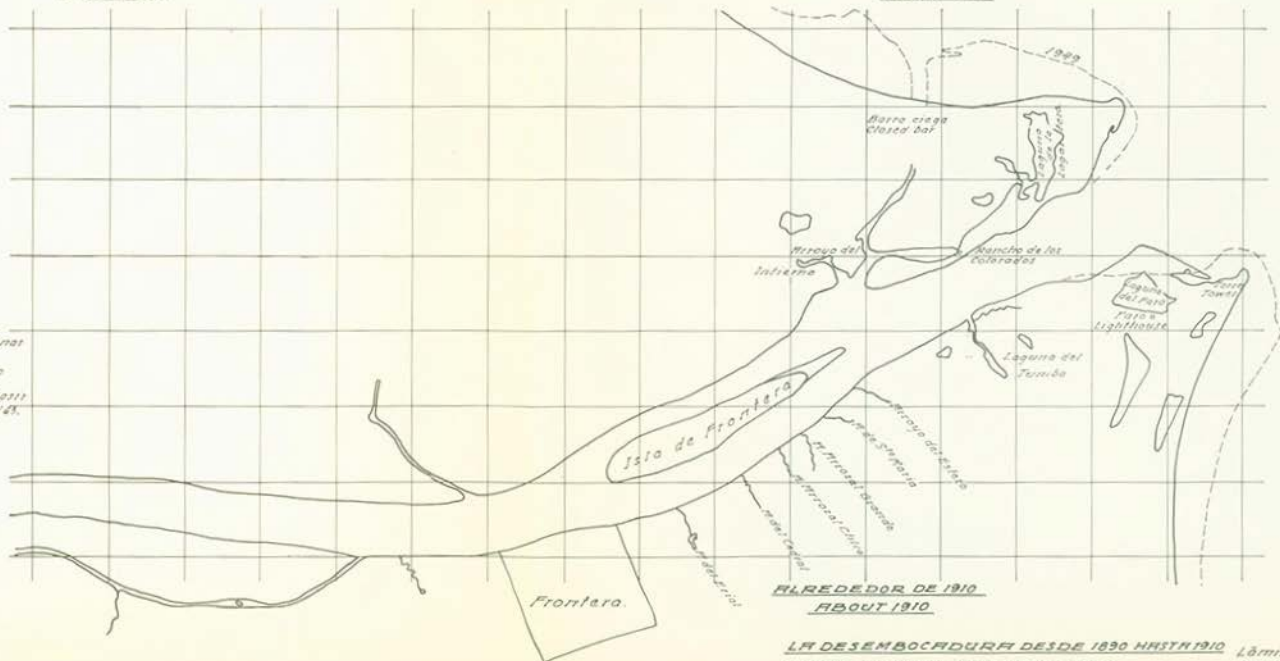


ALREDEDOR DE 1900
ABOUT 1900



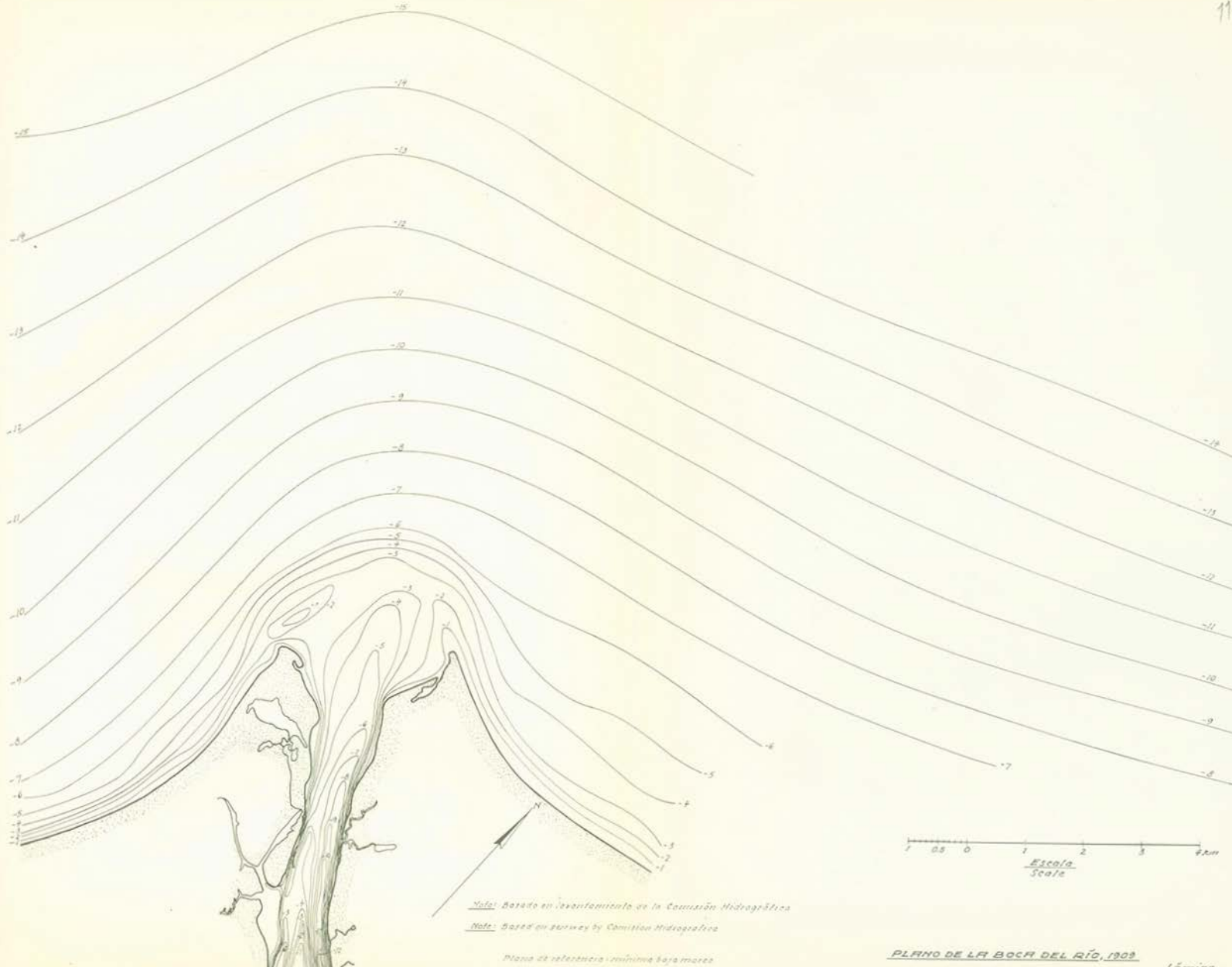
Notes: Los planos están estimados sobre la base de los croquis de las láminas Nos. 42 y 45. Cada cuadrado mide 1 Km por lado.

Notes: The plans are estimated on the basis of the sketches on plates No 42 and 45. Side length in squares = 1 Km.



ALREDEDOR DE 1910
ABOUT 1910

LA DESEMBOCADURA DESDE 1890 HASTA 1910
THE RIVER MOUTH FROM 1890 TO 1910.



Note: Basado en levantamiento de la Comisión Hidrográfica

Note: Based on survey by Comisión Hidrográfica

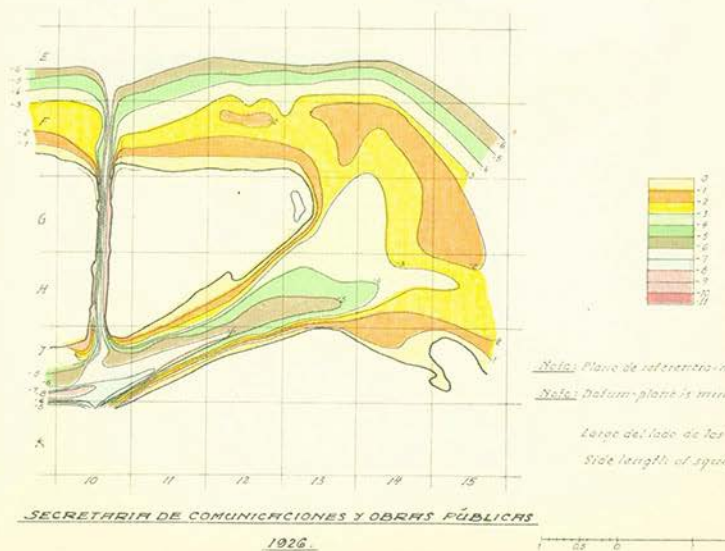
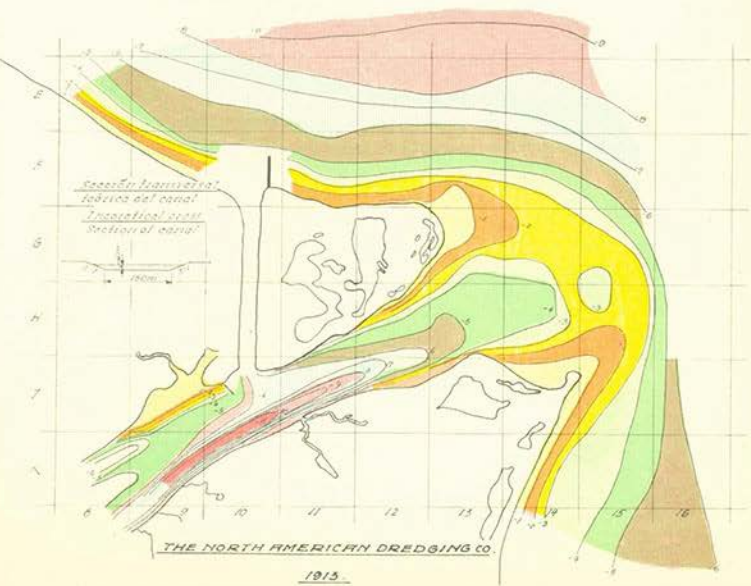
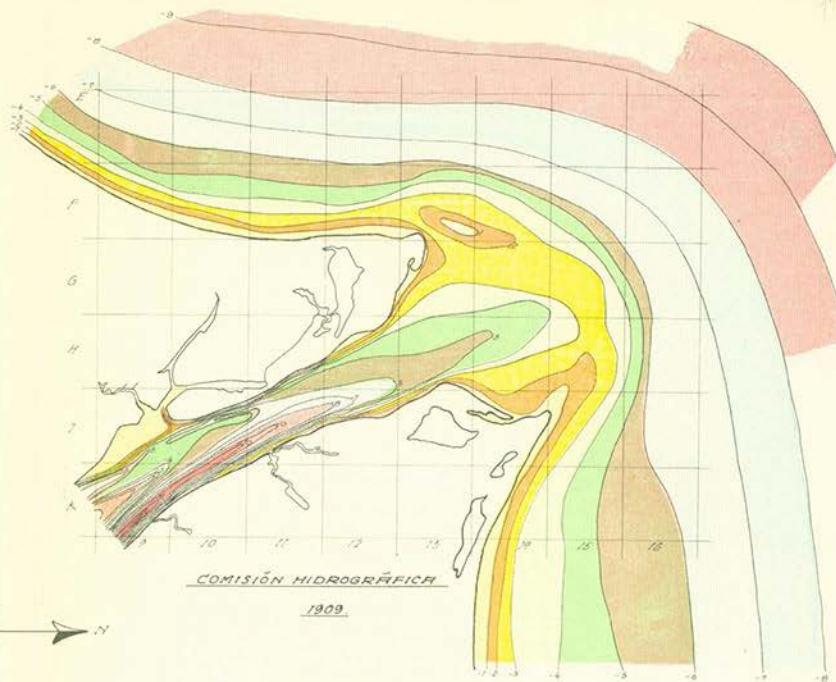
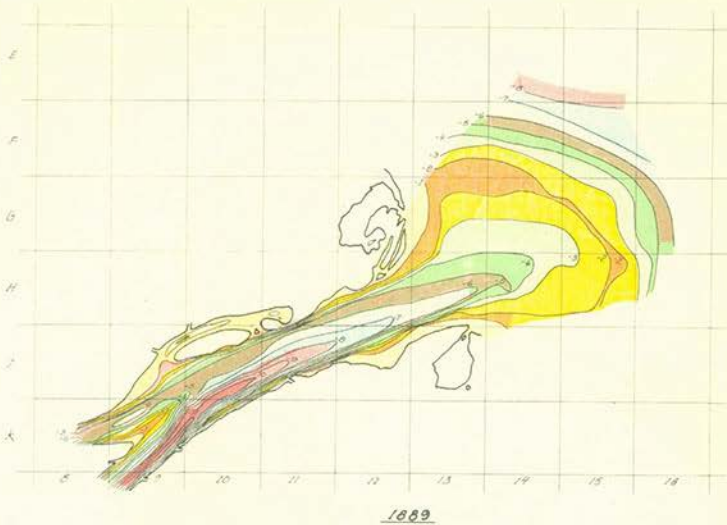
Plano de referencia - mínimo bajo marea

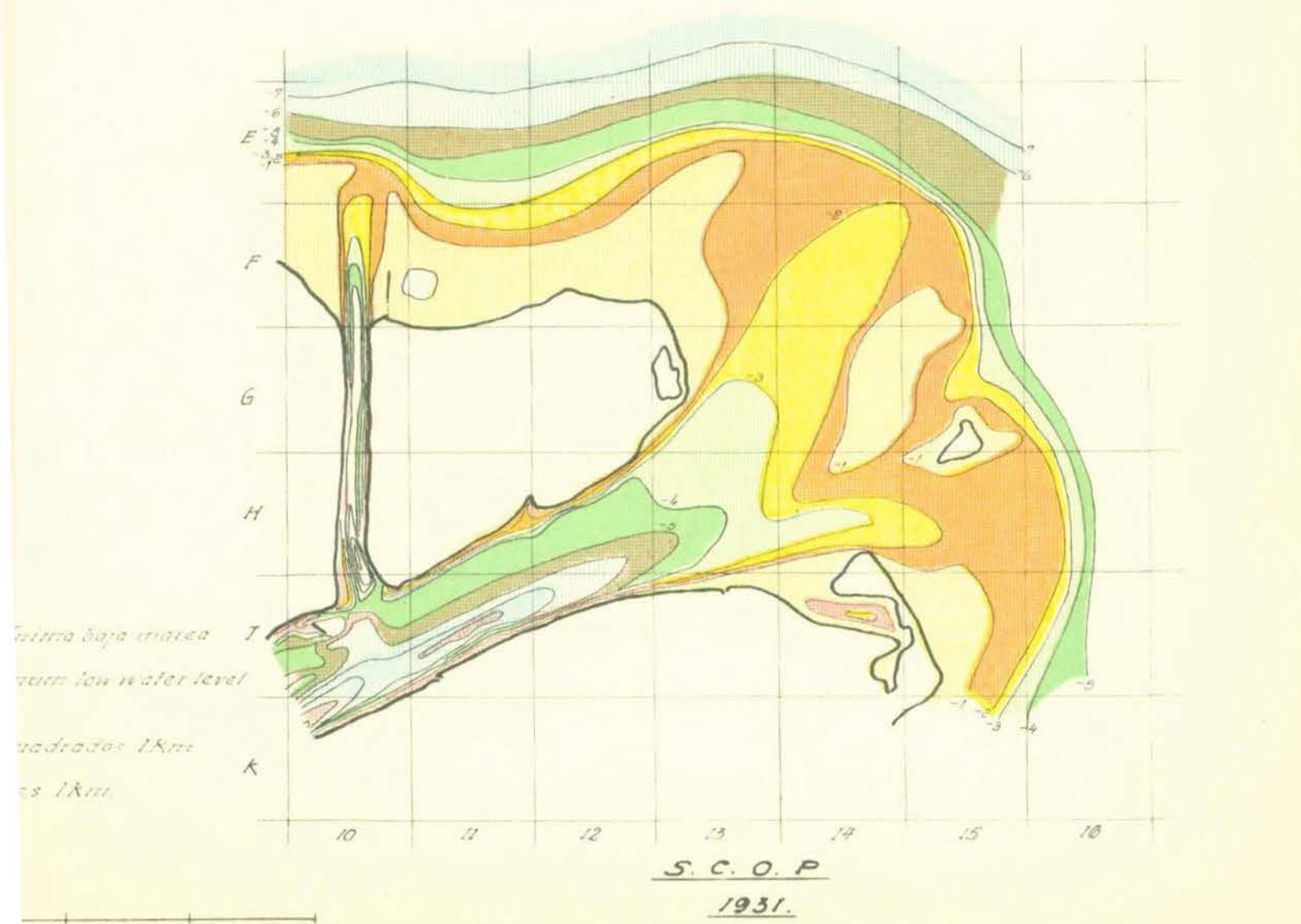
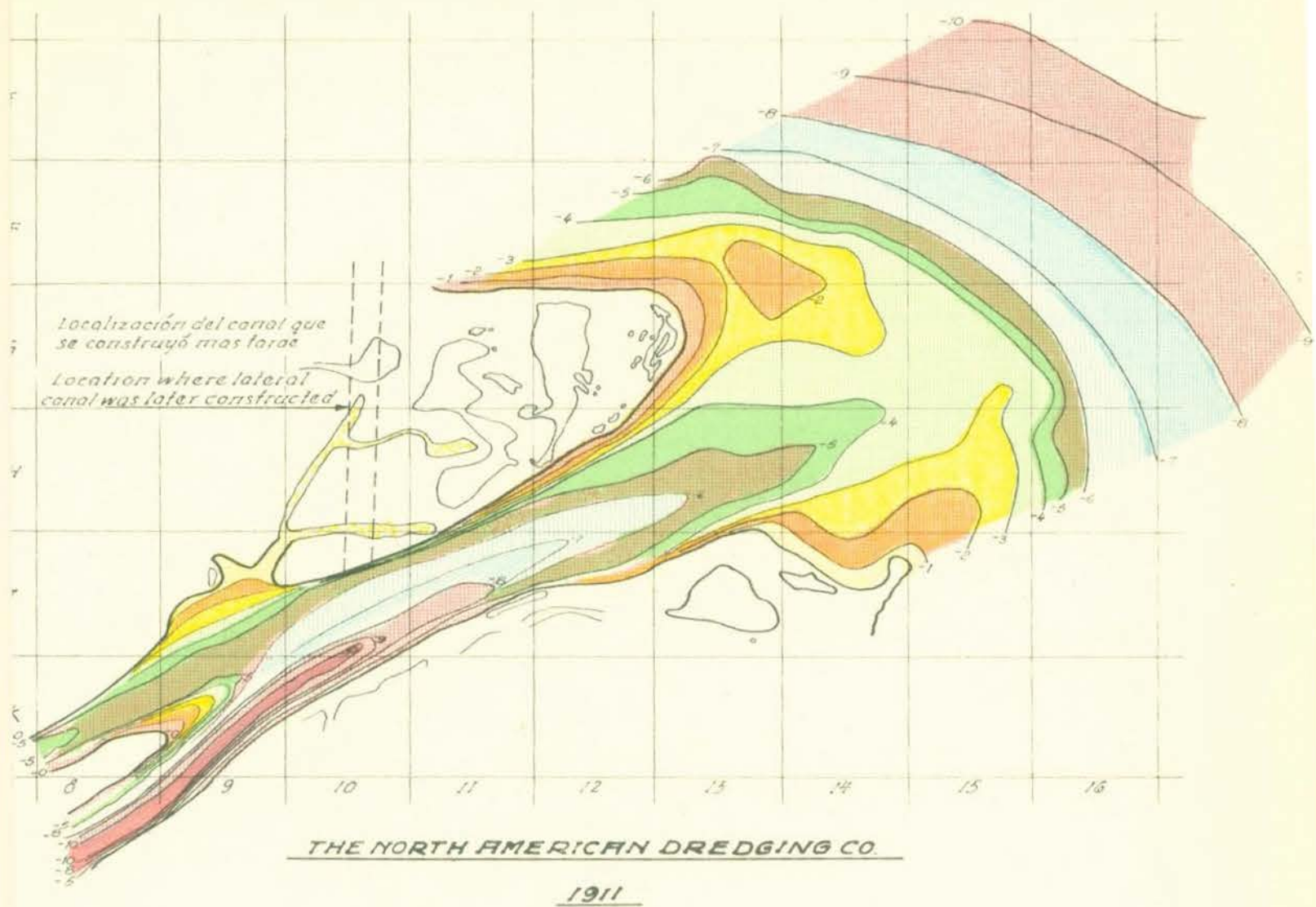
Datum: mean of minimum low water level

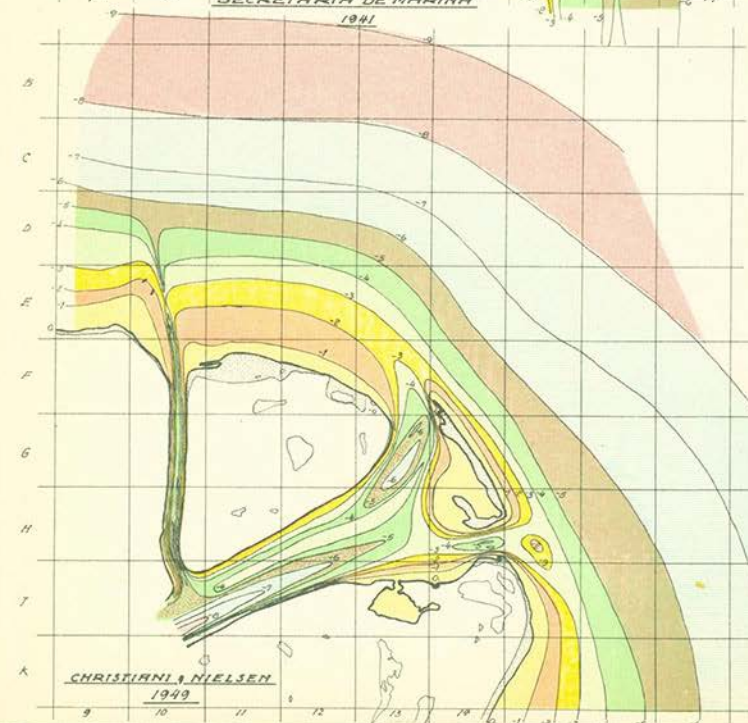
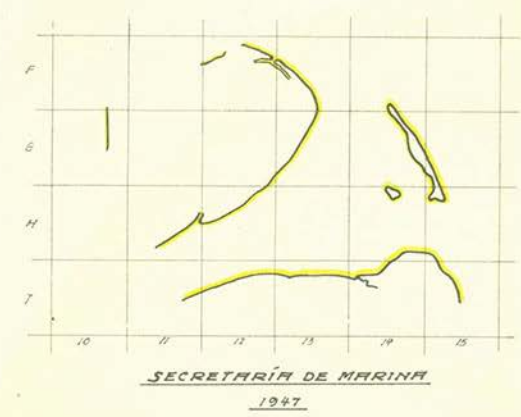
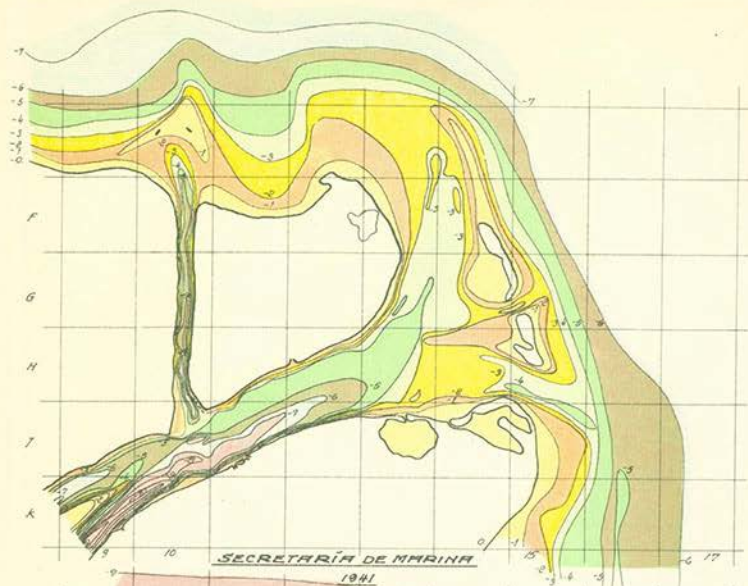
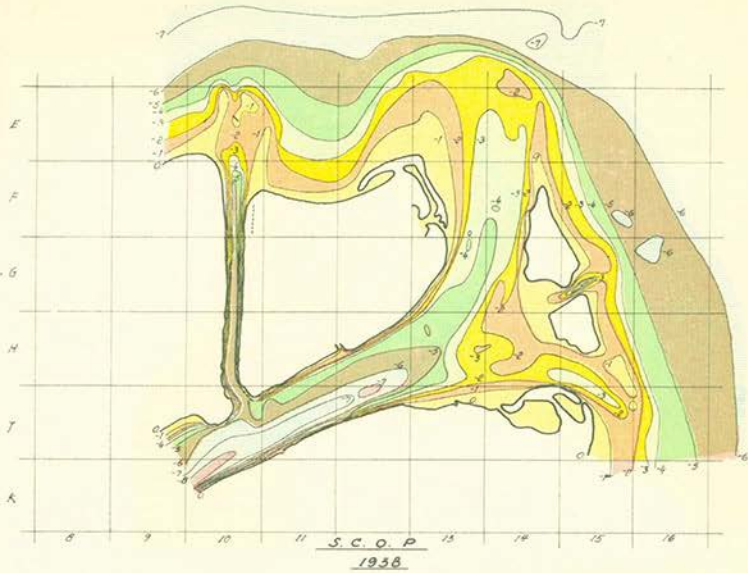
1 0.5 0 1 2 3 4 Km
Escala
Scale

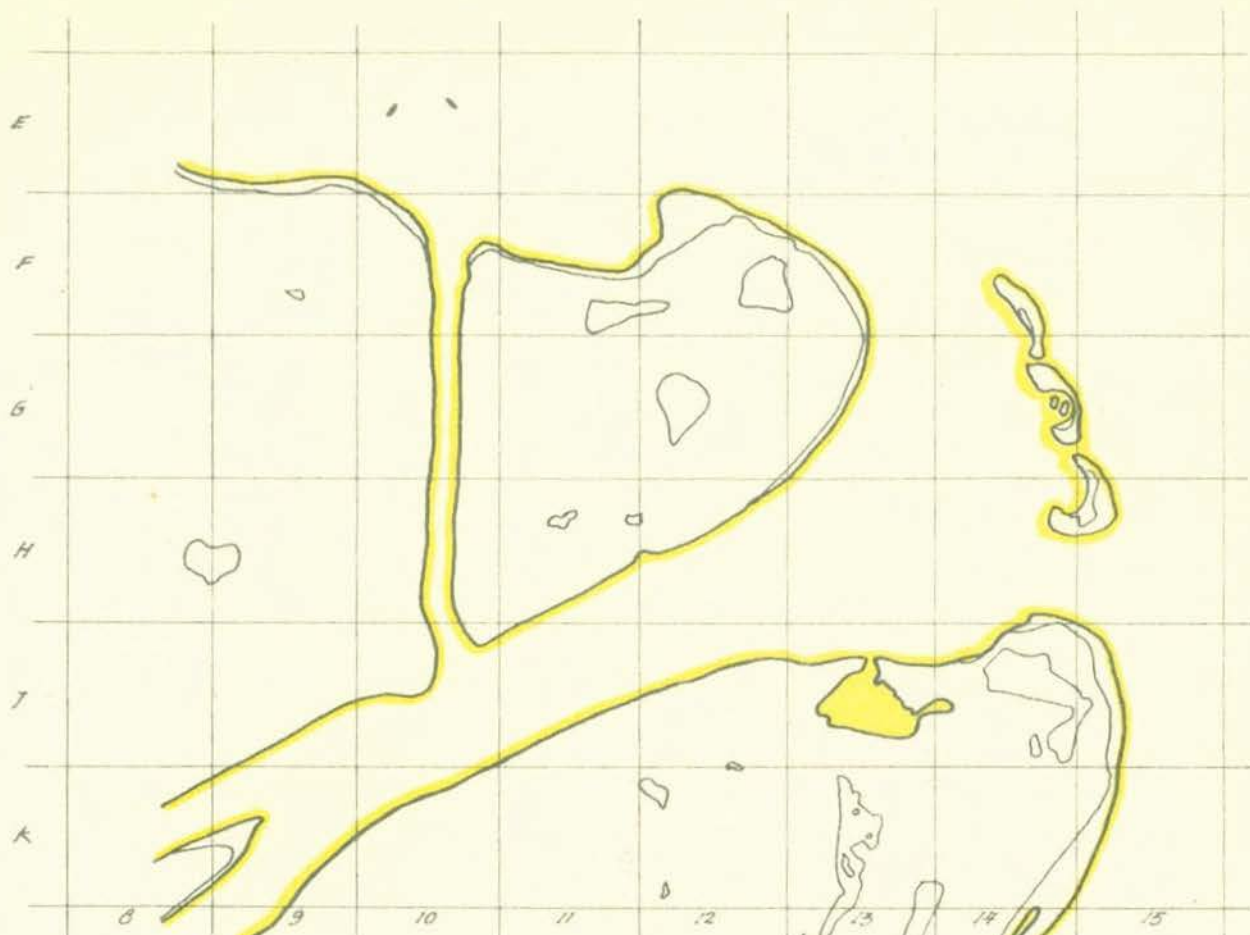
PLANO DE LA BOCA DEL RIO, 1903

PLAN OF THE RIVER MOUTH, 1903





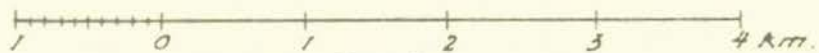




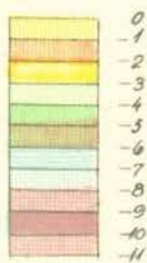
BASADO EN FOTO AÉREA
BASED ON AERIAL PHOTO
1943

Nota: Plano de referencia: mínima baja marea

Note: Datum-plane is minimum low water level

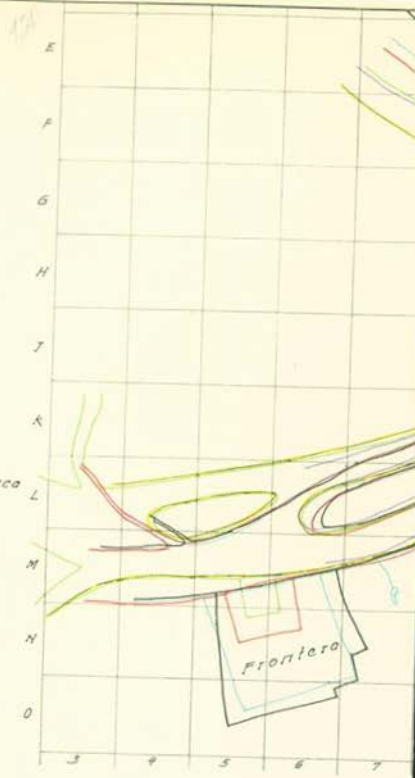
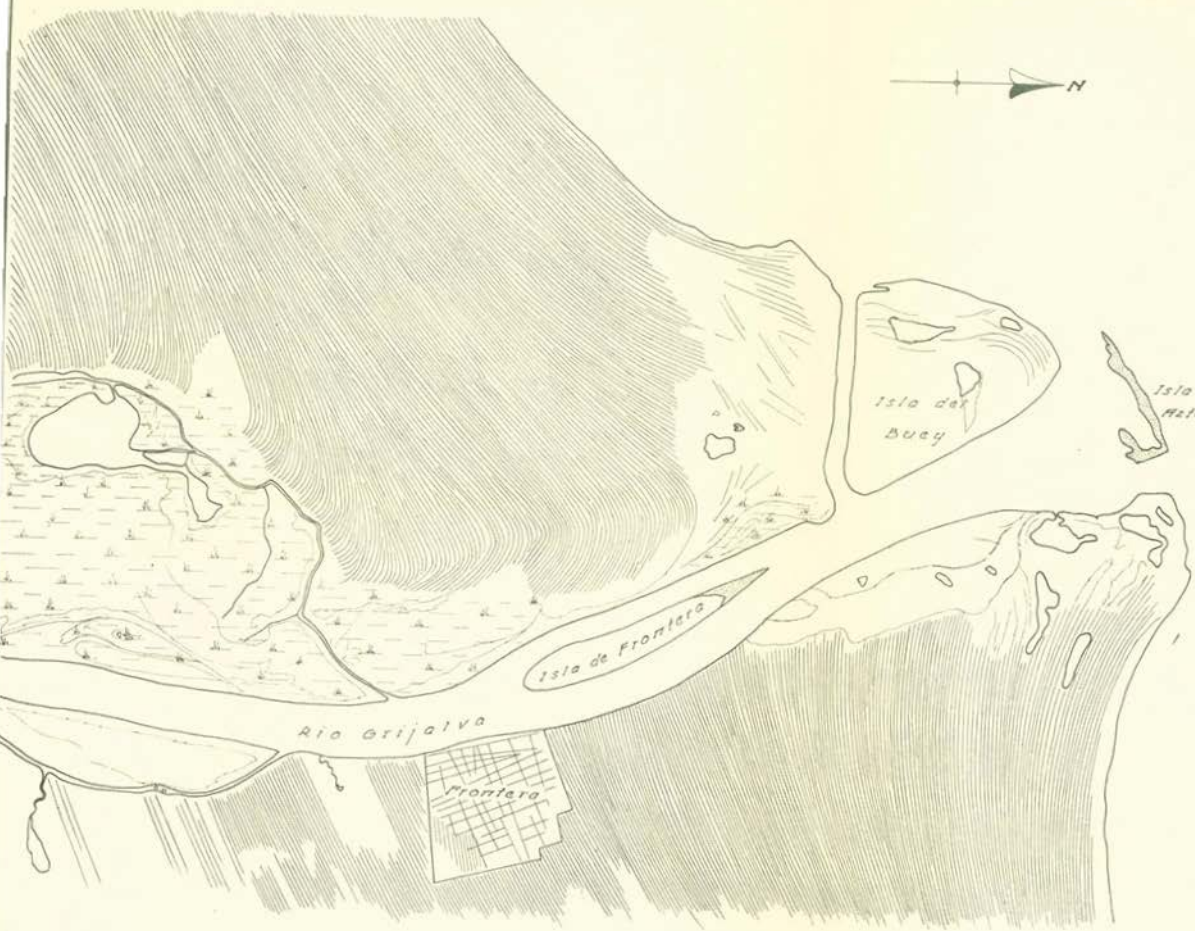


Escala
Scale



PLANOS DE LA BOCA DEL RÍO 1938 A 1949

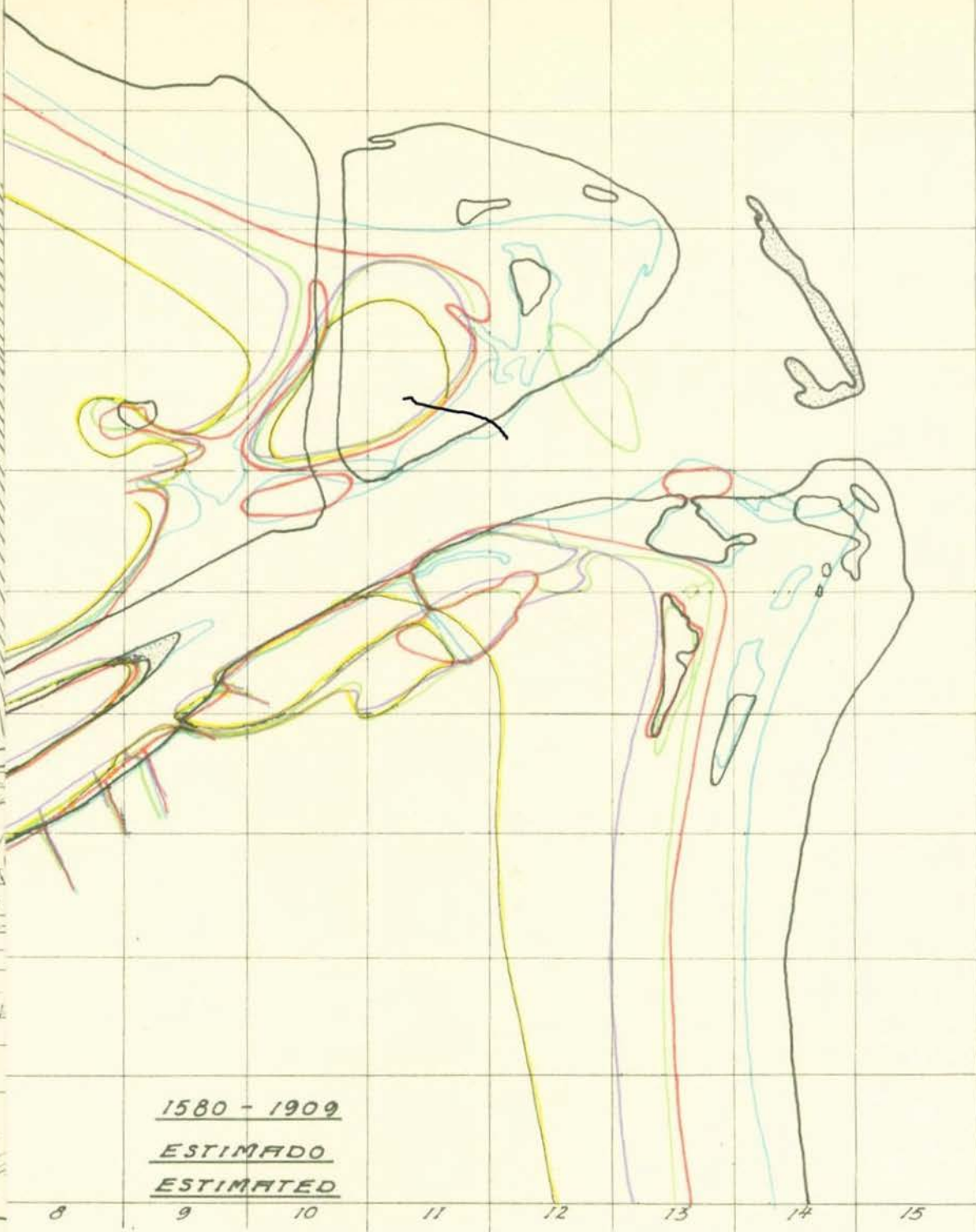
PLANS OF RIVER MOUTH 1938 TO 1949



PLANO BASADO EN FOTOGRAFÍAS AÉREAS
PLAN BASED ON AERIAL PHOTOGRAPHS

SITUACIÓN 1949
SITUATION

1 0 1 2 3 4 5 Km
Escala
Scale



- 1580
- 1760
- 1800
- 1860
- 1909

Nota: La Línea de costa de 1909 esta mostrada con línea continua gruesa para referencia.

Note: Coastline 1909 has been shown with full heavy line for reference

1580 - 1909
ESTIMADO
ESTIMATED

8 9 10 11 12 13 14 15

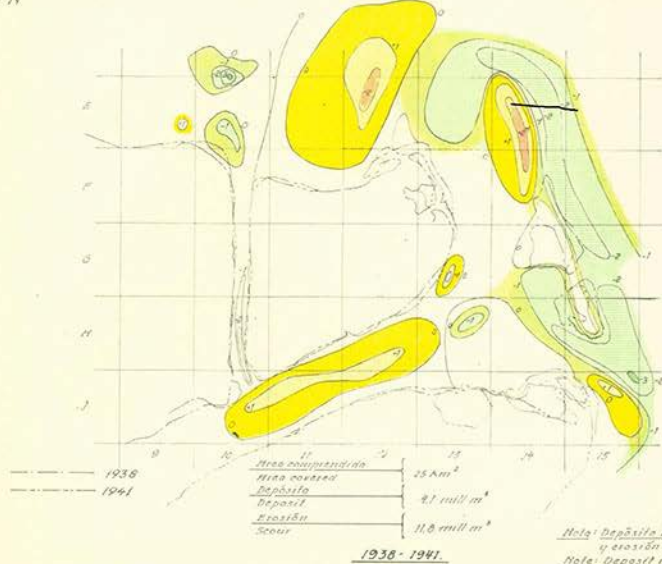
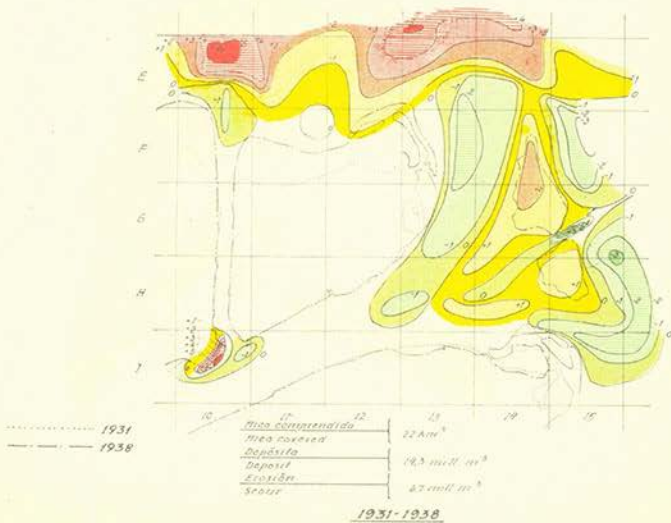
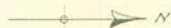
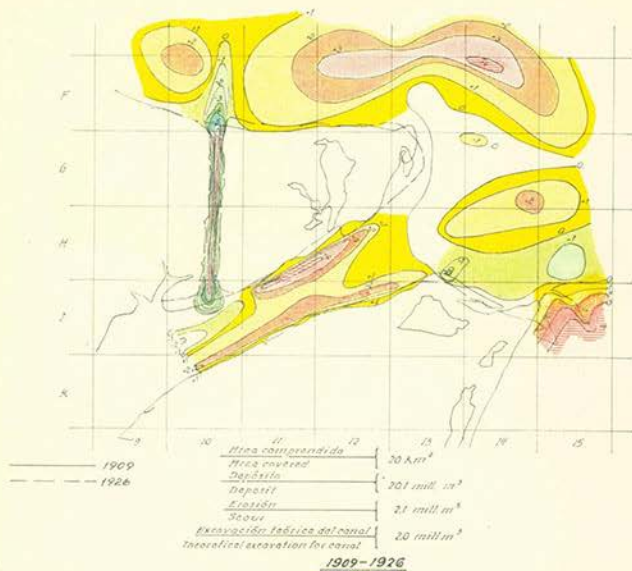
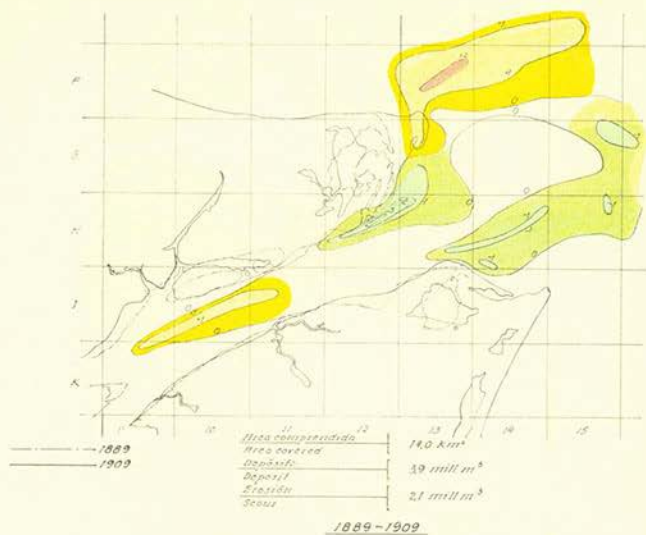


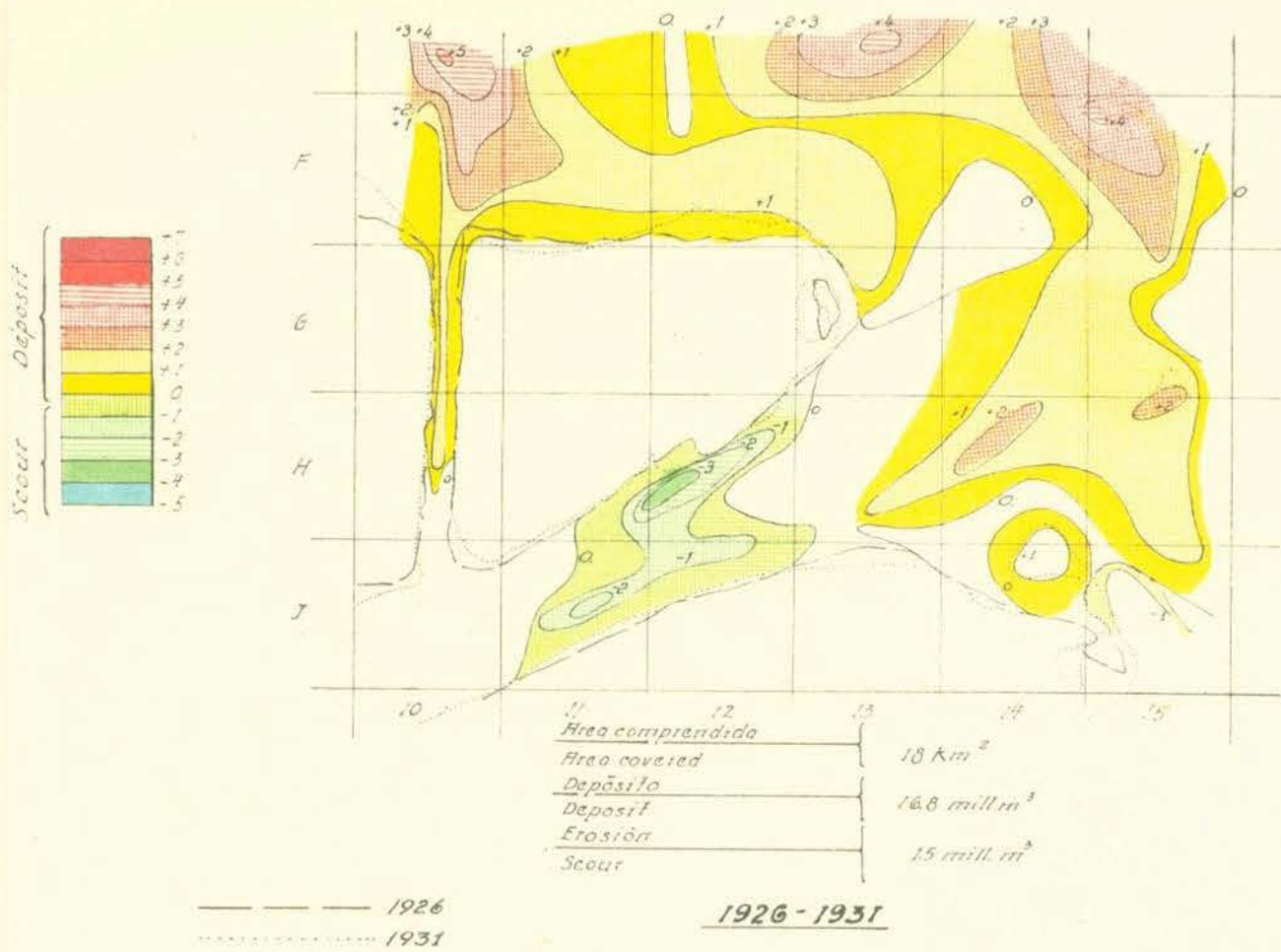
- 1909
- 1926
- 1951
- 1941
- 1949

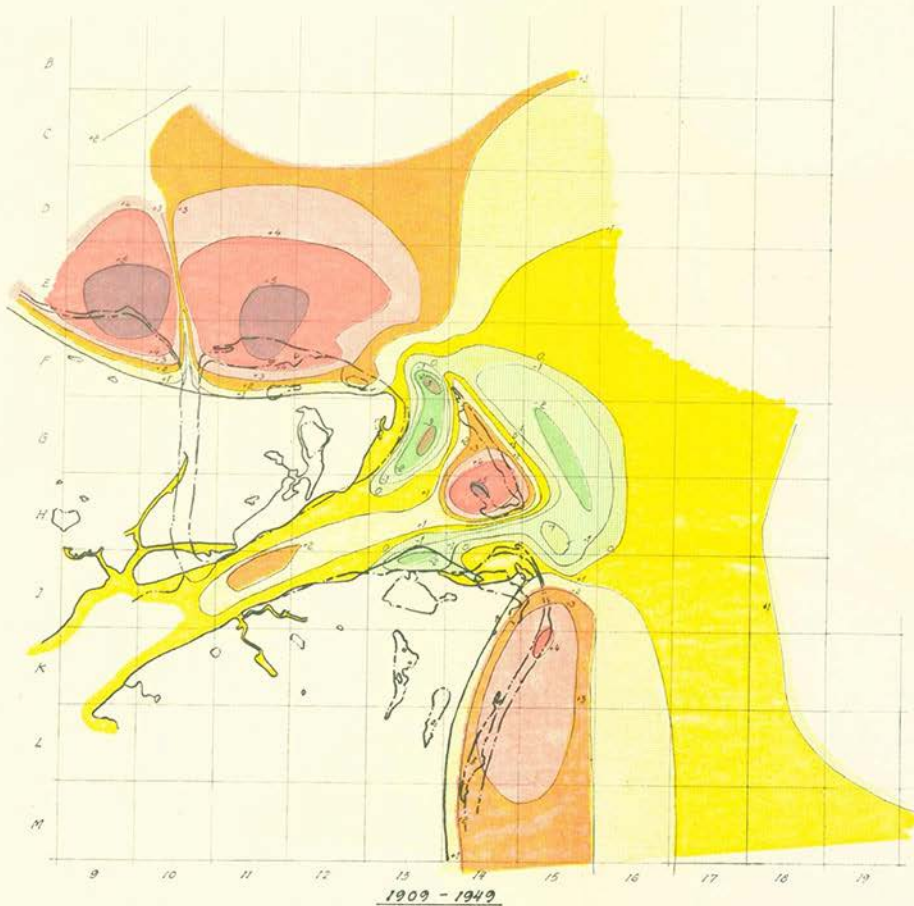
1909 - 1949

8 9 10 11 12 13 14 15

CAMBIOS DE LAS LÍNEAS DE COSTA CERCA DE LA BOCA DEL RÍO
CHANGES IN SHORE LINES AT RIVER MOUTH



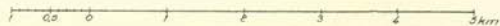




Área comprendida	55 Km ²
Área covered	
Depósito	105 mill. m ³
Depositi	
Erosión	7 mill. m ³
Scour	

*Nota: Depósito indicado con números positivos
y erosión con negativos*
*Note: Deposition is indicated with positive figures
Erosion with negative*

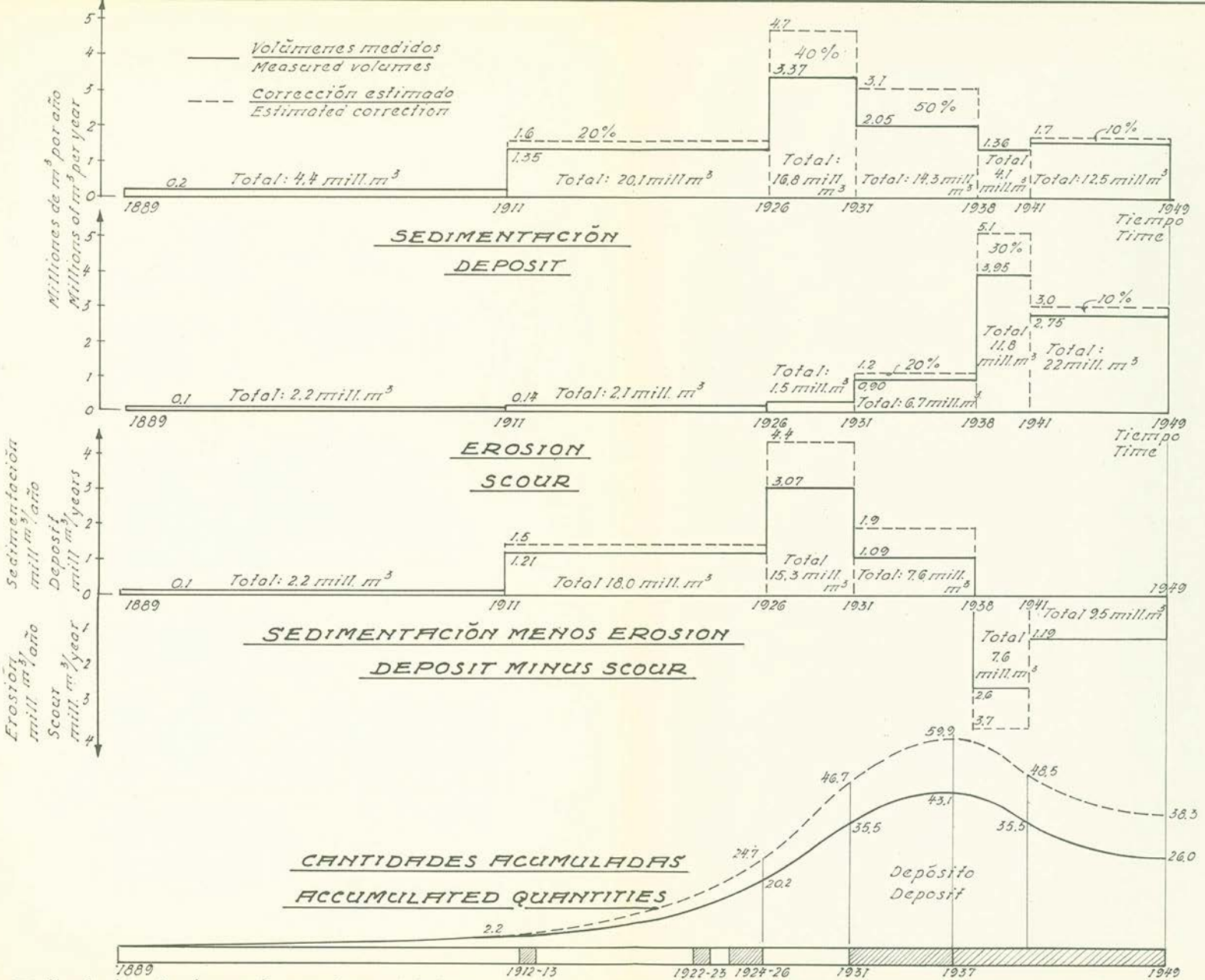
————— 1909
- - - - - 1949



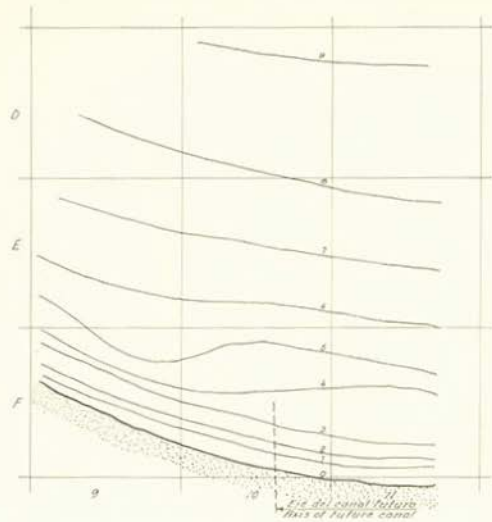
Escafo
Scale

CAMBIOS EN LA PROFUNDIDAD DEL AGUA 1909 A 1949

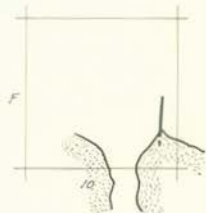
CHANGES IN WATER DEPTHS 1909 TO 1949



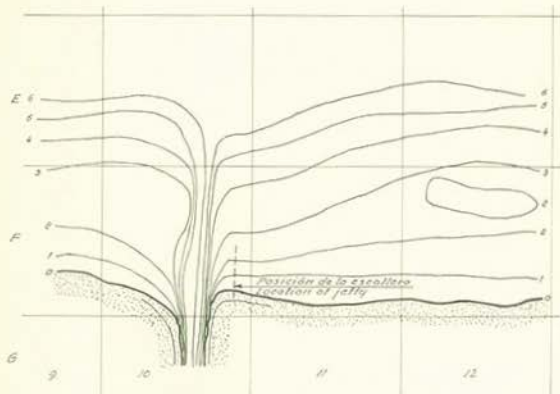
CANTIDADES DE SEDIMENTOS Y EROSION
QUANTITIES OF DEPOSITS AND SCOUR Lámina 73.



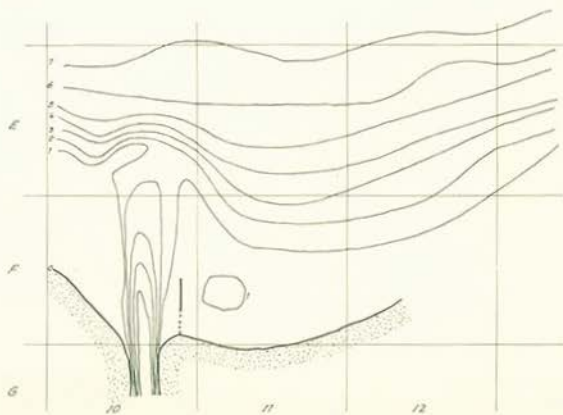
1909



1923



1926



1931

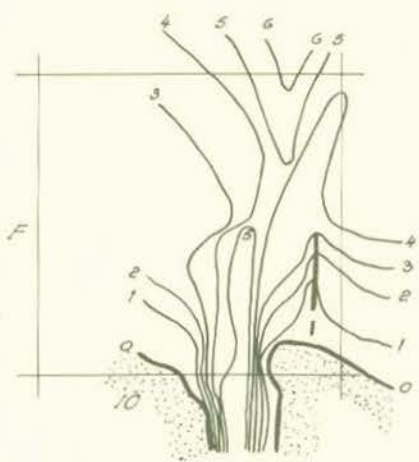


1933

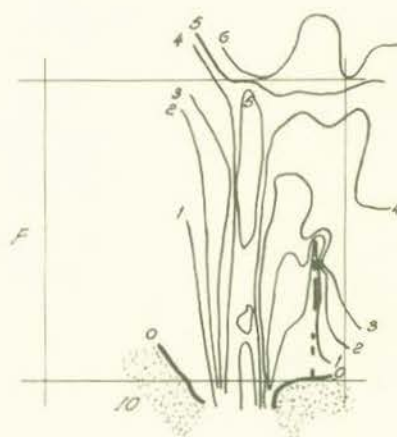


1938

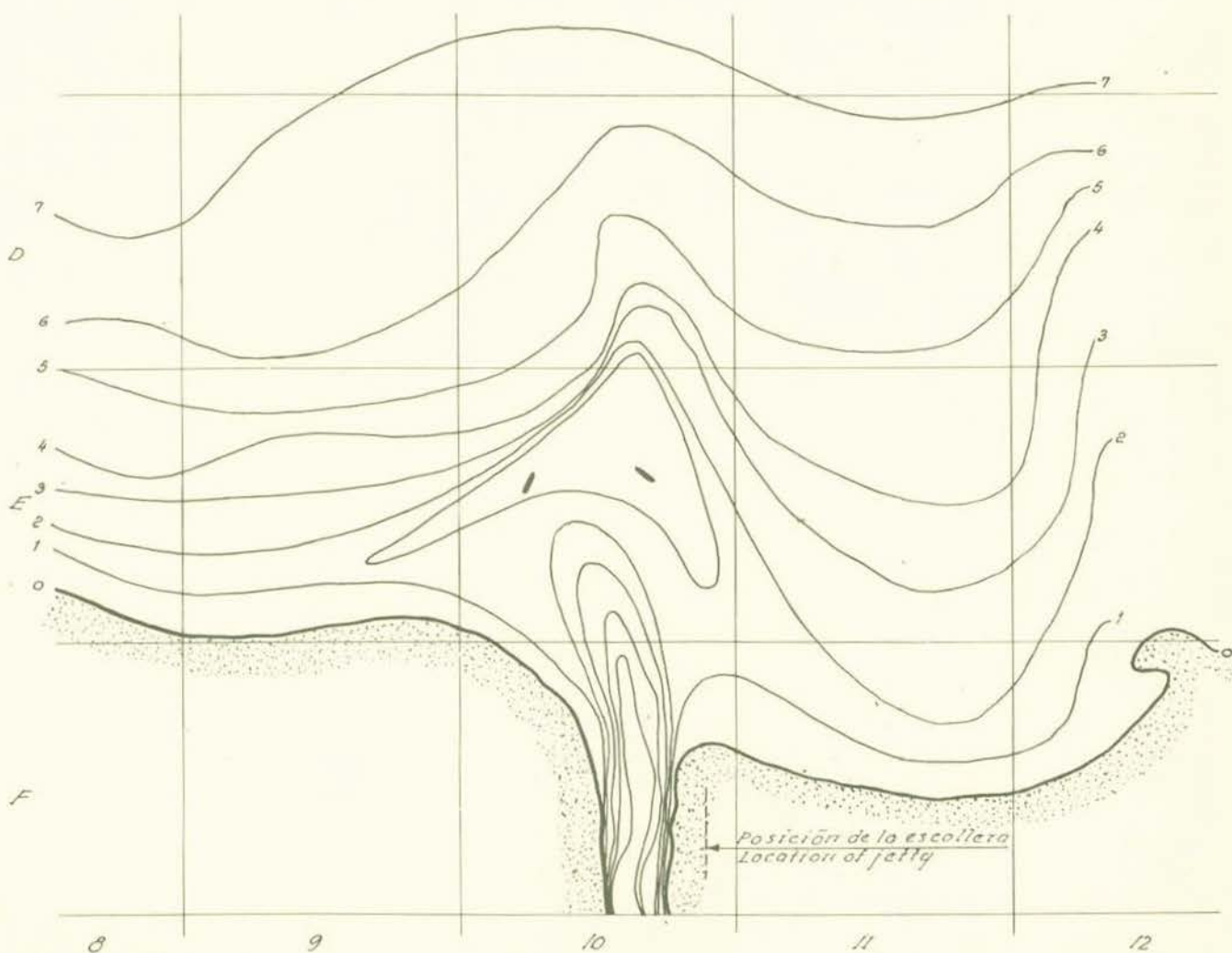
II
Nota: Largo de
Nota: Side for
Pierro de
Dafour.



1927



1929



1941

lado de los cuadrados 1km

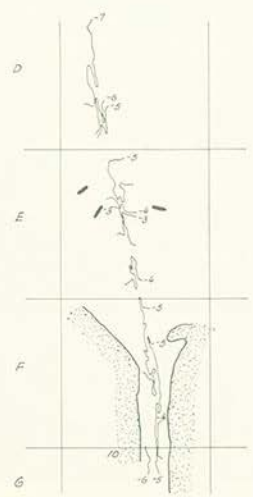
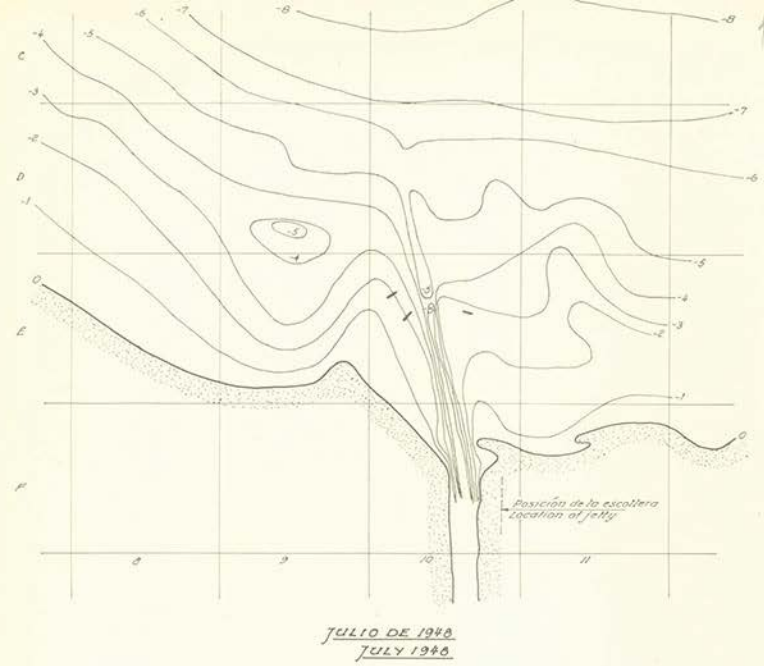
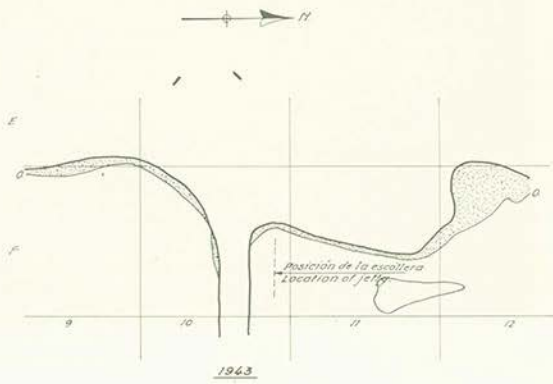
ft of squares 1km.

Referencia: mínima baja marea

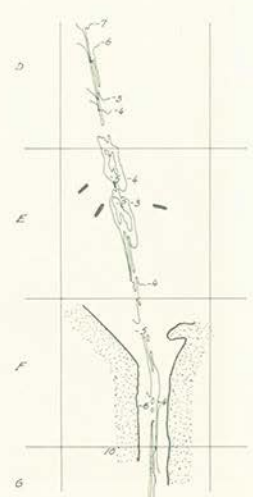
reference: minimum low water level

Boca del Canal de 1909 a 1941
MOUTH OF LATERAL CANAL, 1909 TO 1941.

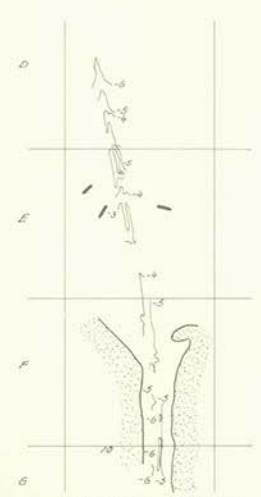
Lámina 74.
 Plate 74.



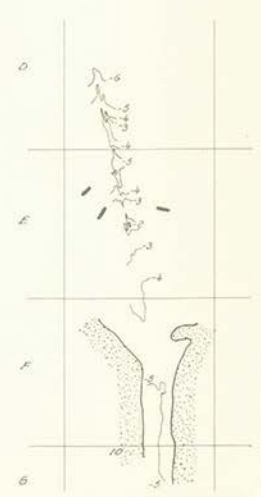
2 DE DICIEMBRE DE 1968
2nd OF DECEMBER 1968



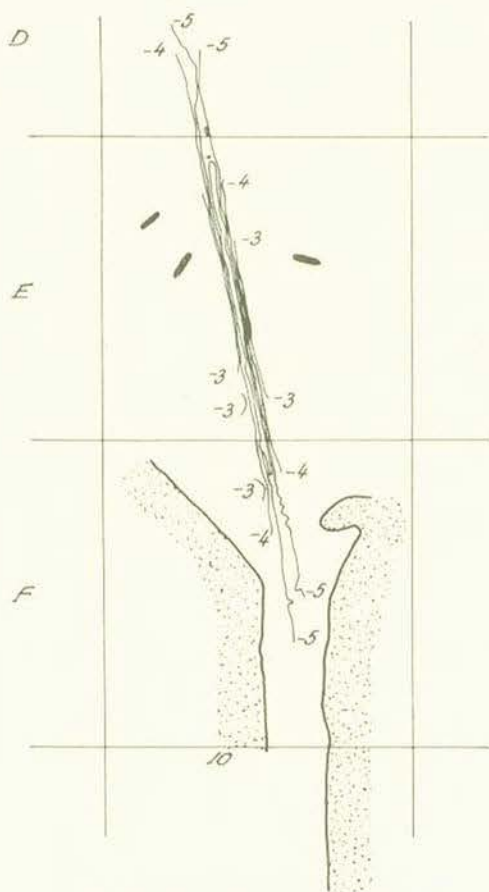
15 DE ENERO DE 1969
15th OF JANUARY 1969



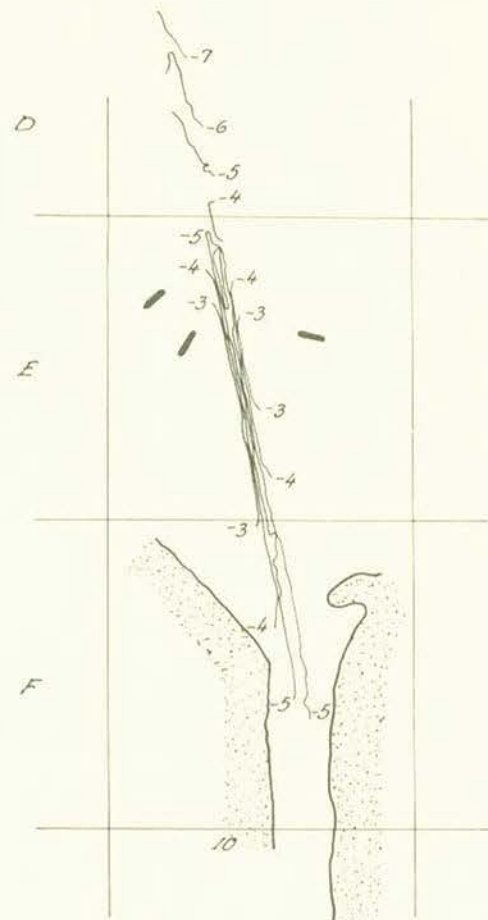
9 DE FEBRERO DE 1969
9th OF FEBRUARY 1969



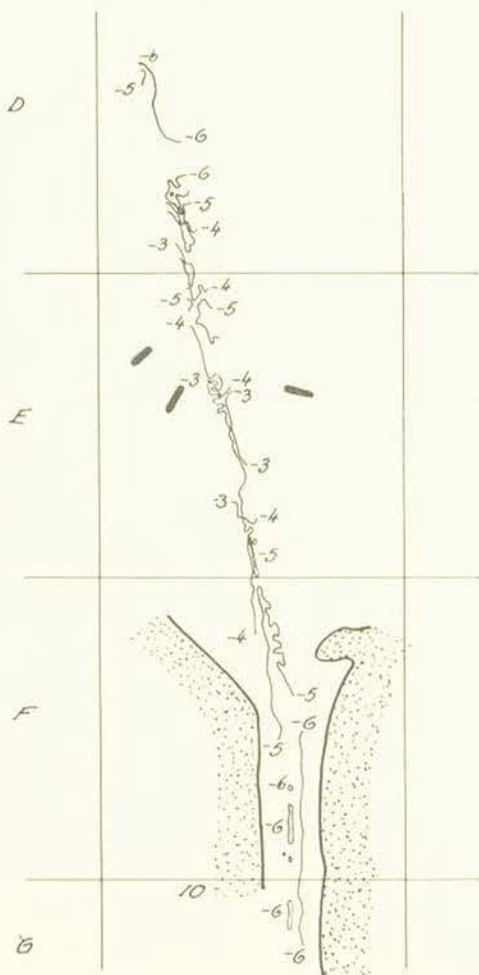
8 DE MARZO DE 1969
8th OF MARCH 1969



26 DE AGOSTO DE 1948
26th OF AUGUST 1948



9 DE OCTUBRE DE 1948
9th OF OCTOBER 1948



22 DE NOVIEMBRE DE 1949
22th OF NOVEMBER 1949

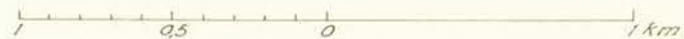


Nota: Largo del lado de los cuadrados 1km

Note: Side length of squares 1km

Plano de referencia: mínima baja marea

Datum-plane is minimum low water level



Escala:
Scale:

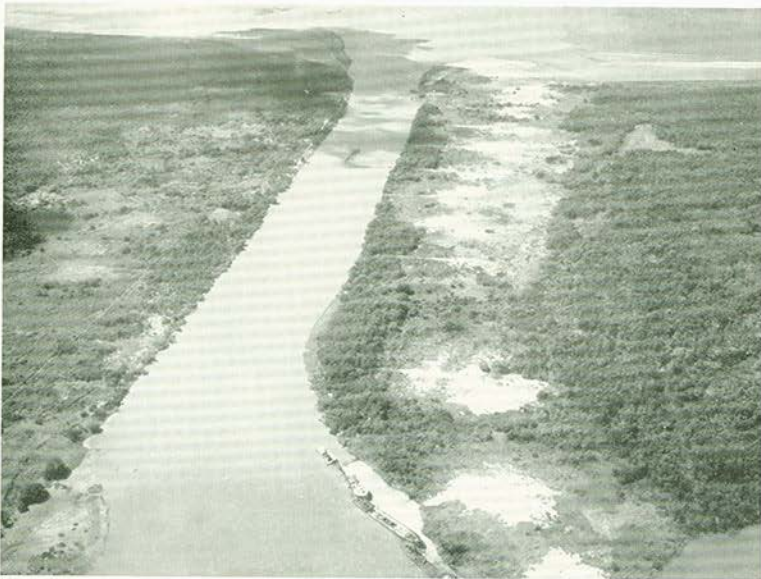
BOCA DEL CANAL LATERAL } 1943-49
MOUTH OF LATERAL CANAL }



1 Boca del Río y canal lateral, mirando al Este
Mouth of river with Lateral canal, looking east



3 Dragado en el canal lateral
Dredging in Lateral canal



2 Canal lateral, mirando al Oeste
Lateral canal, looking west



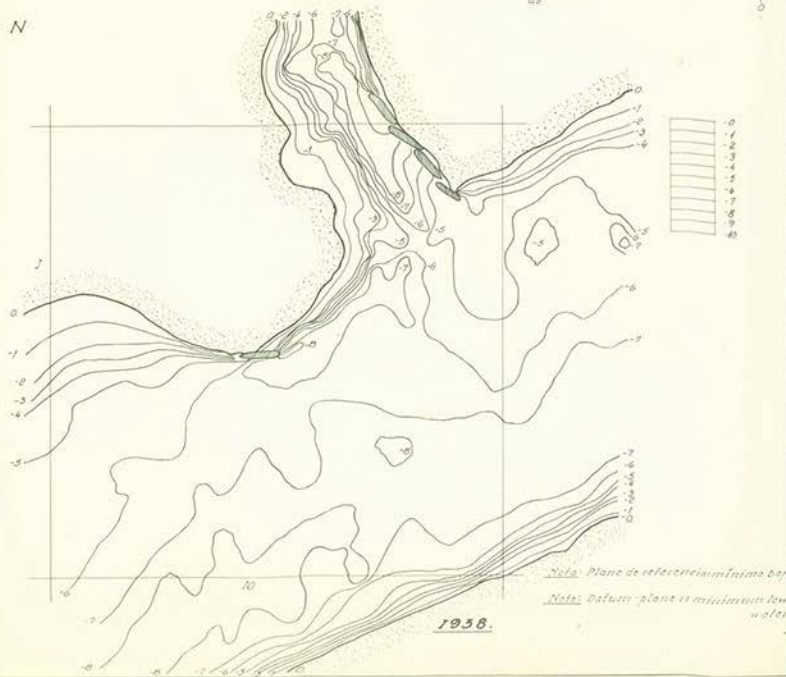
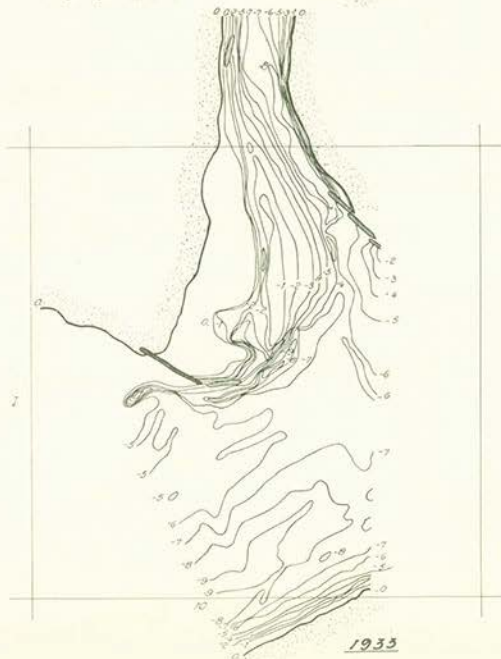
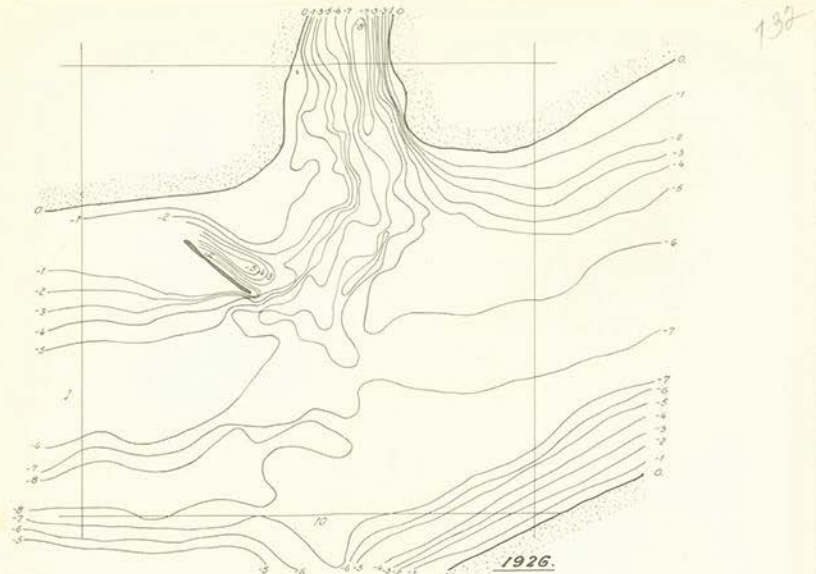
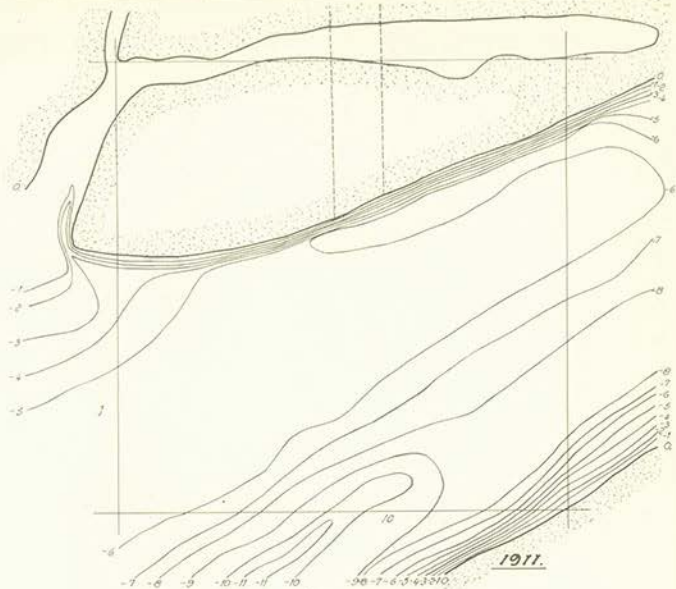
4 Boca del río, mirando al Norte
Mouth of river, looking north



5 Barra en la boca del río, mirando al Este
The bar in the river mouth, looking east

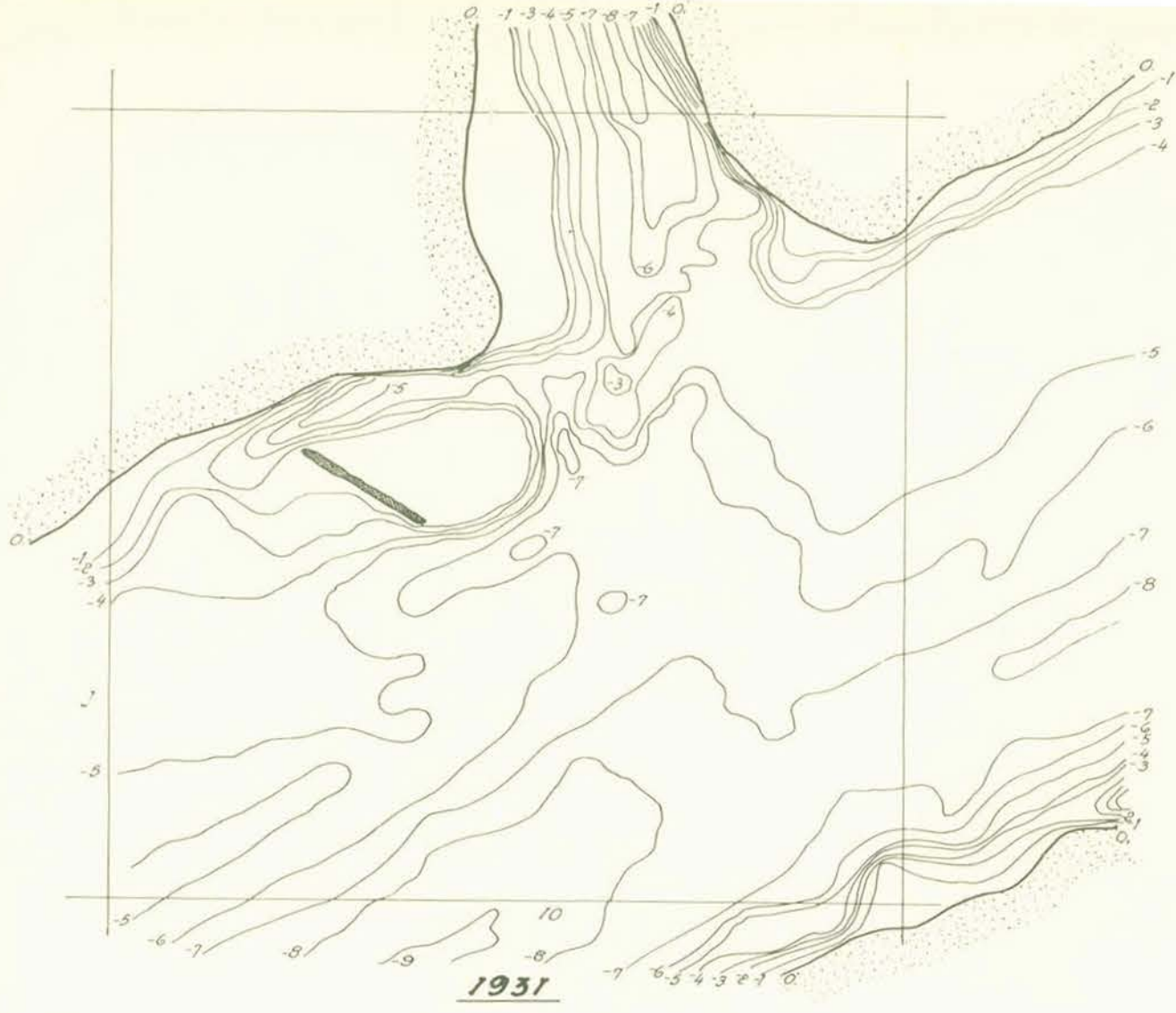


6 Margen derecha y barra
Right bank and bar



Nota: Plano de referență minimă de 10

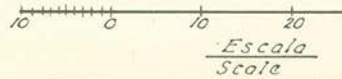
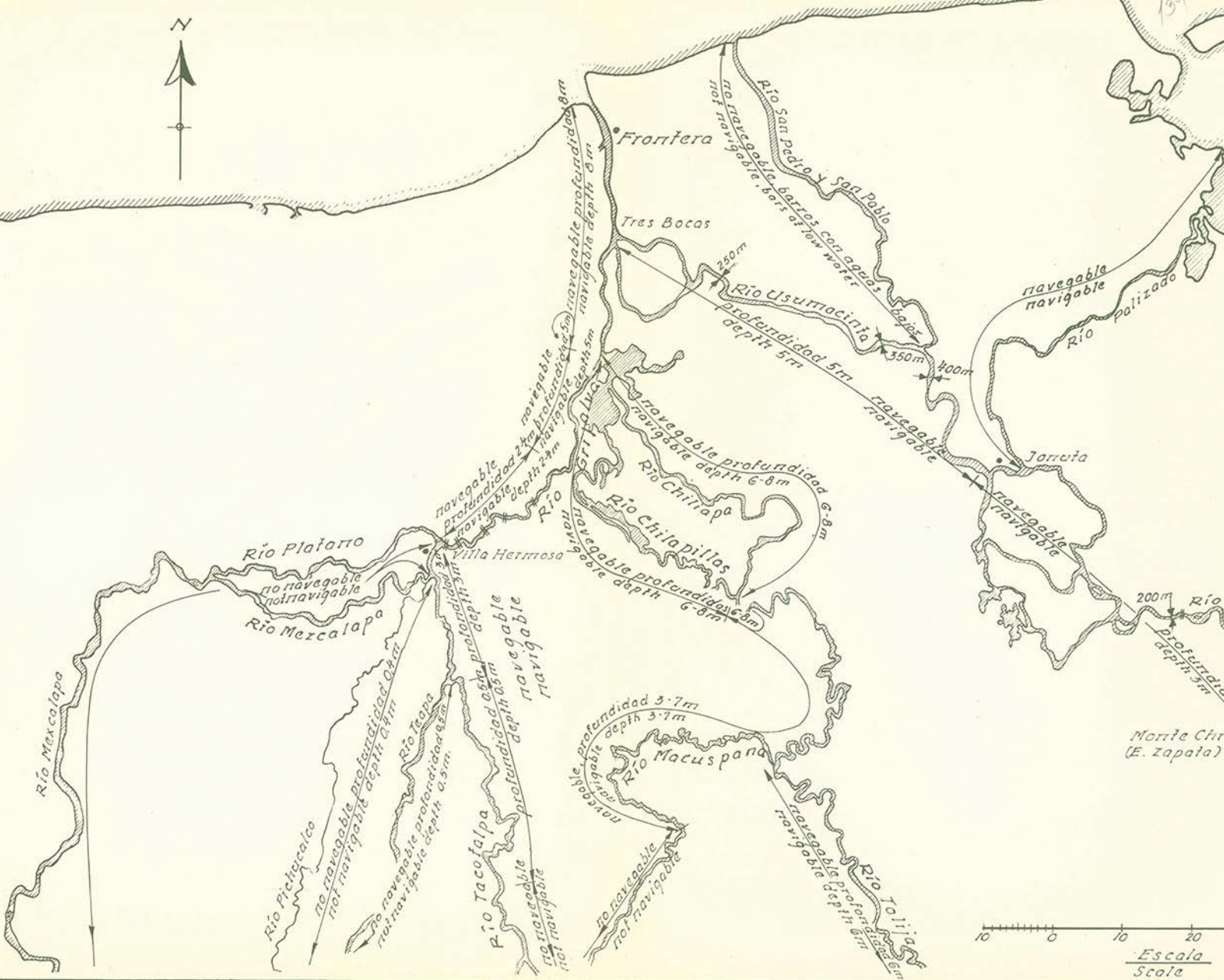
Nota: Diferența plan și nivelul mare

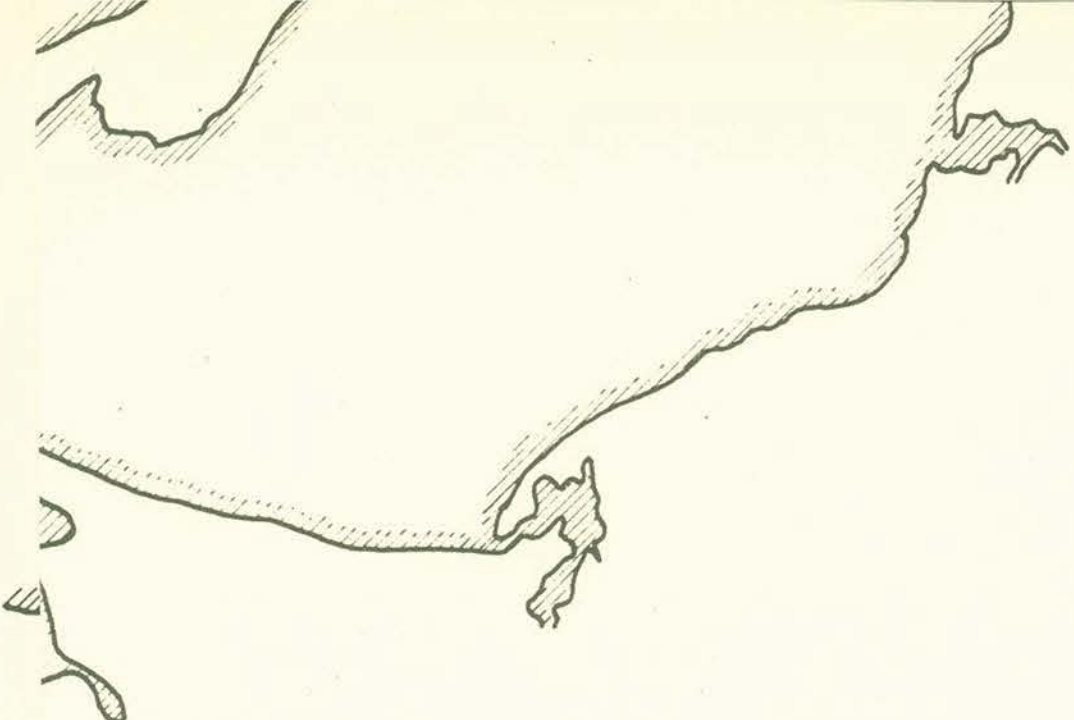


0.5 1 km
 Escala
 Scale



ENTRADA DEL RÍO AL CANAL LATERAL DE 1911 A 1941
 ENTRANCE FROM RIVER TO LATERAL CANAL 1911 TO 1941.

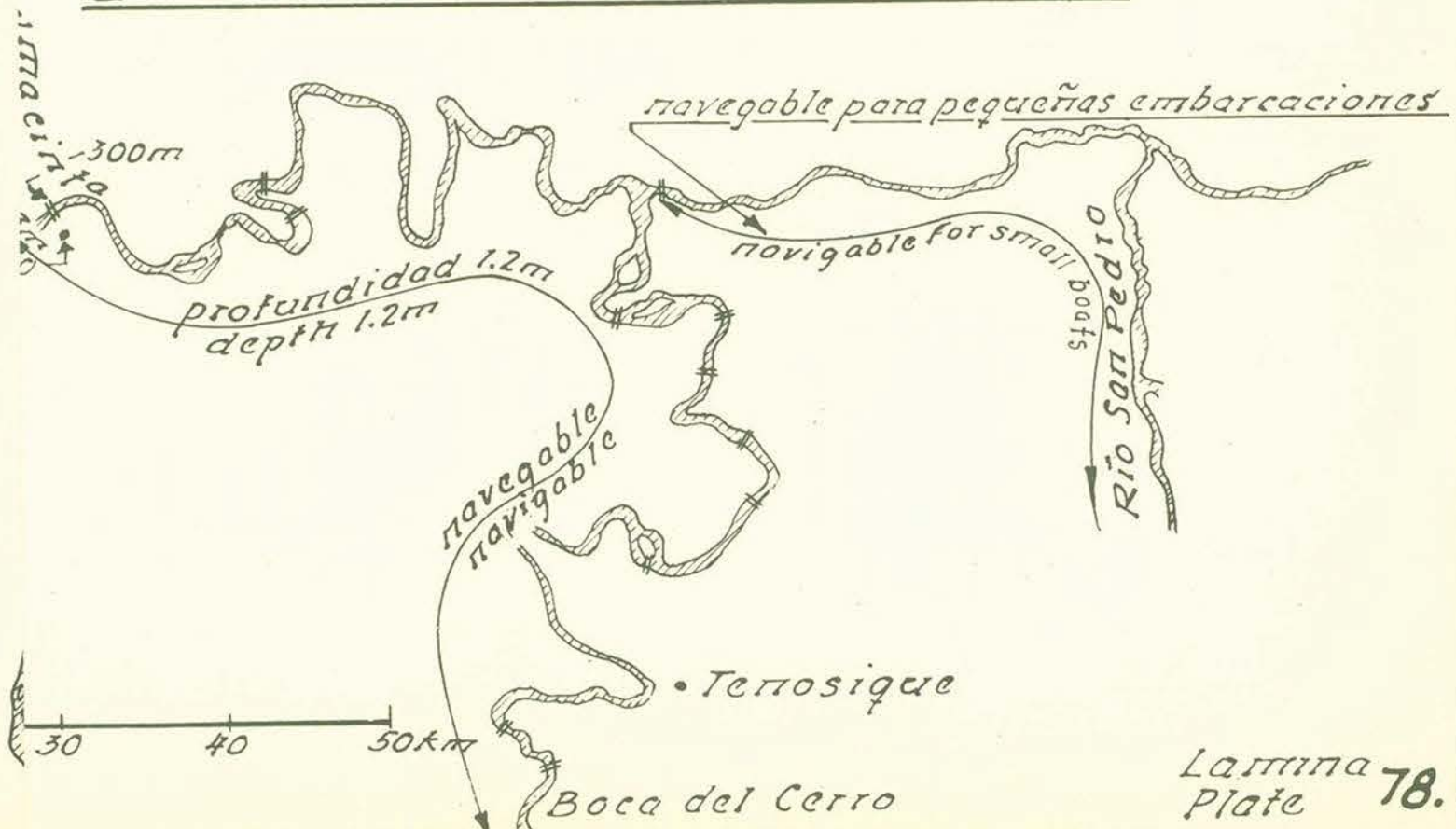


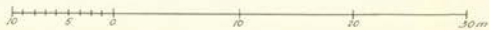
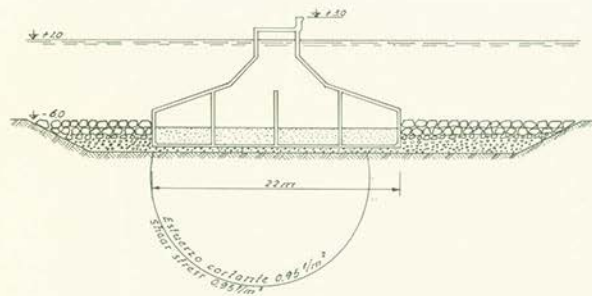
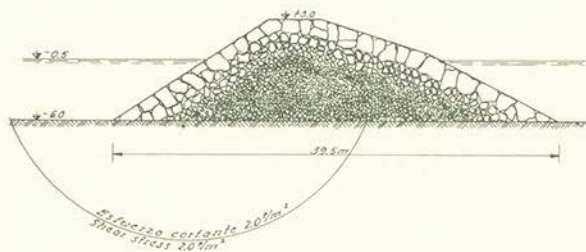
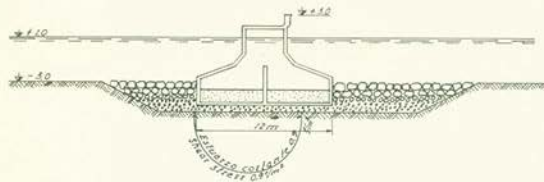
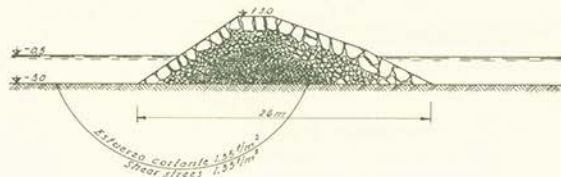


barra
bar

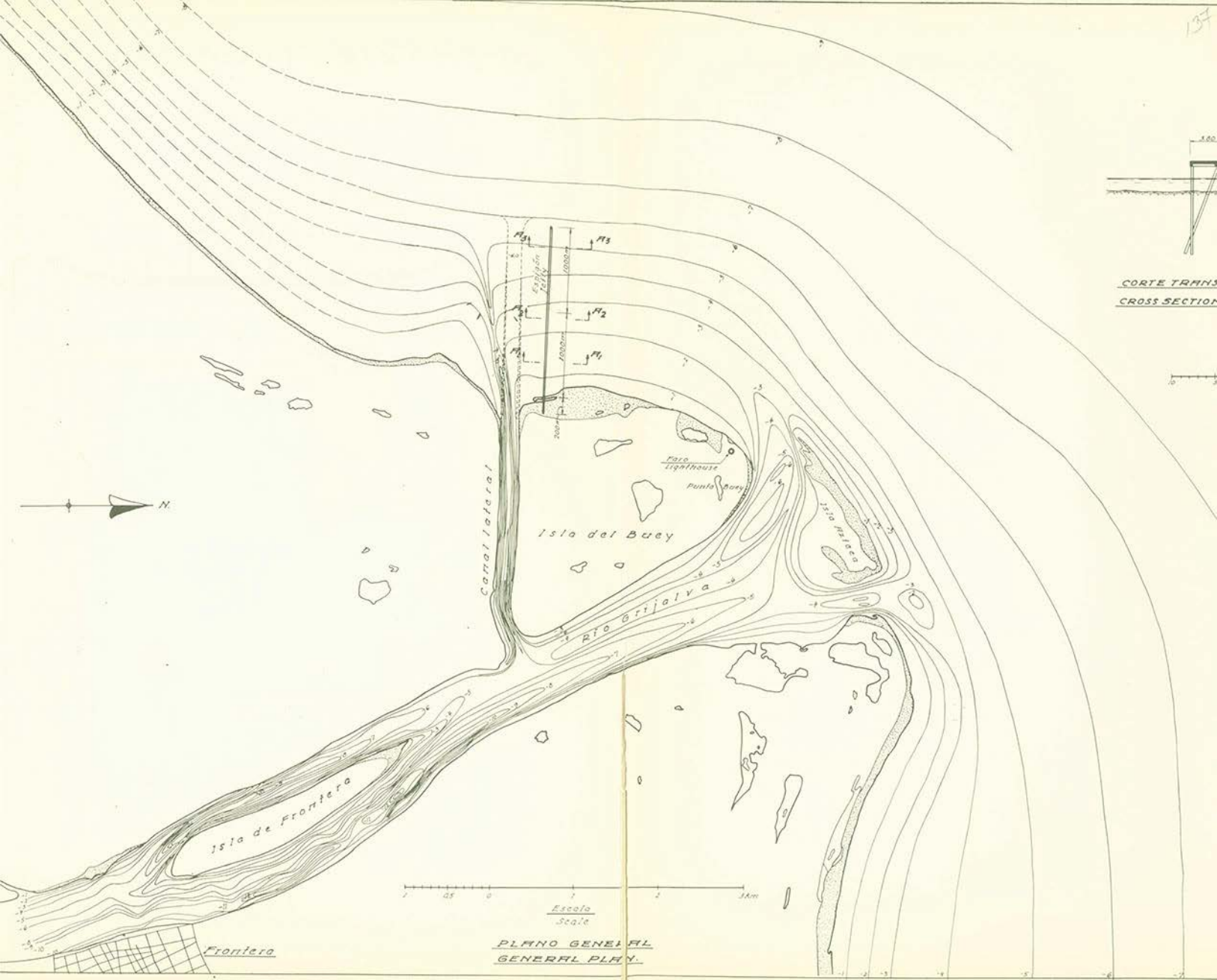
NAVEGABILIDAD DEL SISTEMA FLUVIAL
USUMACINTA - GRIJALVA.

NAVIGABILITY OF USUMACINTA -
GRIJALVA RIVER SYSTEM.

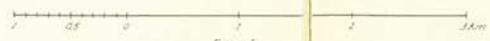




Escala
 Scale

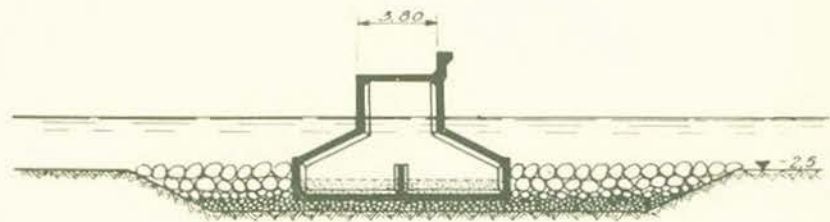


CORTE TRANS
CROSS SECTION



Escala
Scale

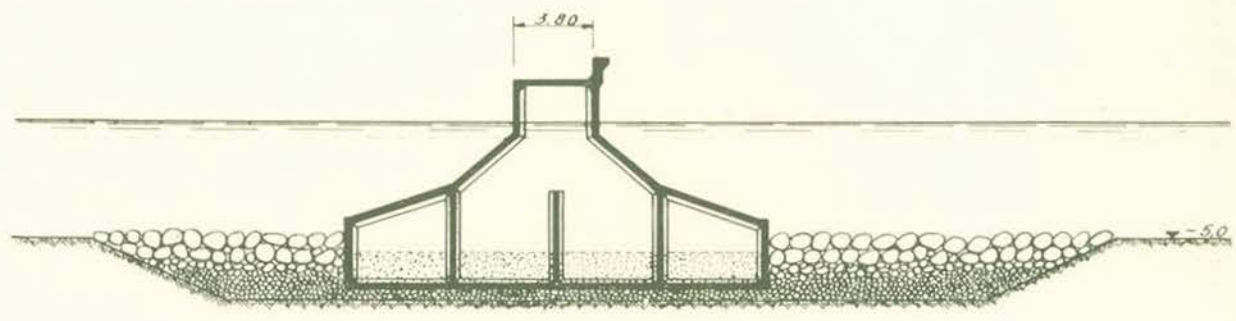
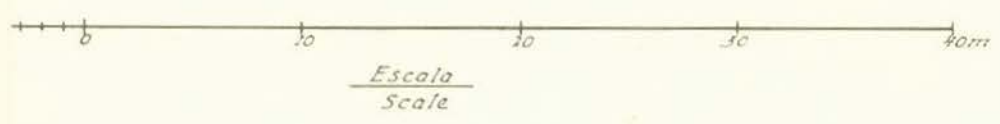
PLANO GENERAL
GENERAL PLAN.



Tablestacado
Sheetpile

SECCION TRANSVERSAL A₁-A₁
A₁-A₁

CORTE TRANSVERSAL A₂-A₂
CROSS SECTION A₂-A₂



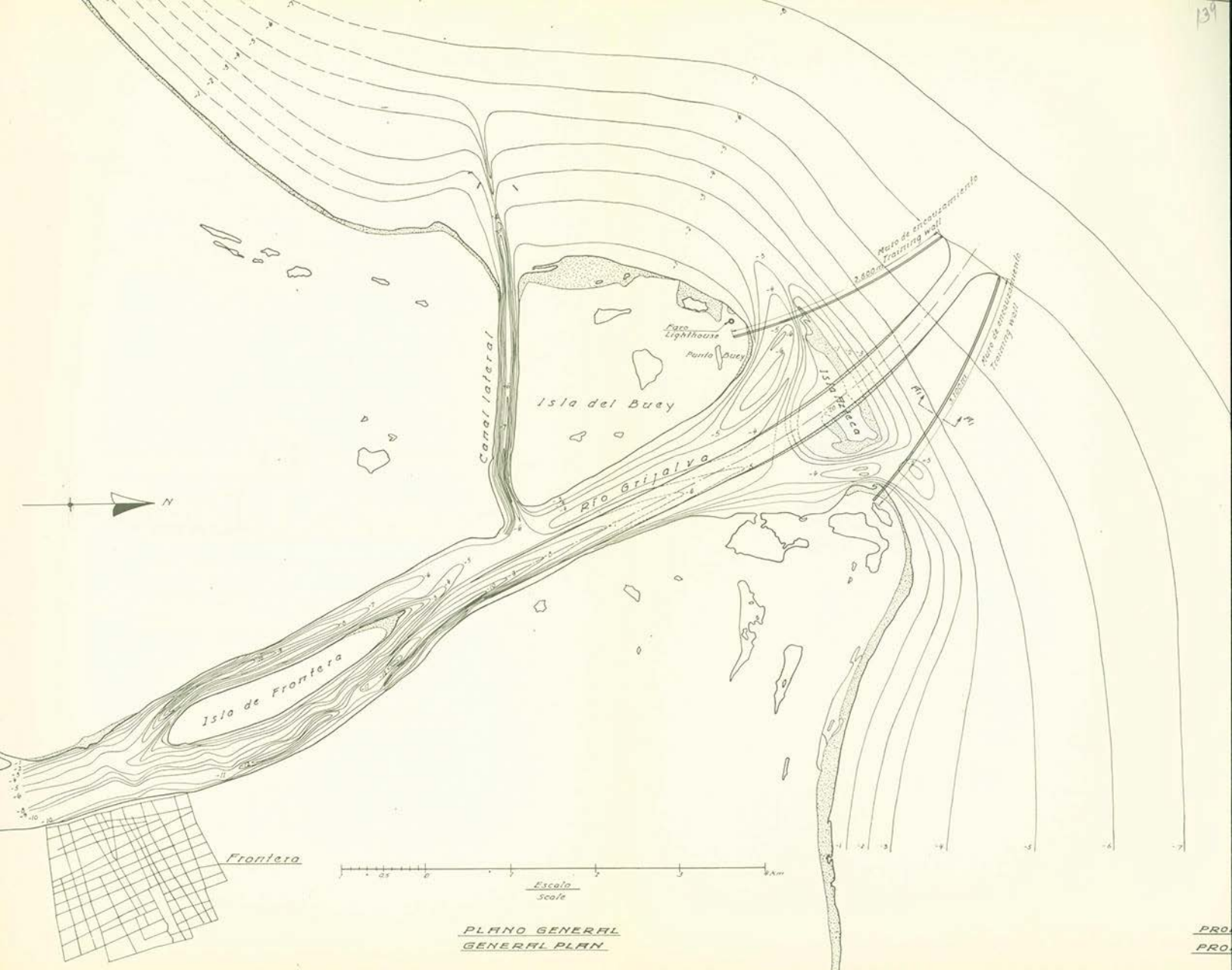
CORTE TRANSVERSAL A₃-A₃
CROSS SECTION A₃-A₃

SECCIONES TRANSVERSALES DEL ESPIGÓN

CROSS SECTIONS IN JETTY.

Nota: Plano de referencia: mínima baja marea
Note: Datum-plane is minimum low water level

PROPUESTA I, ESPIGON JUNTO AL ACTUAL CANAL LATERAL
PROPOSAL I, JETTY AT PRESENT LATERAL CANAL.



Canal lateral

Isla del Buey

Faro Lighthouse
Puerto Buey

Rto. Grijalva

Isla de Frontera

Muro de encauzamiento
Training wall

Muro de encauzamiento
Training wall

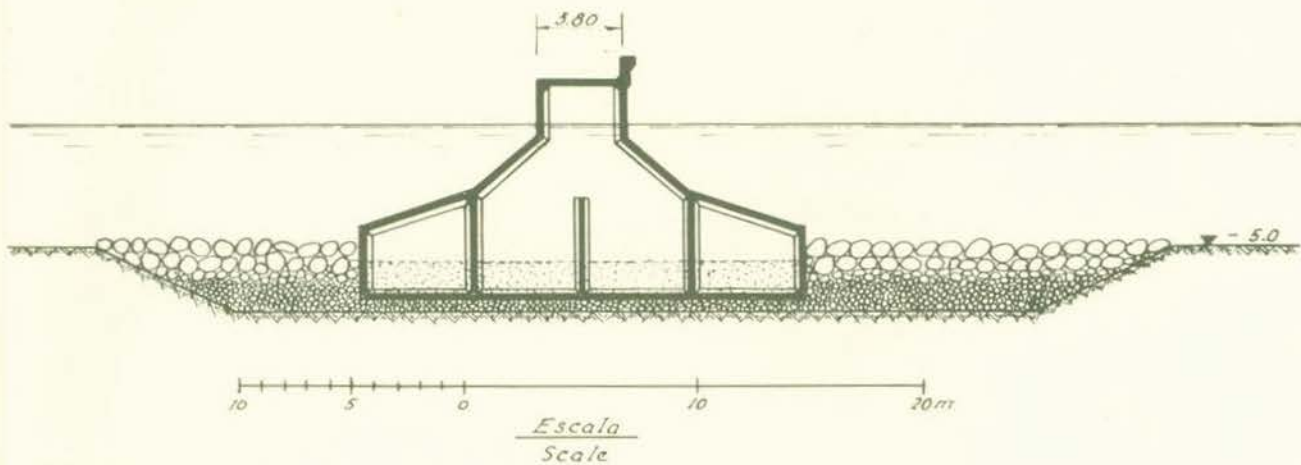
Isla de Frontera

Frontera



PLANO GENERAL
GENERAL PLAN

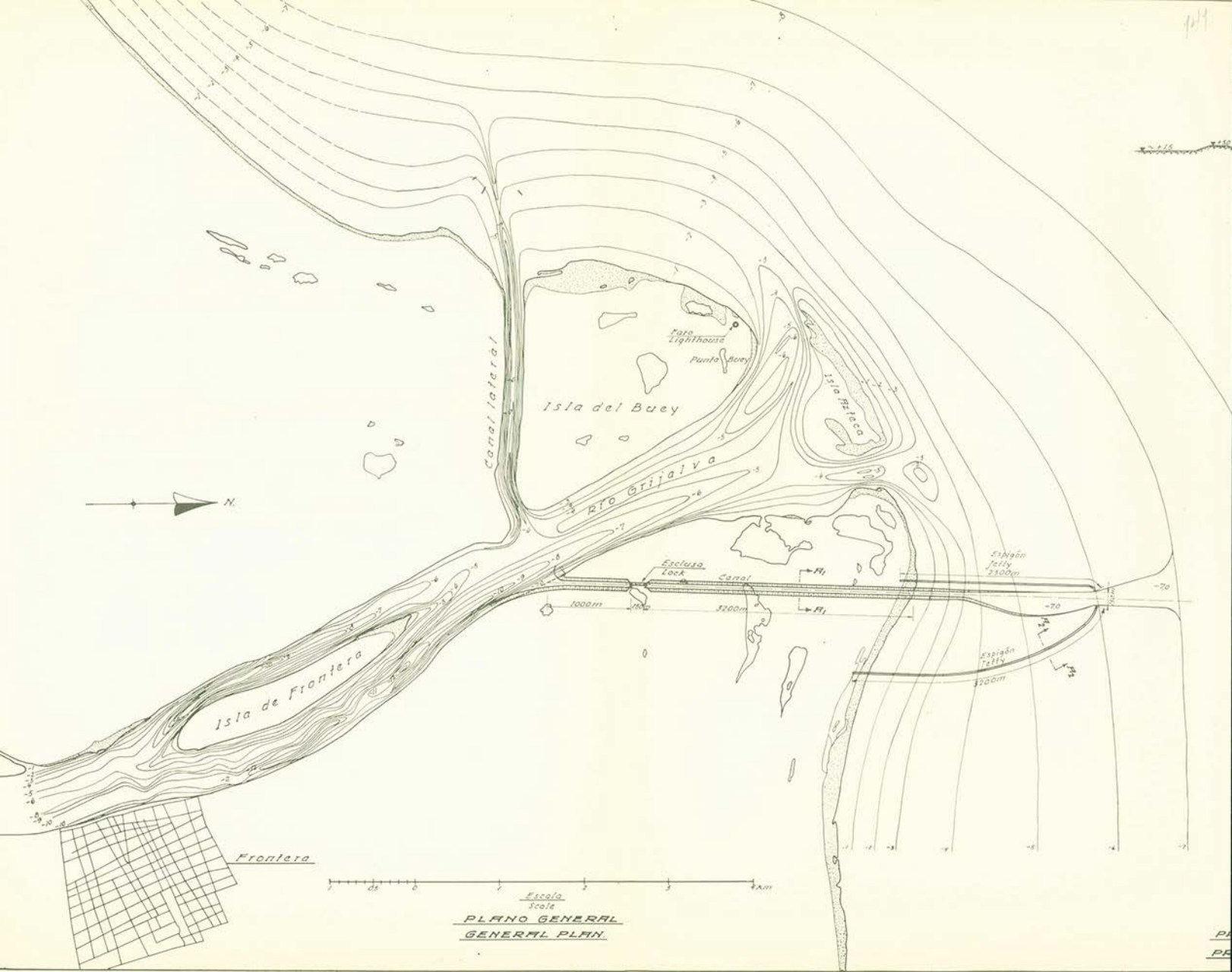
PRO.
PRO.

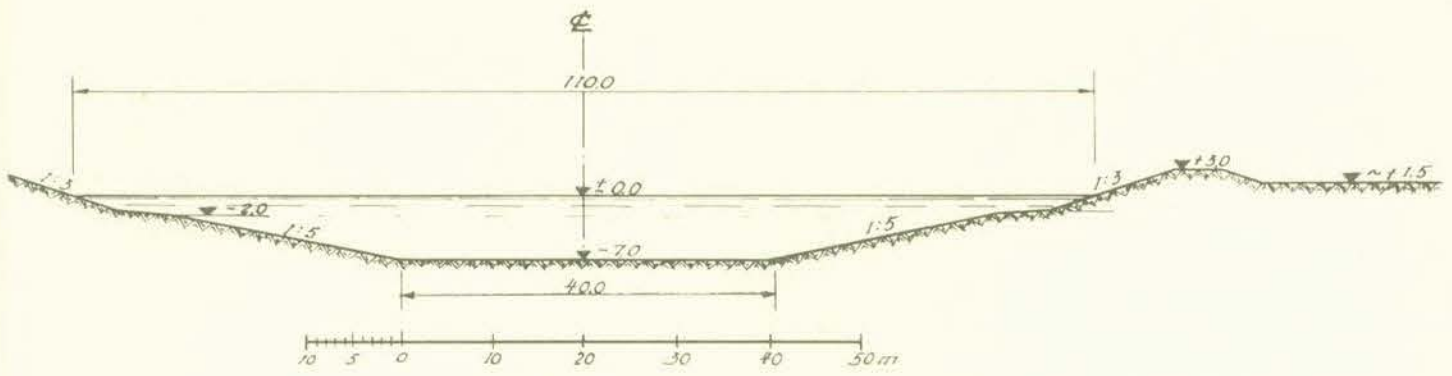


CORTE TRANSVERSAL EN MURO DE ENCAUZAMIENTO $\frac{A_1-A_1}{-}$
CROSS SECTION IN TRAINING WALL

Nota: Plano de referencia: mínima baja marea

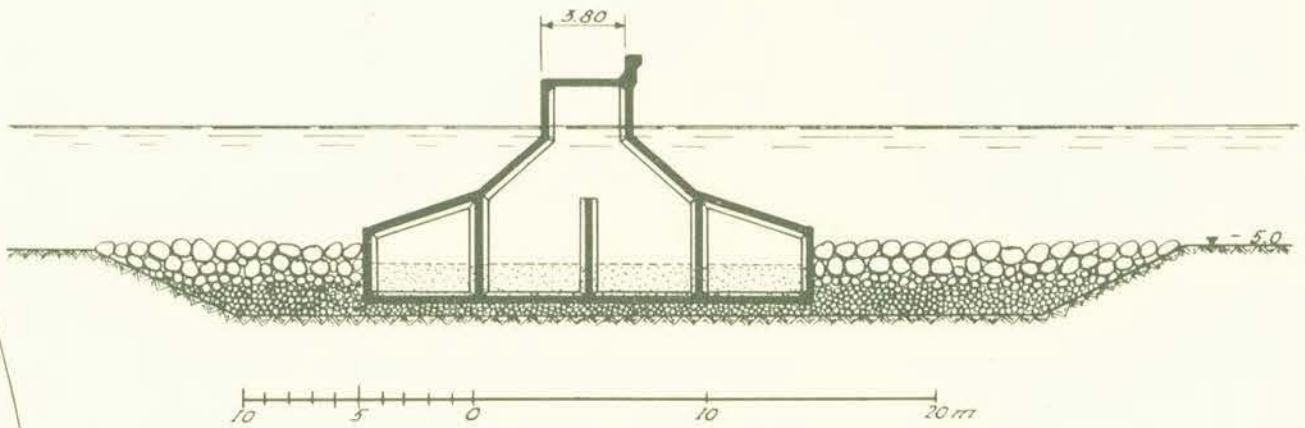
Note: Datum-plane is minimum low water level





Escala
Scale

CORTE TRANSVERSAL DEL CANAL A_1-A_1
CROSS SECTION IN CANAL

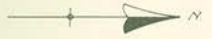
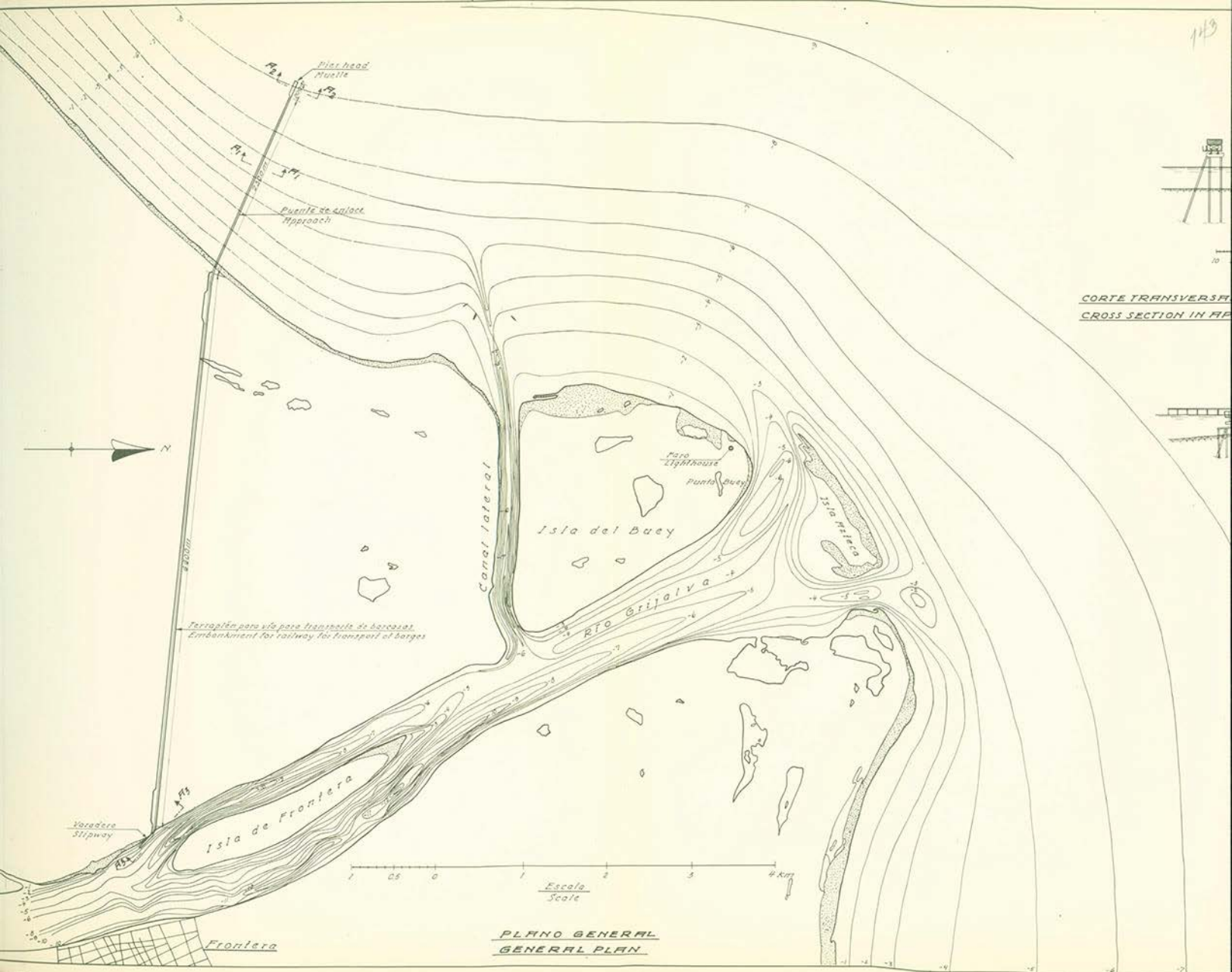


Escala
Scale

CORTE TRANSVERSAL TIPICO DEL ESPIGÓN A_2-A_2
TYPICAL CROSS SECTION IN JETTY

Nota: Plano de referencia: mínima bajo marea

Note: Datum plane is minimum low water level



400m

Terraplén para vía para transporte de bargeas
Embankment for railway for transport of barges

Isla de Frontera

Isla del Bucy

Faro Lighthouse
Punta Bucy

Isla Petisco

Rio Grijalva

Canal lateral

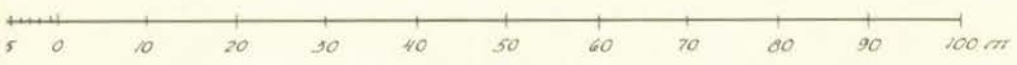
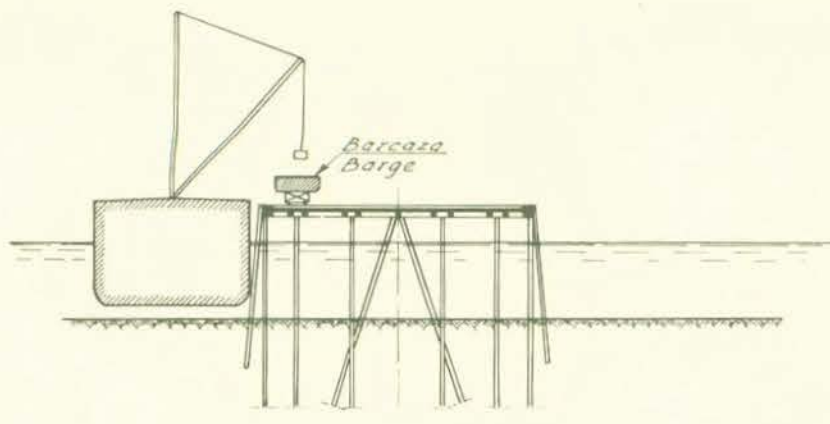
Varedera
Slipway

Frontera



PLANO GENERAL
GENERAL PLAN

CORTE TRANSVERSAL
CROSS SECTION IN P.P.



Escola
Scale

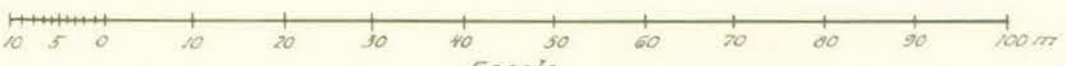
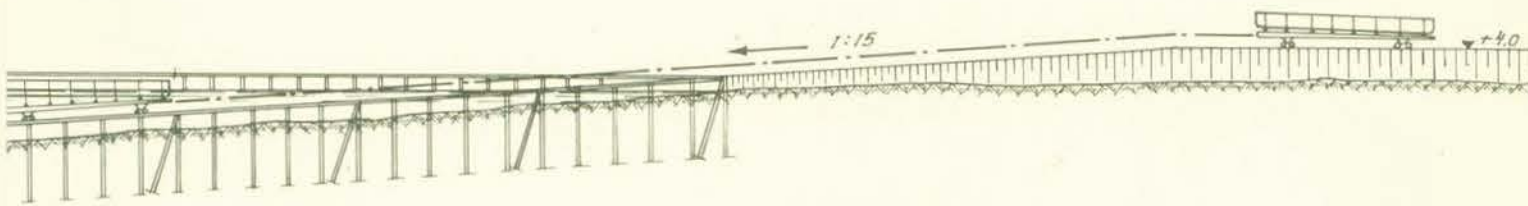
L DEL PUENTE

CORTE TRANSVERSAL DEL MUELLE

PROFCH A1-A1

CROSS SECTION, PIER HEAD

A2-A2



Escola
Scale

VARADERO PARA BARCAZAS, CORTE

A3-A3

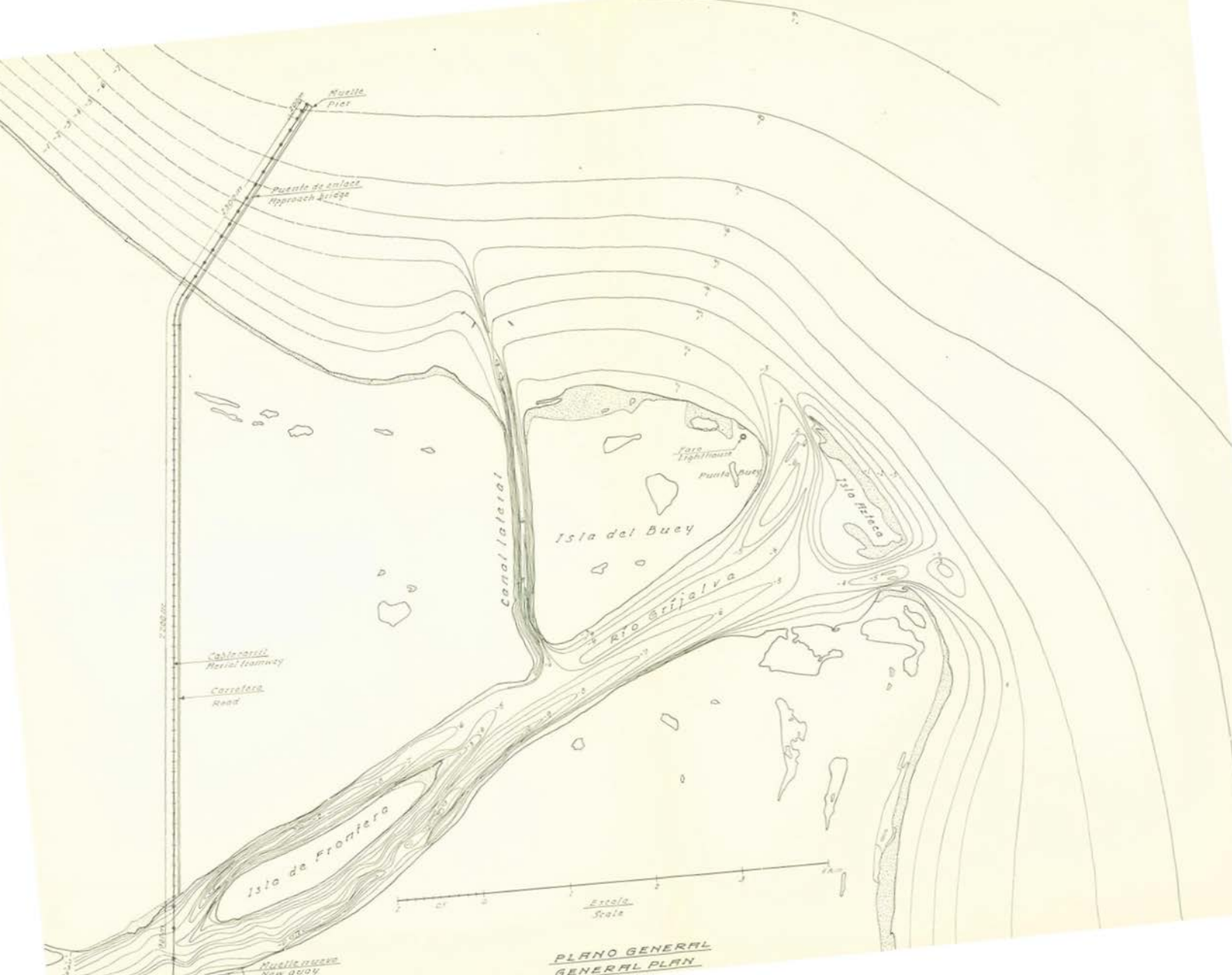
SLIPWAY FOR BARGES, SECTION

Nota: Plano de referencia: mínima baja marea

Nota: Datum plane is minimum low water level

MUELLE PARA TRANSPORTE DE BARCAZAS POR RIEL

PIER FOR THE TRANSPORT OF BARGES BY RAIL



Muelle
Pier

Puerto de anclas
Approach bridge

Canal lateral

Fare
Lighthouse

Puerto Buey

Isla del Buey

Isla de la Cruz

Rio Sijalva

Cableway
Marine tramway

Carretera
Road

Isla de Frontera

Escala
Scale

PLANO GENERAL
GENERAL PLAN

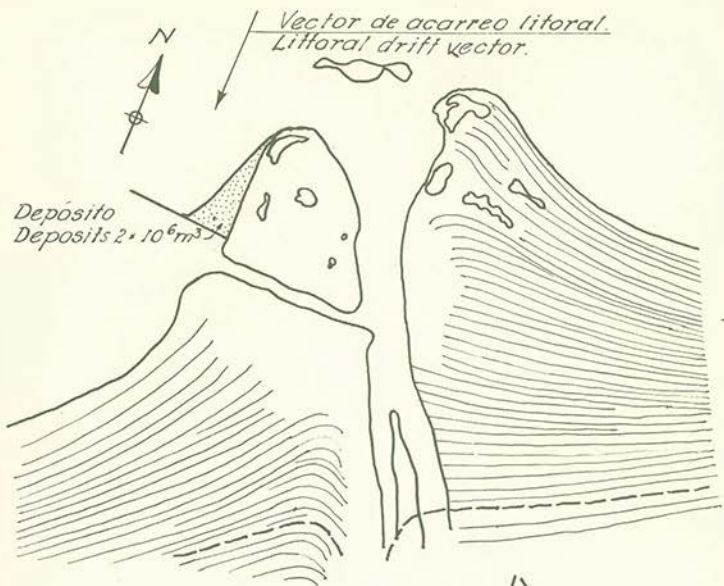
Muelle de anclas
Approach bridge



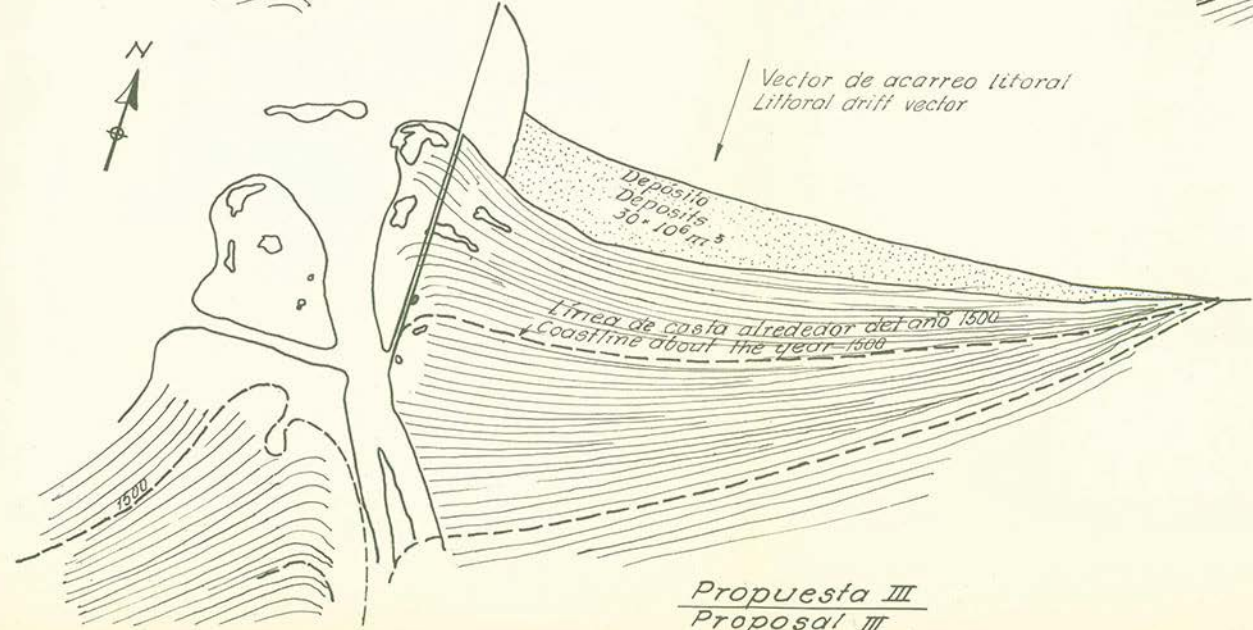
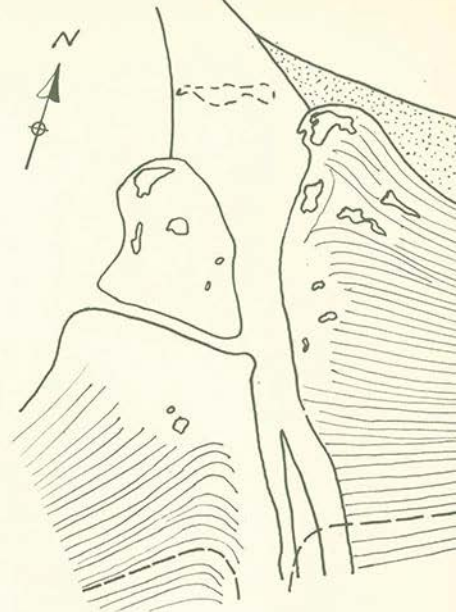
CABLECARRIL

AERIAL TRAMWAY

Lamina 84.
Plate



Propuesta I
Proposal I

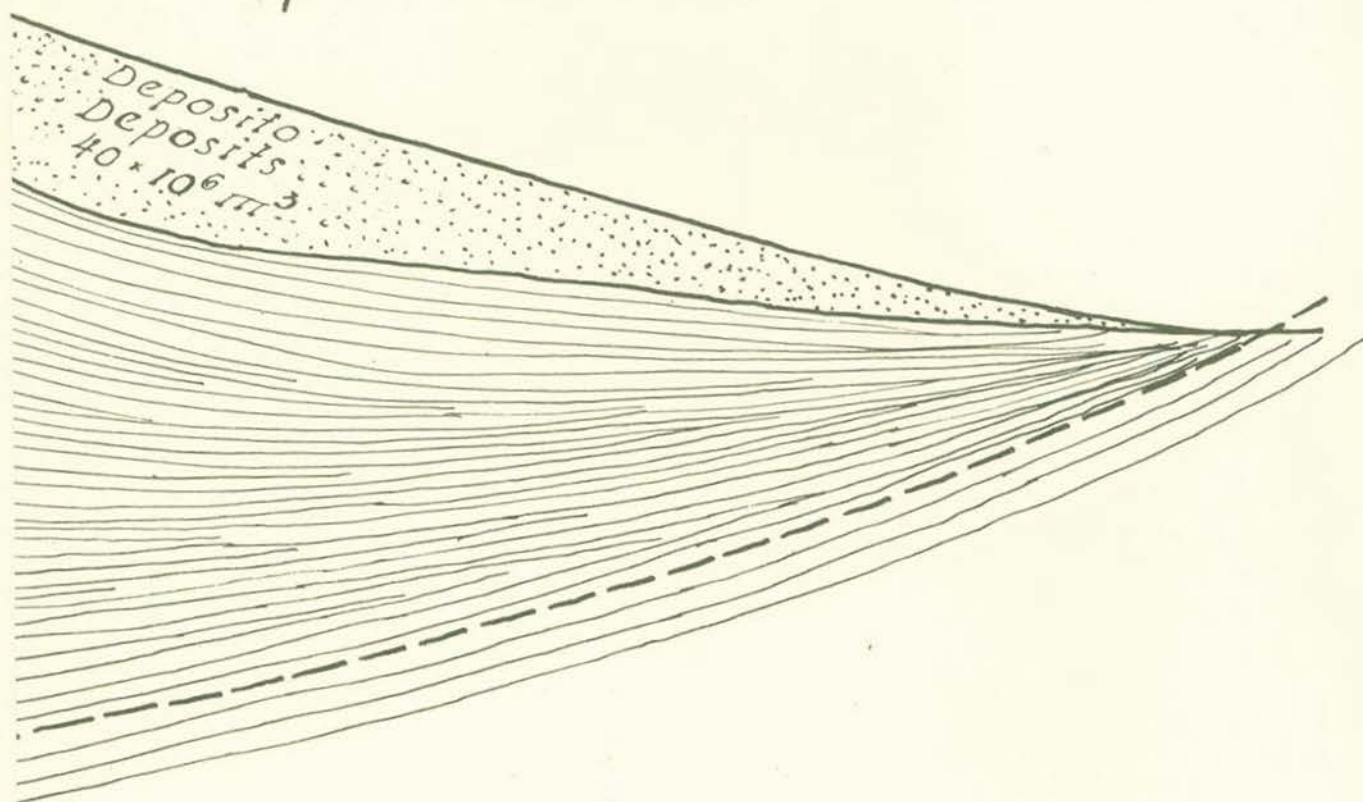


Propuesta III
Proposal III

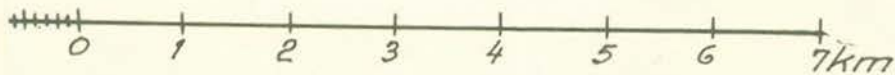
FORMA ESTIMADA
ESTIMATED

120

Vector de acarreo litoral.
Littoral drift vector.



Propuesta II
Proposal II



TADA DE LOS DEPÓSITOS DE LAS DIVERSAS PROPUESTAS.

SHAPE OF DEPOSITS BY VARIOUS PROPOSALS. Lámina
Plate 85.