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**FIMISTON MINERALS**

**Report of the Marine Geological  
Investigation  
of Macquarie Harbour**

**By**

**Robert H Goodwin Ph D**

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E.L. 37/70 - Macquarie Harbour  
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## Report of the Marine Geological Investigation of Macquarie Harbour

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## Introduction

This report is a summary of two months field investigation of Macquarie Harbour, Tasmania. The field work was carried out during December 1970 and January 1971 and included the following aspects:

1) Collection and preliminary assesment of bottom samples over the entire harbour. 2) A series of echo sounding profiles which would then be used to construct an accurate bathymetric chart. 3) Collection of water samples from selected areas for analysis. 4) Collection where possible of bottom samples from the offshore area outside of Macquarie Harbour and 5) Delineating the areas within the harbour with a reducing environment. An attempt was also made to delineate the source of sediments from the sediment colour but this was only partially successful.

Macquarie Harbour is located at longitude  $145^{\circ} 20'$  east and latitude  $42^{\circ} 20'$  south. It is approximately 20 miles long and 4 miles wide with an average depth of 100 feet. Tidal range is small, being 3 feet at ebb and 5 to 6 feet at neap.

The study was suggested by Sydney Geological and Geophysical Services Pty. Ltd. to Fimiston Minerals N.L. for several reasons: 1) The two major rivers flowing into Macquarie Harbour, the King and the Gordon, drain an extensive catchment area of unknown mineral potential. 2) The area is a predominantly rugged terrain with a high rainfall and rapid

erosion, 3) The residue from the Mount Lyall mining operation in Queenstown enters the harbour via the King River, 4) Several earlier samples from the harbour indicated high copper values.

Very little previous work has been done on Macquarie Harbour. The Admiralty Chart of the harbour (1622) consists mainly of soundings from a survey by G.W. Evans in 1822 with a small section being updated by the Royal Australian Navy in 1930. The harbour entrance was extensively surveyed in 1965 in a study sponsored by Pickands Mather and Company of Cleveland Ohio who also took a series of sounding runs over the harbour. To the author's knowledge there has been no work carried out on the bottom samples of the harbour.

There is no detailed geological map of the area surrounding Macquarie Harbour. The rocks range from Precambrian to Ordovician. Close to the harbour itself a series of clays, lignites, silts sands and conglomerates over 700 feet thick constitute the Macquarie Harbour Beds (Tertiary) which are well stratified, rather unconsolidated and lacustrine(?) in origin. The high incidence of rainfall and the semi-consolidated nature of these beds make them a major contributing feature of the Macquarie Harbour bottom sediments.

Rainfall in the area is controlled by topography - the greater the elevation, the higher the rainfall - so that rainfall increases with distance from the coastline. There are no rainfall records kept at Strahan so the figures given in Table 1 for Cape Sorell and Queenstown represent minimum and maximum values respectively for the catchment area. It can be seen from

TABLE 1 POINTS OF RAINFALL 1969

	Cape Sorell	Queenstown
JAN.	281.17	738.19
FEB.	661.13	848.16
MAR.	408.17	667.19
APR.	570.24	1034.24
MAY	514.19	801.23
JUNE	314.17	641.13
JULY	710.29	1159.28
AUG.	677.22	1062.20
SEPT.	669.24	1211.25
OCT.	185.11	359.17
NOV.	401.15	463.22
DEC.	652.18	925.29
TOTAL	6042.226	9958.249
NO. OF WET DAYS	226	249

Table 1 that the rainfall is rather evenly spread out over the year with July being the wettest month and October the dryest.

Sampling of bottom sediments was accomplished mainly with a small, but effective, dredge which collected between 6 and 10 pounds of sample. The dredge was washed thoroughly between the taking of each sample to prevent any contamination. Sampling stations were located by areal photographs and dead reckoning.

During echo sounding profile runs the boat was run between two known points and the tracks plotted with the aid of areal photographs. The echo sounder used was a Furuno, Type F 712 A, with a range of 0-100 Fathoms or 0-200 fathoms on a shallow and deep scale respectively. The boat steamed at a constant 1500 revolutions during sounding profiling which gave a speed of about 6 knots.

#### Bottom Samples:

Two Hundred and Forty Eight bottom samples were collected by dredging from Macquarie Harbour. The location of these samples is shown in Figure 1. The samples have been prefixed with the letters F, G or H. The sampling programme encompassed all areas of the harbour from the entrance to Birches Inlet. Spacing between samples is between  $\frac{1}{4}$  and  $\frac{1}{2}$  mile. During the latter stages of sampling when the vessel "Huon" was being utilized for dredging, accurate depths of each sample collected were obtained from the echo sounder and these are included with the description of the individual samples which follows:

## Description of Bottom Samples

- \* F1. Greyish black to black soft mud.
- F2. Greyish black to black soft mud.
- F3. Greyish black to brownish black mud.
- F4. Dark brown, medium to fine sand.
- F5. Dark brown, fine grained, sand.
- F6. Rock bottom.
- F6A. Dark brown, fine sand.
- F7. Dark brown, fine to medium, sand.
- F8. Fine grained, light to medium grey, mud.
- F9. Fine grained, light to medium grey, mud. Sample contains leaves and twigs - deep water 130' - 140'.
- F10. Dark brown, soft mud, contains a coarse fraction which gives sample a "gritty" feel. The coarse fraction made up of angular pebbles of shale and mudstone with black concretionary build up on the pebbles.
- F11. Extremely fine, light to medium grey, mud, no coarse fraction.
- F12. Dark grey, soft, mud.
- F13. Dark grey to dark brown, soft mud.
- F14. Very fine grained, dark grained, mud. Very strong odour of hydrogen sulphide. Depth about 120'.
- F15. Dark grey to brown, soft, mud. No hydrogen sulphide odour, very fine grained.

\* Samples F1 and F2 collected by means of a gravity corer - all others with a small dredge.

- F16. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F17. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F18. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F19. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F20. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F21. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F22. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F23. Dark grey to brown, very fine grained, soft mud. Very high odour of hydrogen sulphide.
- F24. Dark brownish-grey, very fine grained, soft mud. Sample contains some twigs and decayed plant material. Very strong odour of hydrogen sulphide.
- F25. Dark greyish-brown, very fine grained, soft mud. Very strong odour of hydrogen sulphide.
- F26. Dark grey, very fine grained, soft mud. Very strong odour of hydrogen sulphide. Sample contains numerous gum leaves, very little decayed.
- F27. Dark brown, very fine grained, soft mud. Very little odour of hydrogen sulphide. Sample at the mouth of the Gordon River.

- F28. Dark brown, very fine grained, soft mud. Very little odour of hydrogen sulphide. Sample contains much decayed and semi-decayed twigs and plant debris.
- F29. Dark brown, very fine grained, soft mud. Very little odour of hydrogen sulphide.
- F30. Dark brown, very fine grained, soft mud. Sample contains some black decayed plant material however there is little odour of hydrogen sulphide.
- F31. Dark brown, very fine grained, soft mud. Very little odour of hydrogen sulphide.
- F32. Dark brown, fine to medium grained, sand. Sample contains live worms.
- F33. Dark brown, very fine grained, soft, mud. Very little odour of hydrogen sulphide.
- F34. Dark brownish-black, very fine grained, soft, mud. A very strong odour of hydrogen sulphide.
- F35. Dark brown to black, very fine grained, soft, mud. A very strong odour of hydrogen sulphide. The black particles in this sample may be heavy minerals.
- F36. Dark brownish-black, very fine grained, soft, mud. A very strong odour of hydrogen sulphide.
- F37. Dark brown, very fine grained, soft, mud. A very strong odour of hydrogen sulphide.
- F38. Dark brown, very fine grained, soft, mud with fine black streaks throughout. A very strong odour of hydrogen sulphide. Sample contains numerous twig fragments.
- F39. Dark brown, very fine grained, soft, mud. A very strong odour of hydrogen sulphide. Sample contains a high concentration of plant fragments in

various stages of decay and one highly decayed shell.

- F40. Dark brown, very fine grained, soft, mud, containing minor amounts of black fines (heavy minerals?) and minor amounts of decayed plant material. A very strong odour of hydrogen sulphide.
- F41. Medium brown, very fine grained, soft, mud. A very strong odour of hydrogen sulphide. On shore from this sample station is a brown sand beach and a small bar from the point.
- F42. Medium brown, very fine grained, soft, mud. A strong odour of hydrogen sulphide. Sample contains several small (1" - 1 $\frac{1}{4}$ ") elongate shells (mussels?)
- F43. Dark brown, very fine grained, soft, mud. A very strong odour of hydrogen sulphide. Sample contains some decayed plant debris.
- F44. Dark to medium dark brown, very fine grained, soft, mud. A strong odour of hydrogen sulphide. Sample contains a high concentration of twigs and other plant debris including some grass.
- F45. Binodal sample - greyish-brown, soft, mud and white to light brown sand, sub-angular quartz grains - medium to coarse grained. No odour of hydrogen sulphide. This sample was taken in the river some 200 yards upstream of the mouth.
- F46. Dark brown, very fine grained, soft, mud. Some coarse quartz grains giving sample a "gritty" feel. A high concentration of plant debris, mainly twigs.
- F47. Dark brown, very fine grained, soft, mud. No coarse fraction. A high concentration of plant debris including twigs, leaves, and bits of wood.
- F48. Dark brown, very fine grained, soft, mud. Sample contains no plant fragments and has only a slight odour of hydrogen sulphide.

- F49. Dark brown, very fine grained, soft, mud. Sample contains minor amounts of wood fragments and some grass with only a slight odour of hydrogen sulphide.
- F50. Medium to dark brown, very fine grained, soft, mud. A slight odour of hydrogen sulphide. Twigs, leaves and other plant debris comprise close to 50 percent of the sample.
- F51. Dark grey, very fine grained, soft, mud. A strong odour of hydrogen sulphide.
- F52. Dark brown, very fine grained, soft, mud, containing minor amounts of black fines in streaks throughout sample. A slight odour of hydrogen sulphide.
- F53. Dark grey to brown, fine grained, mud. Sample contains minor plant debris, mainly grasses. A slight odour of hydrogen sulphide.
- F54. Dark grey, fine grained, soft, mud containing minor amounts of black fines and minor plant debris-mainly grasses. A slight odour of hydrogen sulphide.
- F55. Dark grey, fine grained, soft, mud. A slight odour of hydrogen sulphide.
- F56. Dark brownish-grey, fine grained, soft, mud. A slight odour of hydrogen sulphide. Onshore rock out crops to the water's edge.
- F57. Dark brownish-grey, fine grained, soft, mud. A slight odour of hydrogen sulphide.
- F58. Dark grey, fine grained, soft, mud. A slight odour of hydrogen sulphide. Sample contains minor plant debris.
- F59. Dark greyish-brown, fine grained, soft, mud, containing very minor amounts of shell debris in small pieces. A very strong odour of hydrogen sulphide.
- F60. Dark greyish-brown, fine grained, soft, mud. A slight odour of hydrogen sulphide.

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- F61. Dark grey, fine grained, soft, mud, containing minor plant debris - mainly twigs. A strong odour of hydrogen sulphide.
- F62. Dark brownish-grey, fine grained, soft, mud, containing some minor plant debris. A strong odour of hydrogen sulphide.
- F63. Dark brownish-grey, fine grained, soft, mud, containing some minor plant fragments and one live worm. A strong odour of hydrogen sulphide.
- F64. No sample.
- F65. Dark grey and dark brown, fine grained, soft, mud. A slight odour of hydrogen sulphide.
- F66. Dark brown, fine to medium, sand. Appears to be well sorted. No odour of hydrogen sulphide.
- F67. Bimodal sample - dark brown fine to medium well sorted sand plus white stiff clay. Sample probably reflects a thin layer of sand covering partially indurated clay.
- F68. Dark greyish-brown sandy mud with no H<sub>2</sub>S odour.
- F69. Dark grey, fine grained, soft, mud- no sand fraction. Fine pyrite quite abundant to the naked eye.
- F70. Dark grey, fine grained, soft, mud.
- F71. Dark grey, fine grained, soft, mud, containing minor fine black streaks.
- F72. Dark greyish brown muddy clay - medium stiff indicating partial induration.
- F73. Dark greyish brown muddy clay - partially indurated.
- F74. Dark brown muddy clay.
- F75. Coarse grey gravel (shale pebbles) angular in a brown clay matrix. Angular pebbles comprise majority of sample.

- F76. Dark grey, fine grained, soft, mud.
- F77. Dark grey, fine grained, soft, mud containing minor fine black streaks.
- F78. Dark brown, fine grained, soft, mud containing minor fine black streaks.
- F79. Dark brown, fine grained, soft, mud containing minor fine black streaks and a relatively high concentration of fine shiny pyrite.
- F80. Dark brown, fine grained, soft, mud containing minor fine black streaks and minor flecks of pyrite.
- F81. Medium to dark brown, fine grained, soft mud with minor fine black streaks and minor pyrite flecks.
- F82. Dark greyish-brown, fine grained, soft, mud with a very minor sand fraction - no pyrite apparent.
- F83. Dark brown, medium grained, sand with a high quartz content.
- F84. Close inshore near abandoned jetty - very thin layer of muddy sand on top of rock. Sample again 75 yds. further offshore.  
Dark brown, fine to medium, sand with large angular quartz pebbles throughout.
- F85. Dark greyish-brown, fine grained, soft, mud with minor fine black streaks.
- F86. Dark greyish-brown, fine grained, soft, mud with minor fine black streaks.
- F87. Greyish-brown, fine grained, soft, mud with some fine black streaks and no odour of hydrogen sulphide. Sample lost overboard in heavy seas.
- F88. Dark grey to brown, fine grained, soft, mud containing minor plant fragments. A small amount of sample collected.
- F89. Medium to dark brown, fine grained, soft, mud with some minor fine black streaks.
- F90. Dark grey, fine grained, soft, mud with some minor fine black streaks.

- F91. Dark grey to black, fine grained, soft, mud.
- F92. Dark grey to black, fine grained, soft, mud.
- F93. Dark greyish-brown, fine grained, soft, mud with minor fine black streaks.
- F94. Dark brownish grey, fine grained, soft, mud with some minor fine black streaks.
- F95. Dark greyish-brown to black, sandy, mud, containing large pebble fragments up to  $\frac{1}{8}$ " diameter.
- F96. Dark grey to black, fine grained, soft, mud.
- F97. Dark brown, fine grained, soft, mud with some minor fine black streaks.
- F98. Light brown, fine grained, sand containing some shell debris.
- F99. Dark greyish brown sandy mud containing some decayed plant debris.
  
- G1. Light brown, fine grained, quartz sand with minor plant debris.
- G2. Dark greyish-brown, fine grained, soft, mud, with minor fine black streaks. Sample has a very minor sand fraction.
- G3. Dark greyish-brown to black, fine grained, soft, mud with a very minor sand fraction and some shell debris.
- G4. Dark grey, fine grained, soft, mud.
- G5. Dark grey, fine grained, soft, mud.
- G6. Dark grey, fine grained, soft, mud.
- G7. Dark grey, fine grained, soft, mud. Only a small sample.
- G8. Dark grey, fine grained, soft, mud.
- G9. Dark grey, fine grained, soft, mud.
- G10. Dark grey to black, fine grained, soft, mud with a very minor sand fraction.
- G11. Dark greyish-brown sandy mud.

- 030
- G12. Dark greyish brown, fine grained, soft, mud.
- G13. Dark brownish-grey, fine grained, soft mud, with some minor fine black streaks.
- G14. White to light brown, fine grained, sand.
- G15. Dark brownish-grey sandy mud.
- G16. Dark greyish-brown, soft, sandy mud.
- G17. Dark grey to slightly brown, fine grained, soft, mud with a very minor sand fraction.
- G18. Dark grey to brown, fine grained, soft, mud with no sand fraction.
- G19. Dark brown, coarse grained, sand over rock. A small sample.
- G20. Black coated, hard, concretionary, cobbles.
- G21. Medium grey, fine grained, soft, mud.
- G22. Medium grey to light brown, fine grained, soft, mud.
- G23. Dark grey, fine grained, soft, mud.
- G24. Dark grey, fine grained, soft, mud, with some fine brown streaks.
- G25. Dark brown, fine to medium grained, sand with minor fine black streaks.
- G26. Dark blackish-brown sandy mud containing some twigs and other plant debris.
- G27. Dark greyish-black to medium brown, fine grained, soft, mud with a very minor sand fraction. Jus inside the point a rock bottom. Collected a highly weathered quartzite pebble.
- G28. Dark greyish-black to medium brown, fine grained, soft, mud with a very minor sand fraction.
- G29. A surface layer (thin) of dark brown, fine grained, soft, mud and below this a dark grey to black fine grained, soft, mud.
- G30. Black carbonaceous, soft, fine grained, mud.

- 031  
G31. Black carbonaceous, soft, fine grained, mud with a very minor sand fraction - off surrounding dunes?
- G32. Dark grey, soft, mud.
- G33. Dark grey, very soft, mud, with some minor brown streaks.
- G34. Dark greyish-brown, soft, mud, containing visible pyrite.
- G35. Dark brownish-grey, soft, mud, minor sand fraction.
- G36. Dark brownish-grey, soft, mud, fine pyrite visible to naked eye. Depth 5 fathoms (30 feet).
- G37. Dark brownish-grey, soft, mud. Has a gritty appearance caused by small mud balls within mud. Depth 20 fathoms.
- G38. Dark brownish-grey, soft, mud with similar appearance to previous sample. Depth 25 fathoms.
- G39. Dark brownish-grey, soft, mud with similar appearance as G37. Depth 21 fathoms.
- G40. Dark brownish-grey, soft, mud. Depth 14 fathoms.
- G41. Dark brownish-grey, soft, mud, containing pyrite? Depth  $9\frac{1}{2}$  fathoms.
- G42. Brownish-grey, soft, mud with a very minor sand fraction. Depth 8 fathoms.
- G43. Dark brown sandy, mud. Depth 6 fathoms.
- G44. Dark greyish-brown, soft, mud. Depth  $10\frac{1}{2}$  fathoms.
- G45. Dark greyish-brown, soft, mud. Sample contains visible pyrite, minor decayed plant material one living mussel shell about 1" diameter. Depth  $10\frac{1}{2}$  fathoms.
- G46. Brownish-grey, soft, mud with visible pyrite. Depth  $12\frac{1}{2}$  fathoms.

- 032
- G47. Greyish-brown, soft, mud with minor plant debris and visible pyrite.  
Depth 20 fathoms.
- G48. Dark brown, soft, mud with fine black streaks and visible pyrite.  
Depth 18 fathoms.
- G49. Soft, greyish-brown mud with visible pyrite. Depth  $9\frac{1}{2}$  fathoms.
- G50. Dark brown medium to coarse-grained sand, containing pebbles of varying composition up to  $\frac{1}{2}$ " diameter. Depth 3 fathoms.
- G51. Dark brown medium to coarse-grained sand. Depth  $2\frac{1}{2}$  fathoms.
- G52. Dark brown, soft, mud. Again has sandy/gritty appearance but is all mud. Depth 14 fathoms.
- G53. Greyish-brown, soft, mud with visible pyrite. Depth 25 fathoms.
- G54. Dark brown, soft, mud with a few flecks of pyrite. Depth 23 fathoms.
- G55. Dark brown sandy mud. Depth 12 fathoms.
- G56. Greyish-brown, soft, mud. Depth 10 fathoms.
- G57. Dark brown, soft, mud. Depth  $7\frac{1}{2}$  fathoms.
- G58. Dark brown sandy mud. Depth  $5\frac{1}{2}$  fathoms.
- G59. Dark brown, soft, mud. Depth 11 fathoms.
- G60. Dark brown, soft, mud with fine black streaks. Depth 14 fathoms.
- G61. Dark brown to black, sandy mud. Depth 18 fathoms.
- G62. Dark brown to black, soft, mud. Depth 10 fathoms.
- G63. Dark brown fine to medium grained sand. Depth  $2\frac{1}{2}$  fathoms.
- G64. Dark brown fine to medium grained sand. Depth  $2\frac{1}{2}$  fathoms.
- G65. Dark brownish-grey, soft, mud. Depth 7 fathoms.
- G66. Dark greyish-brown soft, mud with visible pyrite flecks - very fine.  
Depth  $18\frac{1}{2}$  fathoms.
- G67. Dark greyish-brown, soft, mud. Depth 21 fathoms.

- G68. Greyish-brown to black soft mud. Depth 22 fathoms.
- G69. Dark greyish-brown, sandy mud. Depth 12 fathoms.
- G70. Greyish-brown, soft, mud containing a few shell fragments. Depth 13 fathoms.
- G71. Muddy sand plus large shell incrustated piece of sandstone on top of stiff grey clay. Depth 7 fathoms.
- G72. Brown medium grained sand. Depth 4 fathoms.
- G73. Dark greyish-brown soft mud with a very minor sand fraction. Depth 7 fathoms.
- G74. Dark greyish-brown, soft, mud. Depth  $9\frac{1}{2}$  fathoms.
- G75. Dark greyish-brown soft, mud. Depth 13 fathoms.
- G76. Greyish-brown, soft, mud, containing abundant plant fragments of leaves and twigs. Depth  $7\frac{1}{2}$  fathoms.
- G77. Greyish-brown, soft, mud. Depth 25 fathoms.
- G78. Dark brown-grey sandy mud. Depth 10 fathoms.
- G79. Dark grey to black, soft, mud with minor pyrite? Depth 11 fathoms.
- G80. Dark brown, muddy sand, with minor amounts of shell debris and plant debris. Depth  $7\frac{1}{2}$  fathoms.
- G81. Dark brown, soft, mud, with minor fine pyrite? Depth 5 fathoms.
- G82. Dark brown, fine grained, sand, with a few shells and a flat sandstone - silt stone rock with coral growth on outside. Depth 3 fathoms.
- G83. Dark brown, sandy mud. Depth 8 fathoms.
- G84. Dark brown to grey, soft, mud. Depth  $14\frac{1}{2}$  fathoms.
- G85. Dark brown, slightly muddy, fine grained sand. Depth 12 fathoms.

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- G86. Medium brown, fine grained sand with an abundant shell fraction.  
Depth  $2\frac{1}{2}$  fathoms.
- G87. Light grey to brown, fine grained, sand. Depth 2 fathoms.
- G88. Light grey to light brown fine grained sand. Depth  $12\frac{1}{2}$  fathoms.
- G89. Light grey to light brown fine grained sand. Depth  $12\frac{1}{2}$  fathoms.
- G90. Light grey to light brown fine to medium grained sand. Depth 12 fathoms.
- G91. Light grey to light brown fine grained sand. Depth  $10\frac{1}{2}$  fathoms.
- G92. Light grey to brown, fine grained, sand. Depth  $7\frac{1}{2}$  fathoms.
- G93. Light grey to brown, fine grained, sand. Depth  $2\frac{1}{2}$  fathoms.
- G94. Brown, coarse grained, shelly sand. Depth 13 fathoms.
- G95. Light brown, fine grained, sand, containing a few shells. Depth 12 fathoms.
- G96. Light brown, fine grained, sand, containing a few shell fragments.  
Depth 2 fathoms.
- G97. Light brown, fine grained, sand containing a few shell fragments. Depth  $3\frac{1}{2}$  fathoms.
- G98. Light brown, fine grained, sand, with a high shell (whole + debris) content. Depth  $2\frac{1}{2}$  fathoms.
- G99. Light brown, fine grained, sand, with a high shell content. Depth 2 fathoms.
  
- H1. Dark brown, soft, mud. A slight odour of hydrogen sulphide.
- H2. Dark brown, soft, mud containing live worms. A slight odour of hydrogen sulphide.
- H3. Dark brown, muddy sand, predominantly fine grained but with a few coarse grains.

- H4. Very dark brown to black, soft, mud. Sample has visible fine pyrite and a strong odour of hydrogen sulphide.
- H5. Dark brownish-grey, soft, mud. Sample contains minor amounts of visible pyrite and has a weak odour of hydrogen sulphide.
- H6. Dark brownish-grey, soft, mud. Sample contains minor amounts of visible pyrite and has a weak odour of hydrogen sulphide.
- H7. Dark brownish-grey, soft, mud, minor visible pyrite and a strong odour of hydrogen sulphide.
- H8. Dark brown, fine to medium grained, sand. Landward of this sample station is a rocky bottom.
- H9. Dark greyish-brown, soft, mud, containing visible pyrite.
- H10. Soft, dark brown, mud, with a very minor sand fraction. Sample contains some shell debris.
- H11. Light brown, fine grained, sand, with a high shell content. Depth 3 fathoms.
- H12. Light brown, fine grained, sand, with only a few shells. Depth  $4\frac{1}{2}$  fathoms.
- H13. Light brown, fine grained, sand. Depth  $3\frac{1}{2}$  fathoms.
- H14. Dark brown to black, sandy mud. Sample contains a minor shell fraction and a small amount of plant debris. Depth 5 fathoms.
- H15. Dark greyish-brown, soft, mud. Depth 18 fathoms.
- H16. Greyish-brown sandy, mud, containing a few plant fragments. Depth 14 fathoms.
- H17. Dark greyish-brown, soft, mud, Depth 28 fathoms.
- H18. Dark greyish-brown, soft, mud. Depth 25 fathoms.
- H19. Dark blackish-brown, soft, mud containing visible pyrite flecks, very fine. Depth 8 fathoms.

- H20. Dark blackish-brown, soft, mud containing very fine visible pyrite.  
Depth 15 fathoms.
- H21. Dark brown, fine grained, sand.
- H22. Dark brown to black, soft mud containing very fine visible pyrite.
- H23. Dark greyish-brown, soft, mud with minor black streaks. Depth 18 fathoms.
- H24. Dark brown, soft, mud, with some black streaks and minor visible pyrite.  
Depth  $22\frac{1}{2}$  fathoms.
- H25. Dark brown, soft, mud, with some black streaks and minor visible pyrite.  
Depth  $17\frac{1}{2}$  fathoms.
- H26. Dark brown, soft, mud, with some black streaks and minor visible pyrite.  
Depth 4 fathoms.
- H27. Bi-modal sample of mud and sand - mud is a light brown colour and very soft. Sand is a very coarse grey to black sand or gravel. Depth 2 fathoms.
- H28. Dark brown soft, mud, containing some twigs. Depth 2 fathoms.
- H29A. Rock bottom.
- H29. Greyish brown, soft, mud, with a high pyrite content. Depth  $4\frac{1}{2}$  fathoms.
- H30. Soft, grey, mud with a high pyritic content. Depth 18 fathoms.
- H31. Soft greyish-brown, mud with a high pyrite content. Depth 18 fathoms.
- H32. Soft, greyish-brown, mud containing a few leaves and having a high content of pyrite. Depth 17 fathoms.
- H33. Medium brown, soft, mud with minor black streaks and a high pyritic content. Depth 4 fathoms.
- H34. Medium brown, soft, mud with minor black streaks and a high pyritic content. Depth  $16\frac{1}{2}$  fathoms.
- H35. Soft, grey, mud with some black streaks and a very high pyritic content.

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Depth 16 fathoms. In this sample it appears that the black streaks are caused by a layer of decayed plant material.

- H36. Soft, light grey, mud with a very high pyritic content, plus a stiff mud/clay layer similar to soft mud above. Depth 5 fathoms.
- H37. Light grey, muddy sand, with a very high pyritic content. This sample probably represents a thin mud layer over a basically sandy bottom. Depth 4 fathoms.
- H38. Soft, grey, mud with a very high pyritic content. Depth  $12\frac{1}{2}$  fathoms.
- H39. Soft, grey, mud with a very high pyritic content. Depth  $20\frac{1}{2}$  fathoms.
- H40. Brown, soft, mud. Depth 2 fathoms.
- H41. Soft, grey, mud with a very high pyritic content.
- H42. Soft, grey, mud with a very high pyritic content.
- H43. Soft, grey, mud, a very high pyritic content and a few fine brown streaks.
- H44. Soft, brown, mud with a high pyritic content, containing leaves and other plant fragments.
- H45. Greyish-brown, soft, mud with a high pyritic content.
- H46. Brown, soft, mud, with minor visible pyrite.
- H47. Soft brown, mud containing leaves and twigs and minor amounts of visible pyrite.
- H48. Soft, brownish-grey, mud with minor pyrite and minor plant fragments.

From these samples a map showing the bottom sediment distribution has been prepared (Figure 2). The majority of the sediments are a fine grained soft, mud of variable colour. No attempt was made to distinguish percentages or to specify between silt and clay. There is an extensive narrow band of

sand running along the northern shore of the harbour from Farm Cove to Sophia Point and a corresponding band of sandy mud on the southern shore.

The harbour entrance is entirely a fine grained clean sand. In some samples, notably G-94, situated at the "Hell's Gates" in a large depression, a high shell content is included in the sand. This occurs in the channel samples, G-98, G-99, H-11 and H-12 as well and probably represents in all cases a lag deposit in an area of very strong currents. The sand extends in from the harbour entrance as far as Neck Island at the mouth of the Swan Basin. The samples nearest Neck Island, H-21, G-25 and G-26 are a very dark brown to blackish sand in contrast to the rest of the sand which is very light grey to light brown in colour. This may represent a different source area for the sand or it may reflect a difference in bottom conditions. All the sand is very fine grained in this band. It appears from the similar nature of the sand outside the harbour (Samples G-88, G-89, G-90, G-91, G-92 and G-93) along the ocean beach and in the channel that the sand is derived from outside of the study area and is transported south along the coast by means of longshore drift to be deposited at the mouth of Macquarie Harbour and partially within the harbour as shown on Figure 2. It is likely that much of the transported sand by-passes Macquarie Harbour and continues along the coast but the extensive shallowness out from the entrance to the harbour and the uniformity of the sediments suggests that a proportion of this transported sand is deposited near the harbour entrance.

The area near Asbestos Point dotted on Figure 2 and containing samples F-72, F-73 and F-74 is designated as clay. This medium stiff grey clay probably represents a "basement". It has been argued in the literature that

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a stiff or partially indurated clay represents a period of subareal erosion. If we accept this argument this stiff clay represents a period of sea level low prior to the deposition of the soft muds which constitute the large proportion of the bottom samples. The similarity of the bottom sample muds to the unconsolidated or semi unconsolidated Tertiary sediments of the Macquarie Beds, which in many places form the foreshores of the harbour, plus the incidence of pyrite flecks in the mud samples (usually visible to the naked eye) and the corresponding pyrite in the Macquarie Beds, strongly suggests that the bottom muds are derived from these Tertiary sediments. The stiff clay, therefore, probably represents a pre-Tertiary sea level low and examination of the clays in these three samples for foraminifera could be valuable in dating the sea level stand and approximating a beginning date at least for present day sedimentation in Macquarie Harbour. It is interesting to note from comparison of the sediment distribution map (Figure 2) and the bathymetric contour map (Figure 6) that the sand areas all correspond to shallow depths and the mud areas to deep water while sandy muds and muddy sands are found in intermediate depths. The change from sand to mud is a rapid one and only in the top end of the entrance channel where a relatively large amount of sand is being introduced to the system is there a gradational change.

Gravels are quite rare in the bottom sediments. Some of the areas designated on the sediment distribution map (Figure 2) as gravels are a bit misleading as in some areas, such as the one near Coal Head, the sediment is comprised of large cobbles or boulders and could possibly be designated for

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practical purposes as a rock bottom.

An attempt was made to delineate the extent of various sediment sources, such as the King and Gordon rivers, through the sediment colour (Figure 3). This attempt was relatively unsuccessful except in the area of the King River mouth where the extent of sedimentation in a northerly direction (towards Strahan) can be delineated. The King River sediments are a light grey colour and the extent of sedimentation extends well beyond the mouth (which is not included in the present lease). From the present situation of leases the best prospect for the company appears to be Lettes Bay which has been completely filled with King River sediments. Therefore bottom samples H-41, H-42 and H-43 should be given special attention as any mineral values in the King River sediments should exist in Lettes Bay where there is a large area of sedimentation.

The masking of the sediment colour is mainly caused by decayed plant material, both twigs and leaves. This gives a black colour to the sediments, usually occurring in streaks throughout the sediment and the various mixing of colours makes delineating the source areas tenuous. The sediment from the Gordon River is apparently fine grained, although sand shoals occur at the mouth, but the sediment colour is not distinctive in the bottom sediments.

The second feature shown on Figure 3 is the content of hydrogen sulphide in the sediments. This is confined to the eastern end of the area and reflects quiet bottom conditions and a reducing environment. The implication from this map is that the Gordon River water flows along the southern shore of the harbour and a similar situation exists in Birches Inlet where the river water flowing into the inlet apparently flows along the southern shore.

West of the entrance to Farm Cove there is no hydrogen sulphide content in the sediments. The shallow periphery of Farm Cove produces an odour of hydrogen sulphide in the sediments.

## Bathymetry

In order to ascertain the bathymetry of Macquarie Harbour, one hundred and twenty eight sounding traverses were run using the M.V. HUON equipped with a Furuno, Type F 712A echo sounder. The sounding traverses (Figure 4) were mainly run across the width of the harbour to facilitate positioning and navigation. The soundings cover the entire harbour and three traverses include the narrow entrance channel. This area near the entrance was mapped in detail by Pickands, Mather and Company in 1965 and so was not dealt with to any extent in the present study.

From these traverses a series of soundings were obtained and these are plotted on Figure 5. The readings are given in fathoms (1 fathom = 6 feet) and are uncorrected, which means that they have not been reduced to a datum level (usually Indian Spring Low). The very low tidal range of the harbour means that the difference between the corrected and uncorrected soundings would be less than 3 feet and such correction seems unnecessary in a project of the nature of the present one.

The profiles indicate Macquarie Harbour to be relatively deep. The maximum depth is 30 fathoms (180 feet) some 5 fathoms deeper than any previous soundings. The slope of the bottom configuration is steep and generally falls away very rapidly from the shoreline. In many places during the sounding profiling the boat was able to come within 10 yards of the shore and still be in 2 to 5 fathoms of water. The soundings on Figure 5 have been plotted along the actual traverse lines so that Figures 4 and 5 can be overlain. A series of photographs were taken of selected traverses and these appear in the Plates section at the back of this report. These cross-sections show

clearly the nature of the bottom profiles. The ones from Birches Inlet, F - G, H - I, and J - K strongly suggest a graben feature, suggested in the literature. In the actual harbour profiles the possibility of a graben is not so clearly defined but most of the profiles (example L-M) do indicate a channel on either side of the harbour with a "high" area in the center. The channel on the southern side of the harbour is more pronounced and generally larger than the one on the northern side suggesting that this is the ancient course of the Gordon River. The central "high" is more pronounced in the eastern end of the harbour than the western end (compare profile C-D and L-M). The profiles in the northern corner of the harbour, towards Strahen, such as P-Q indicate the continuation of the bottom character. The profiles drop very quickly on either side to a relatively flat depression at about 20 fathoms.

The equipment used for the echo sounding did not give sufficient penetration, except in a few places, to determine the thickness of sediment. In the depressions, filled with soft mud there was often 5-6 fathoms of penetration so that there would be at least 30 feet of sediment in these areas. The nature of the bottom profiles plus the occurrence of the "basement" clays mentioned earlier, suggests that the thickness of sediment near the shoreline and on the slopes is not great - perhaps of the order of 10 feet while at the base of the slopes in deeper water the thicknesses are considerably greater.

Some of the profiles (example N-O) show a very jagged slope which appears on the profile to be a rock bottom, but dredging in these areas indicates that the sediment cover is mud.

From the soundings (Figure 5) a bathymetric chart has been contoured

(Figure 6) at a contour interval of 5 fathoms. This chart shows the harbour to be roughly an elongated basin structure, aligned lengthwise along the harbour. It must be pointed out that these bathymetric contours represent the author's interpretation and that other interpretations are possible with the given data.

## Discussion:

Although Marine regulations prevented a comprehensive examination of the offshore area outside of Macquarie Harbour the samples which were obtained in the area near the mouth of the Harbour are probably indicative of much of this area. The general movement of sediment along the littoral (predominantly sand) is southwards and so any mineral values present in the leased area will tend to move toward the entrance to Macquarie Harbour. In fact the likelihood is that any concentrations of mineral values in this offshore area would occur near the entrance to Macquarie Harbour.

Some of this sand transported along the littoral by longshore drift will not be deposited at Macquarie Harbour and will by pass the entrance to continue southwards along the coast. This by passing may take place on a shallow offshore bar or may by pass the estuary mouth by means of tidal currents. During flood tide, littoral-drift material is transported in the bayward direction. Part of this material, particularly the finer grain sizes, is returned seaward by the ebb currents and some of it is deposited more or less permanently at the landward end of the channel forming bay shoals. The coarser material returned to the sea may be carried away by waves and currents or part of it may build up an outer bar or shoal. This shoaling is quite evident along the Strahan Ocean beach for some distance north of the entrance to Macquarie Harbour.

The harbour bottom sediments are predominantly mud and appear to be mainly derived from the Tertiary, Macquarie Beds. Thus most of the bottom material in the harbour has been derived from sediments on the periphery of the harbour and not from erosion in the large catchment area. The extent of

river sedimentation can only partially be determined for the King River and not at all for the Gordon River. The movement of King River sediments north into Lettes Bay provides the best economic potential in the harbour area. The still quiet water at the eastern end of the harbour, little affected by tidal change, provide a high reducing environment. This effect is limited to the eastern end of the harbour and diminishes in areas of high fresh water inflow such as the Gordon River mouth.

It is not possible to make proper conclusions on the economic potential of the harbour area until detailed analyses have been carried out on the samples collected. However some preliminary conclusions may be drawn on the study at this stage:

- 1) The majority of the bottom sediments are mud, locally derived, and have the Tertiary Macquarie Beds as source rocks.
- 2) The majority of the sand at the entrance to the harbour has come into the harbour from outside.
- 3) The King River sediments are dispersed in a fan from the river mouth with a large lobe to the north into Lettes Bay.
- 4) It is not possible to delineate the Gordon River sediments.
- 5) Evidence for a graben structure is strong in Birches Inlet and a possibility within the harbour itself.
- 6) The bathymetric charts provide the first detailed survey of the area and show an elongate basin structure.

## Recommendations:

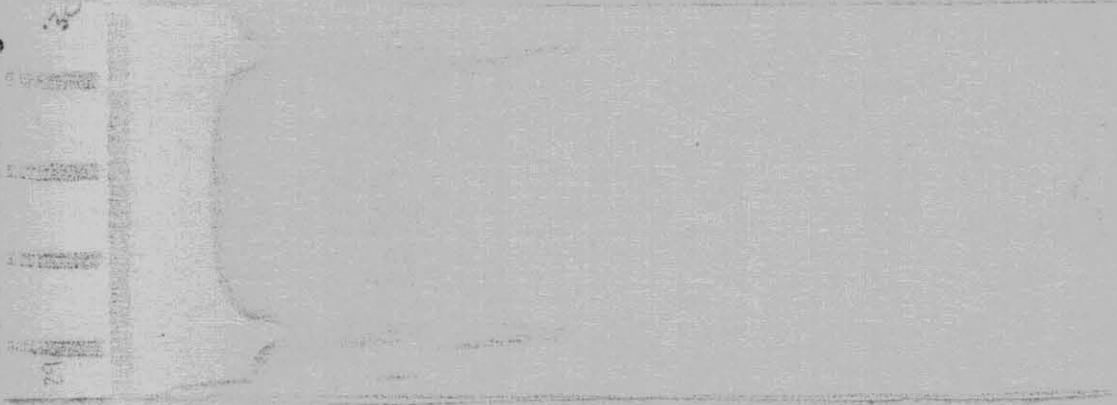
If the sediment analyses show any positive values the following comments and suggestions could be useful. The area surrounding Macquarie Harbour shows at least three major sea level benches and these should be investigated with an eye to properly dating the geologic events which formed the harbour and the bottom sediments. A drilling programme should initially work on the bathymetric slopes as sediment accumulation appears to be thinnest along these slopes. This sediment cover is rarely less than 6 feet and in the bottoms of the many depressions in the harbour is at least 30 feet. A study in detail of the water types and movements should be initiated using a salinity-temperature bridge. It would be useful to set up a small laboratory on site and carry out the initial examination of samples as collected. The Zof corer would be ideal for use in the offshore area as it appears to be entirely fine grained sand of unknown thickness. The leasing of the King River mouth and the careful investigation of the samples obviously derived from the King River should be given top priority.

*R.H. Goodwin*

R.H. GOODWIN

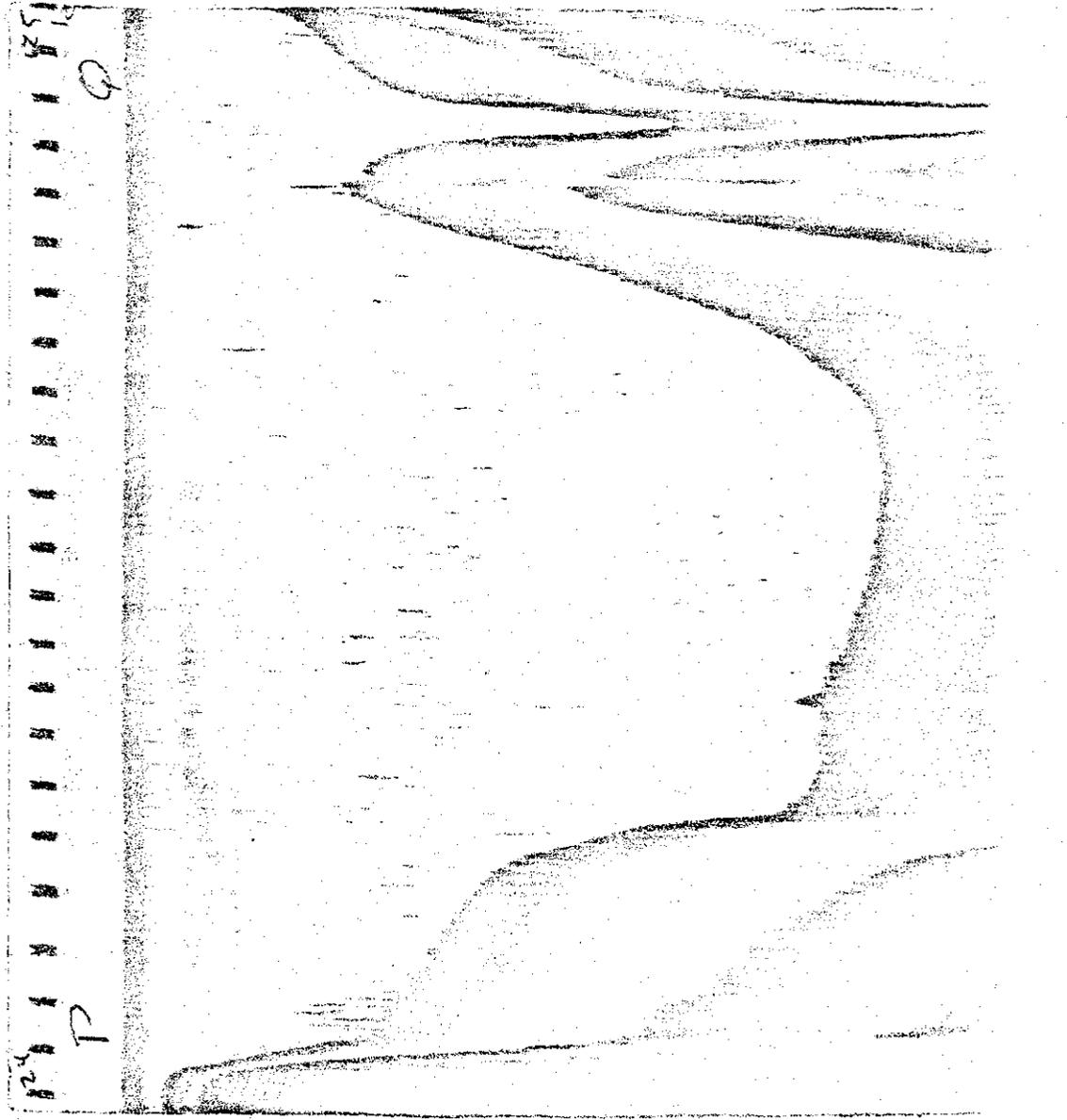
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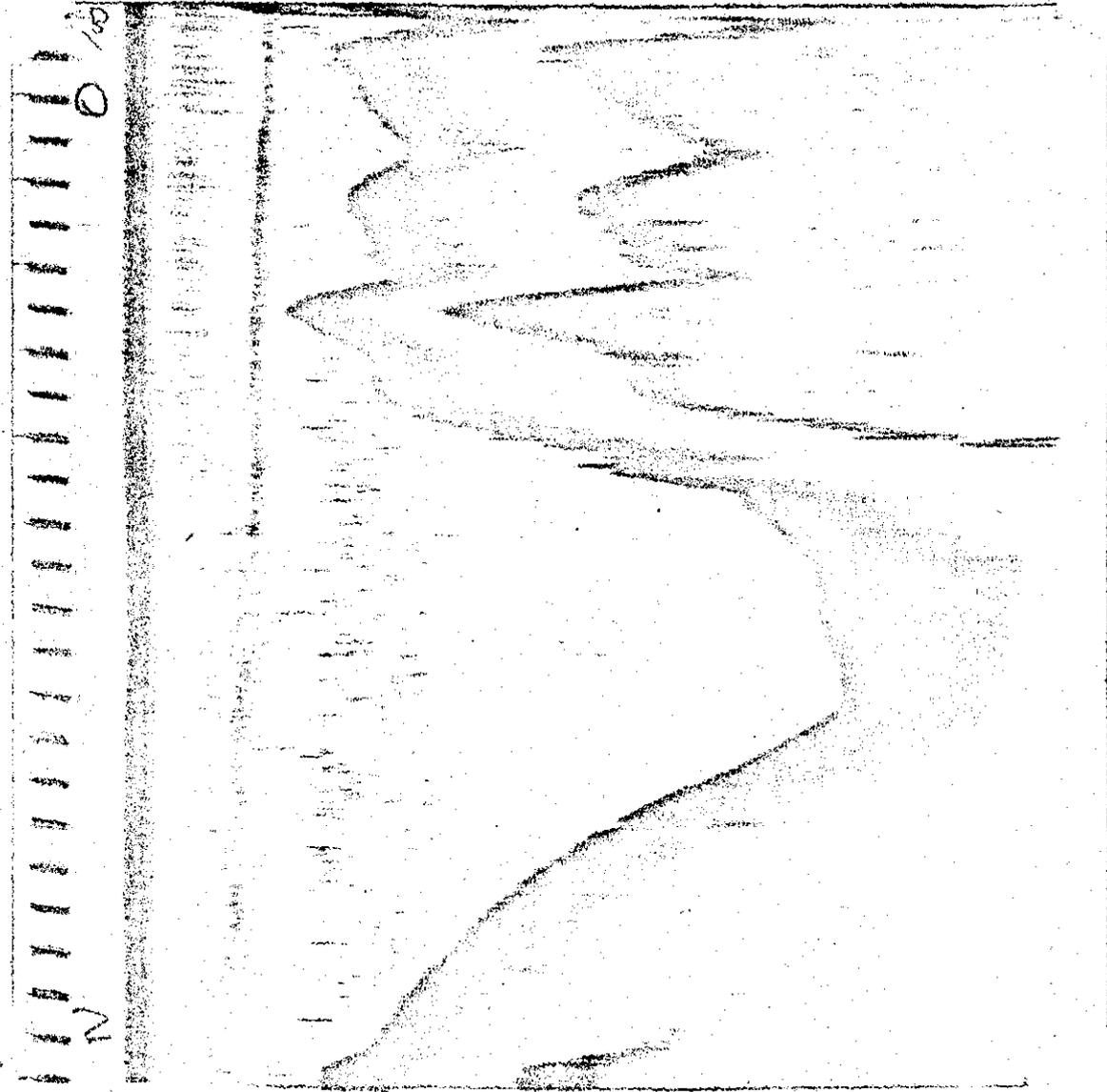


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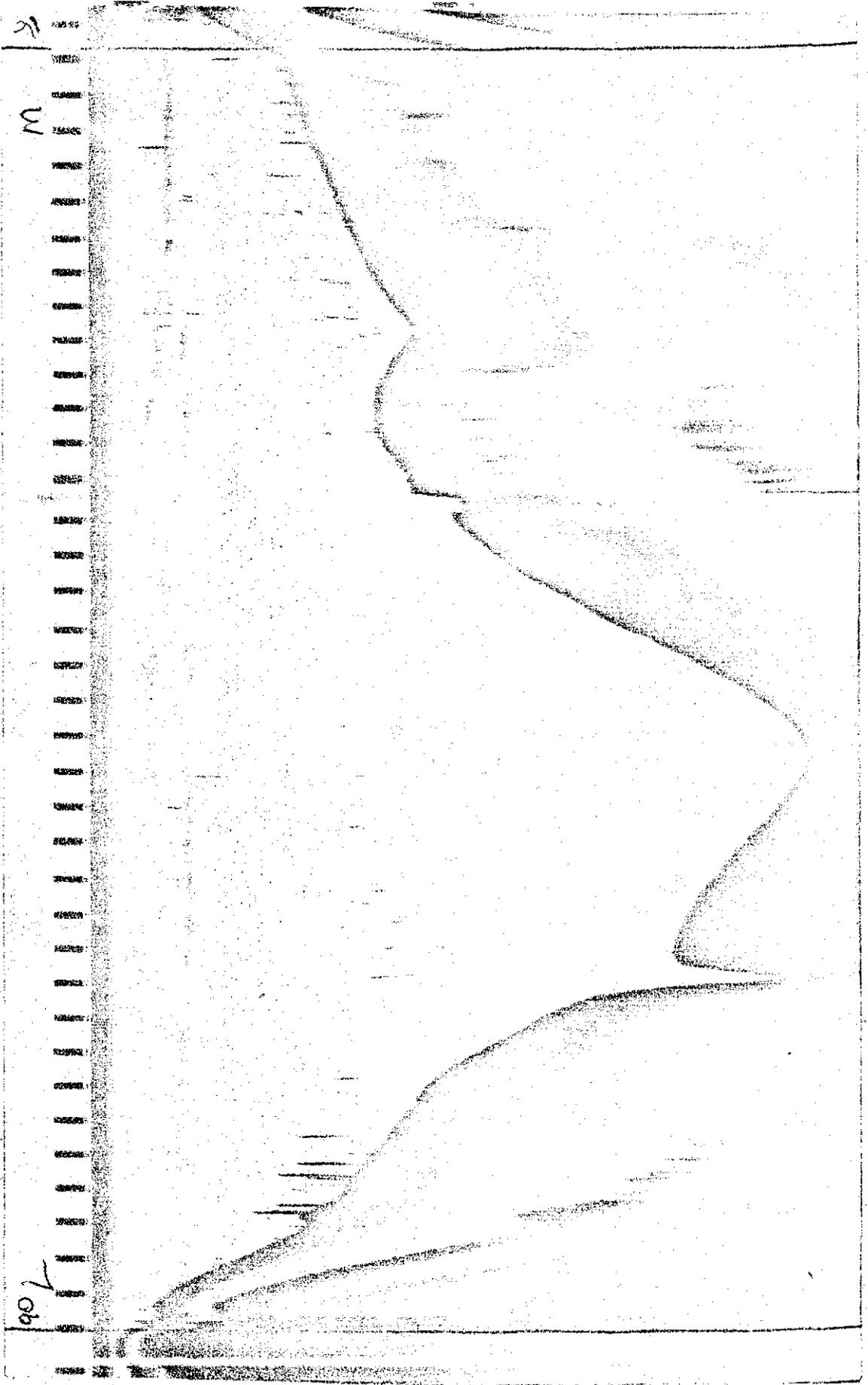
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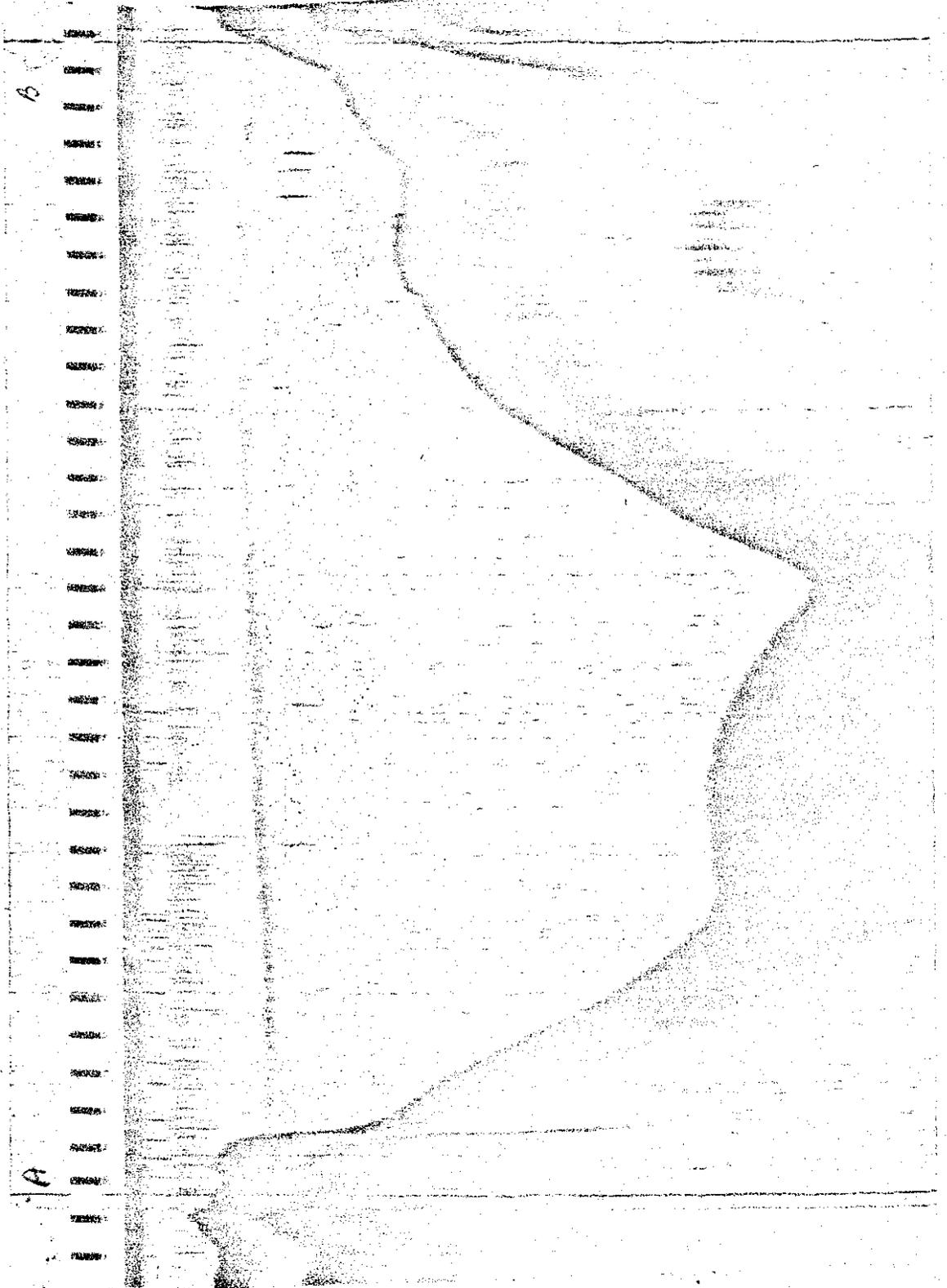
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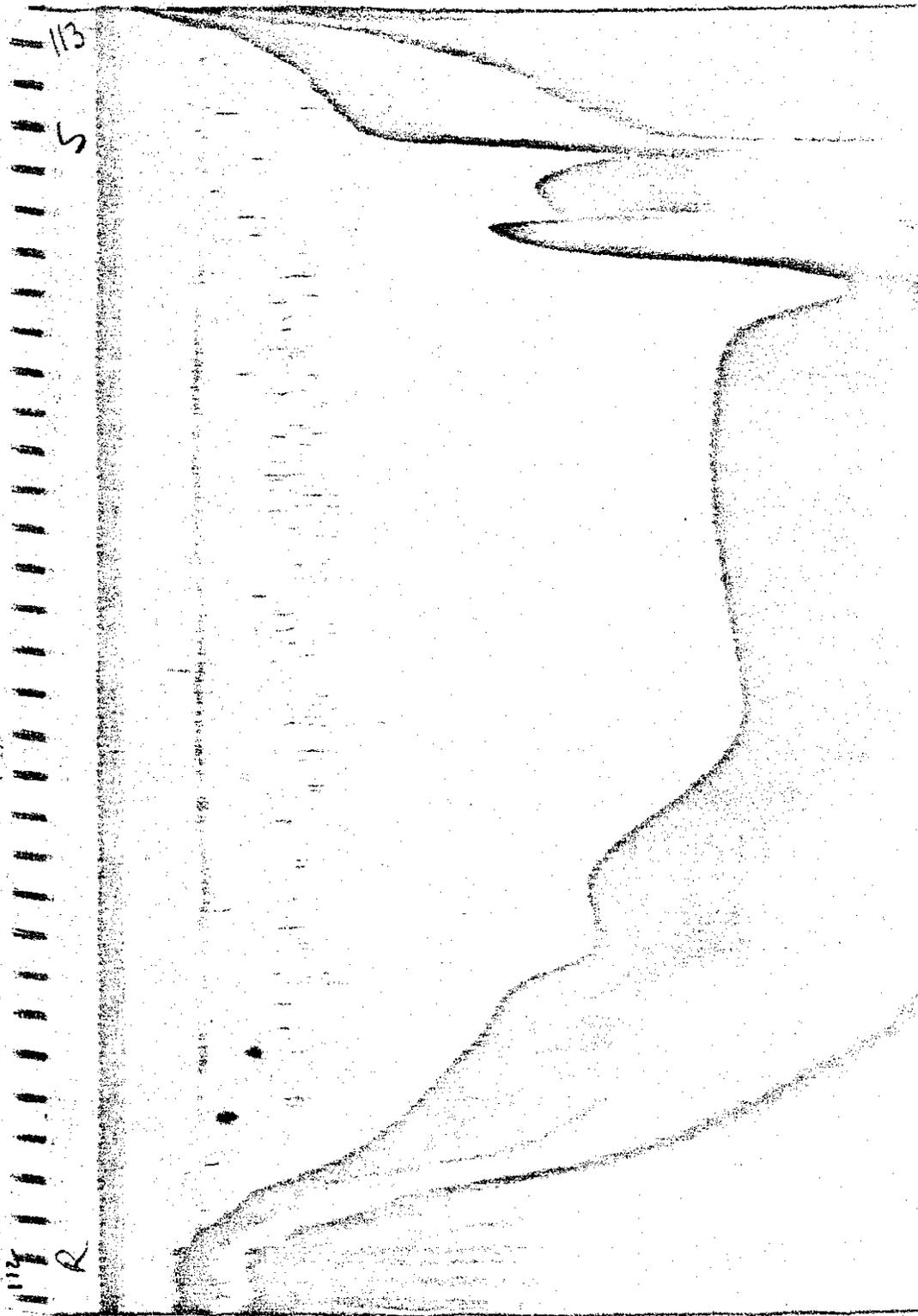
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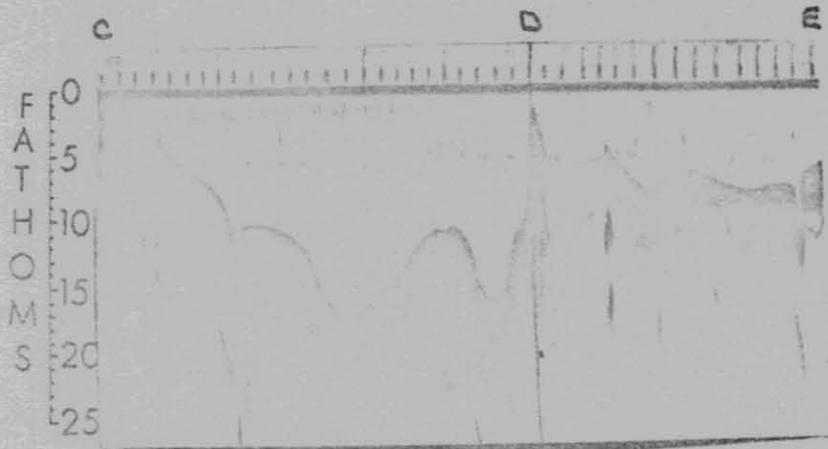
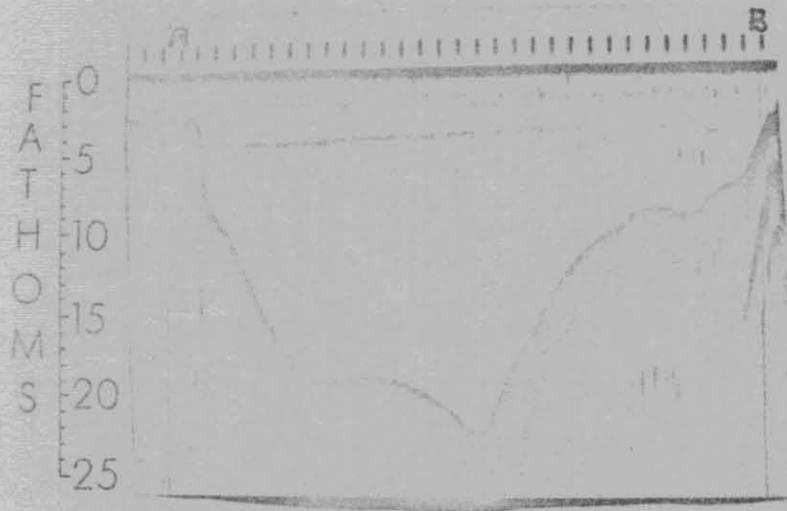
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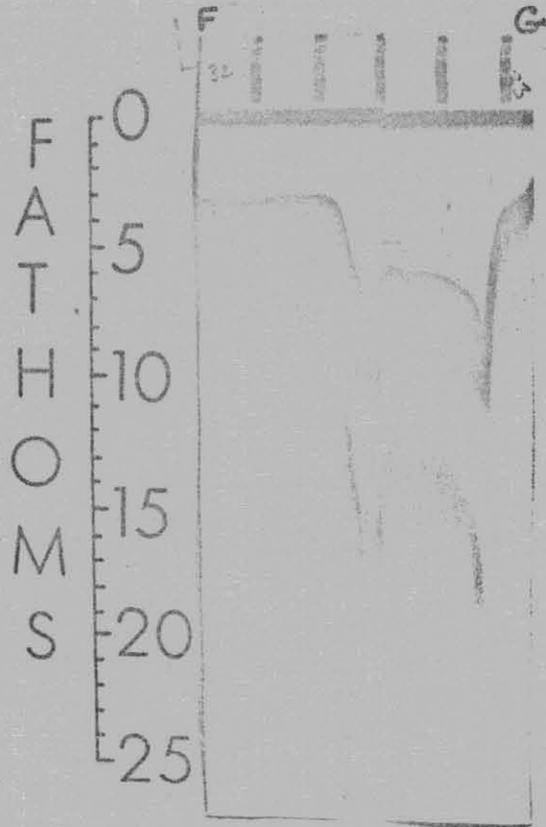
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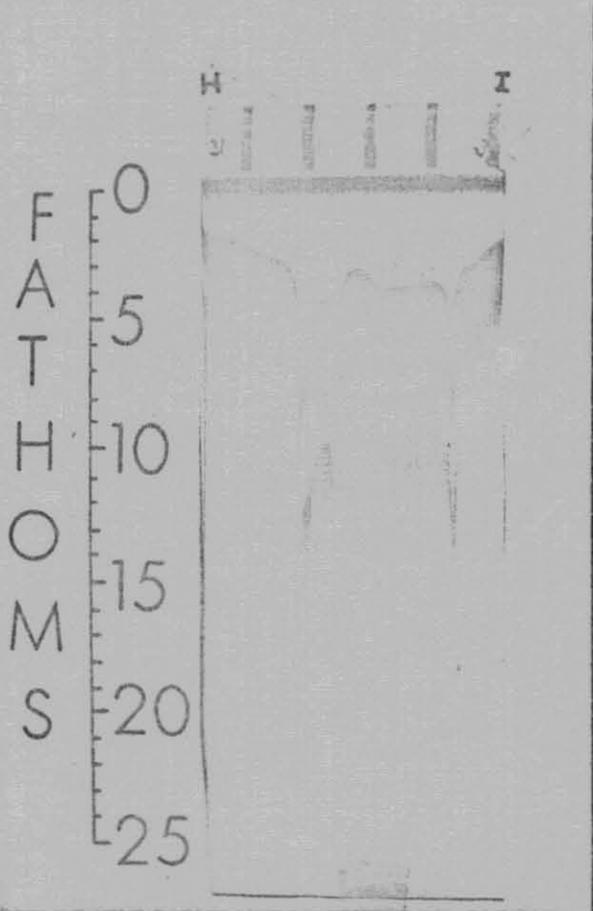
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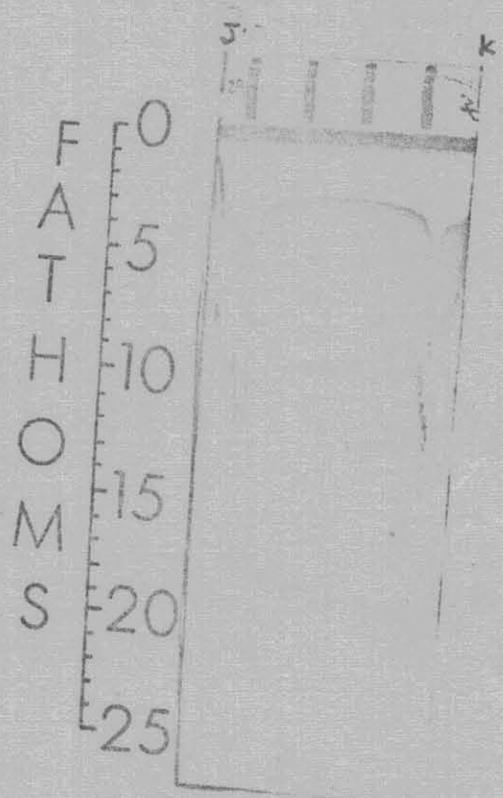
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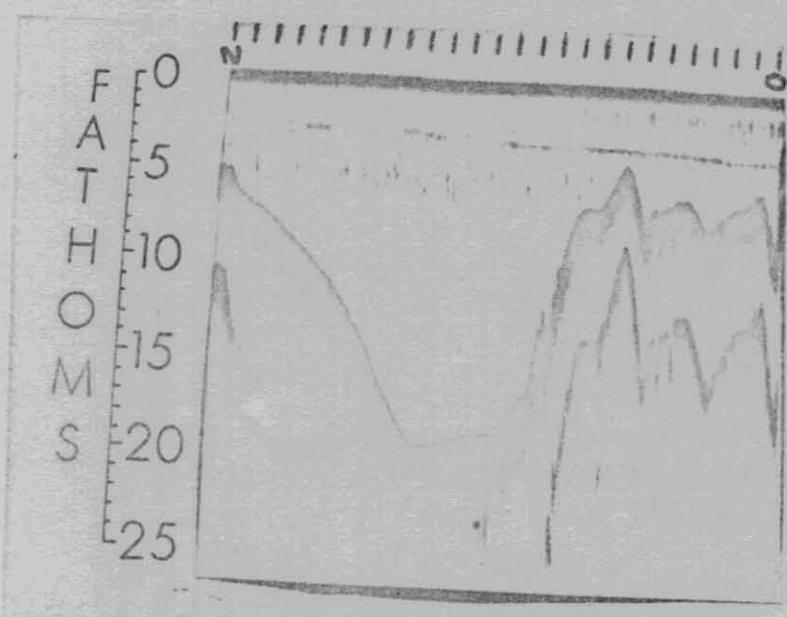
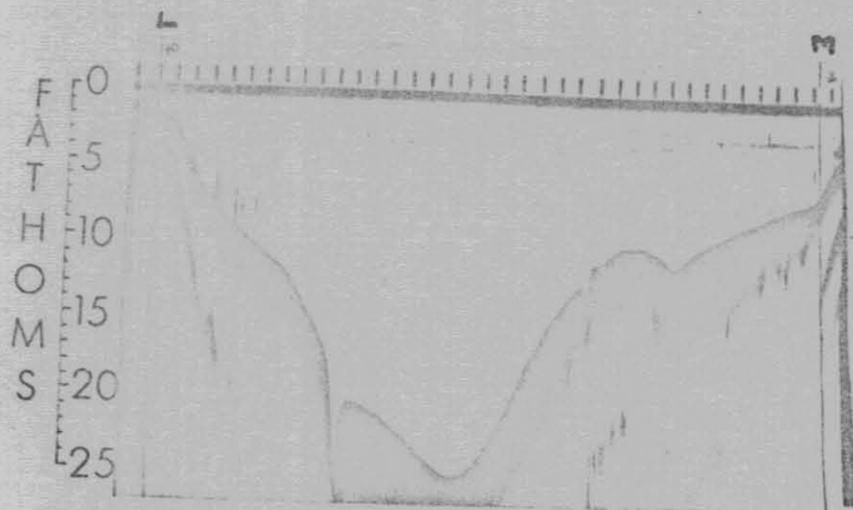
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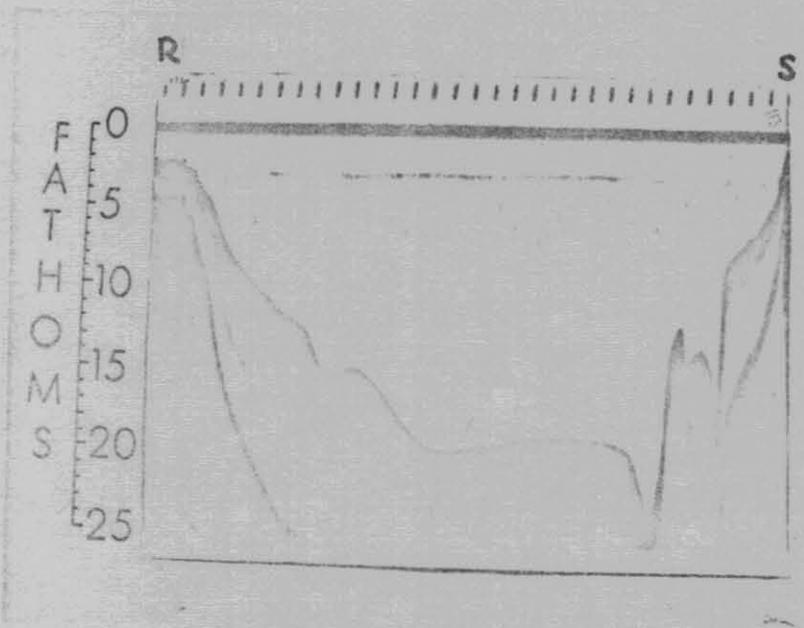
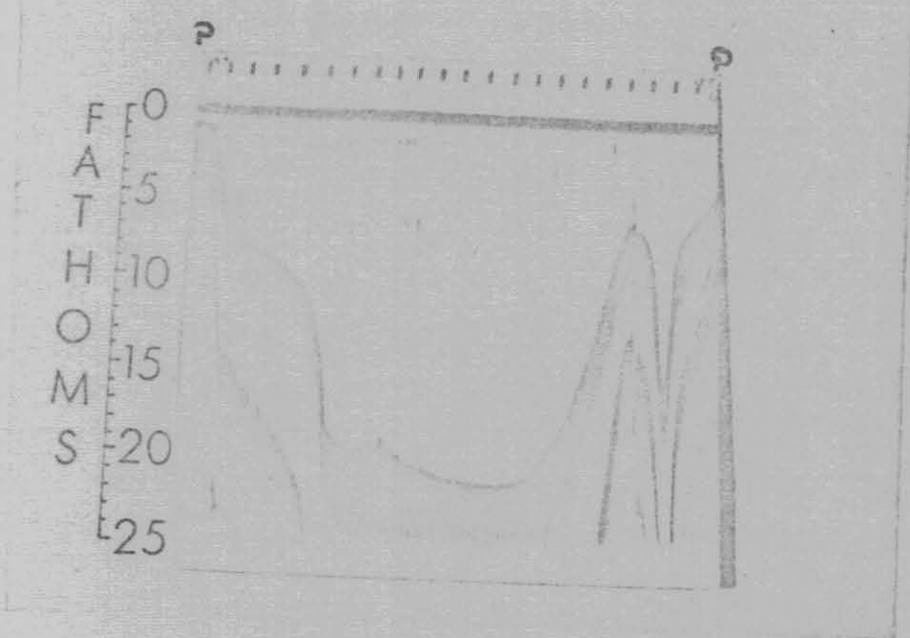




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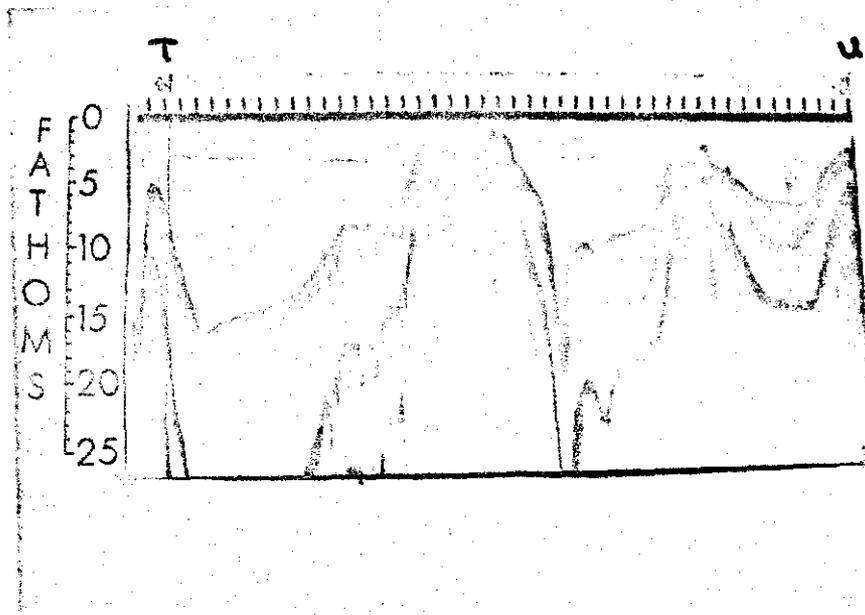






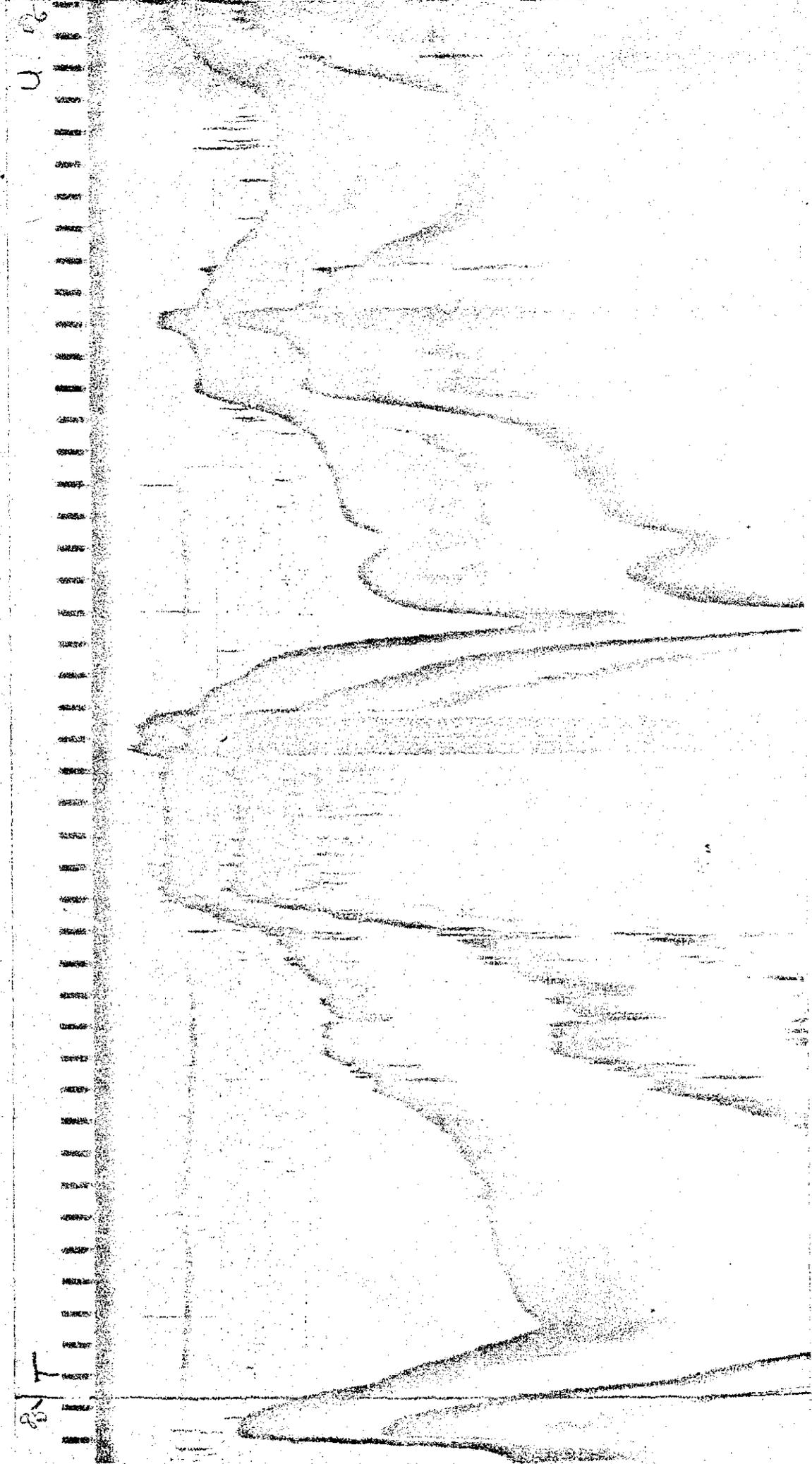
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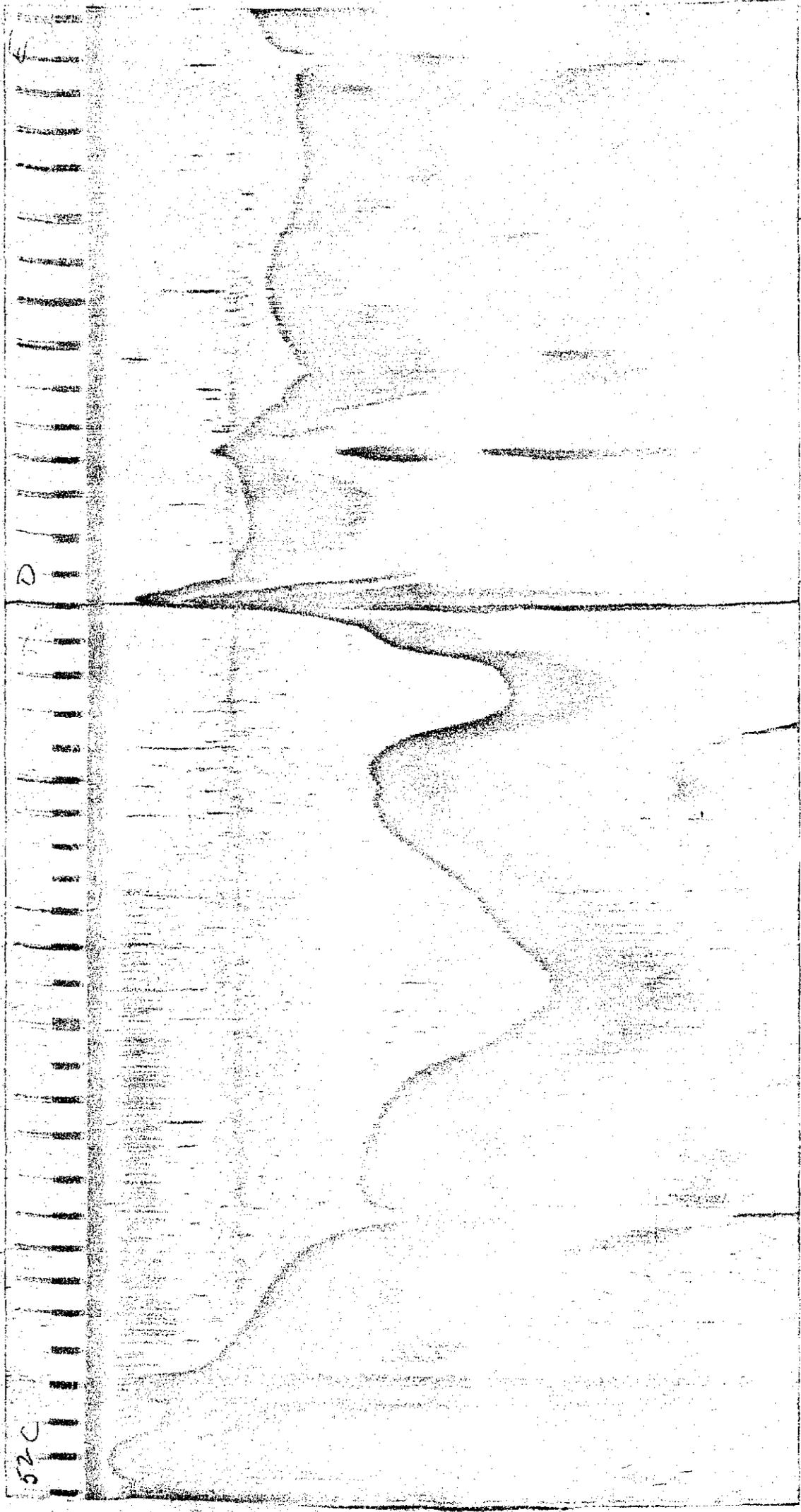
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WARMAN EQUIPMENT (INTERNATIONAL) LTD.

RESEARCH AND DEVELOPMENT DIVISION

LABORATORY REPORT 70/A3094

SUPPLEMENT 1.

ANALYSIS OF SILT SAMPLES FROM

**MICROFILMED**

LABORATORY SAMPLE No(s): ..... 8040

SAMPLE SUBMITTED BY: ..... Sydney Geological & Geophysical  
Services Pty. Ltd.

DATE RECEIVED: ..... 29th July, 1970.

QUANTITY AND DESCRIPTION: ..... 3 Silt Samples from Macquarie  
Harbour Tasmania.

SAMPLE MARK: ..... as reported.

OBJECT OF TESTWORK: ..... To confirm copper levels  
by Atomic Absorption Spectroscopy.

SUMMARY OF RESULTS: ..... Sample % Cu

King North 100 yards	0.066
King River 500 yards (A)	0.070
King River 500 yards (B)	0.087

*A.G. Williams*  
A.G. WILLIAMS  
SENIOR ANALYST.

27th August, 1970.

AGW:MA  
70-5704

It is important to note that the results reported herein refer only to the sample tested. Although to the best of our knowledge the information conveyed by this report is correct, no legal responsibility will be accepted for its use.

E.L. 27/70 Macquarie Harbour  
FIMISTON MINERALS

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13/12/70

**WARMAN EQUIPMENT (INTERNATIONAL) LTD.**  
**RESEARCH AND DEVELOPMENT DIVISION**  
**LABORATORY REPORT**

Report No. 70/A 3094

Qualitative Analysis of Mineral Samples

LABORATORY SAMPLE No(s): .... 8040

SAMPLE SUBMITTED BY: .... Sydney Geological and Geophysical Services Pty. Ltd.

DATE RECEIVED: .... 29th July, 1970.

QUANTITY AND DESCRIPTION: ....  
1. Eleven silt samples.  
2. Two core samples.

SAMPLE MARK: .... See tables.

OBJECT OF TESTWORK: .... To identify all elements above atomic number 22 by XRF method.

SUMMARY OF RESULTS: .... See tables.

S.F. RAYNER

*S.F. Rayner*

10th August, 1970.  
SFR:SH 70-5363.

It is important to note that the results reported herein refer only to the sample tested. Although to the best of our knowledge the information conveyed by this report is correct, no legal responsibility will be accepted for its use.

Qualitative Analysis ResultsTables 1 - 3

Search for all elements above atomic number 22.

Estimates expressed as per-cent.

Average limit of detection 0.005%.

KEY:

G	greater than
L	less than
Trace	less than 0.01%.

TABLE 1. SILT SAMPLES

ESTIMATE OF CONCENTRATION %	No. 1	No. 2	KING NORTH 100 yds.No.1	BIRCH INLET INTERIOR	BIRCH INTERIOR CHANNEL
G 1.0	Fe	Fe	Fe	Fe	Fe
0.1 to 1.0			Ba		
L 0.1	Sr, Rb, Zr, Ti, Pb, Br, Sn	Mn, Sr, Rb, Zr, Ti, Pb	Mn, Sr, Rb, Zr, Pb	Sr, Rb, Zr, Ti, Pb, Br, Ba, Nb	Sr, Zr, Ti, Pb, Br
Trace	I		I	Mn	Rb

TABLE 2. SILT SAMPLES

ESTIMATE OF CONCENTRATION %	KELLYS BASIN WARF-FINES	KELLYS BASIN WARF-COARSE	KELLYS WARF COARSE	KELLYS BASIN INTERIOR	
G 1.0	Fe	Fe	Fe	Fe	
0.1 to 1.0		Zr			
L 0.1	Sr, Rb, Zr, Ti, Pb, Br, Ba.	Sr, Rb, Ti Pb, Br, Ba	Sr, Rb, Zr, Ti, Pb, Br,	Sr, Rb, Zr, Ti Pb, Br, Ba.	
Trace	Mn, I	Mn	Mn, I	Mn	

TABLE 3

ESTIMATE OF CONCENTRATION %	<u>SILT SAMPLES</u>		<u>CORE SAMPLES</u>	
	SETTLEMENT ISLAND	PHILLIP ISLAND	KING RIVER 500 YDS	KING RIVER 500 YDS
G 1.0		Fe	Fe	Fe
0.1 to 1.0	Fe		Mn, Ba	Mn, Ba
L 0.1	Sr, Zr, Ti Pb	Zr, Ti	Sr, Rb, Zr, Ti	Sr, Rb, Zr
Trace	Mn, Br	Mn	Pb	Ti, Fb

NOTE : Vanadium, Silver and Copper not detected in core samples.

WARMAN EQUIPMENT (INTERNATIONAL) LTD.  
RESEARCH AND DEVELOPMENT DIVISION  
LABORATORY REPORT

NO. 70/A3094

SUPPLEMENT 2

ANALYSIS OF SILT SAMPLES FOR COPPER

LABORATORY SAMPLE No(s): .... 8040

SAMPLE SUBMITTED BY: .... Sydney Geological and Geophysical  
Services Pty. Ltd.,  
74 Pitt Street,  
SYDNEY. N.S.W. 2000.

DATE RECEIVED: .... 29th July, 1970

QUANTITY AND DESCRIPTION: .... Eleven silt samples from Macquarie  
Harbour Tasmania.

SAMPLE MARK: .... See report.

OBJECT OF TESTWORK: .... To determine percentage of Copper by the  
AAS method.  
The relationship to previous history of  
these samples in this Laboratory is as  
shown on the attached sheet.

SUMMARY OF RESULTS: .... See attached sheet.

*A.G. Williams*  
A.G. WILLIAMS  
7th October, 1970

AGW:CA 70-6429

It is important to note that the results reported herein refer only to the sample tested. Although to the best of our knowledge the information conveyed by this report is correct, no legal responsibility will be accepted for its use.

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LABORATORY REPORT 70/A3094

PAGE 2.

SUMMARY OF RESULTS:

1. See report for individual results.
2. At the present stage of the development of our techniques, copper in amounts less than 0.1% represents an exception to the infallibility of the XRF method in detecting heavy metals.
3. Atomic absorption procedure is recommended; some evidence of its reproducibility is contained in this Report.

007

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LABORATORY REPORT 70/A3094

PAGE 3.

REPORT NO.CONTENTS

70/A3094	Qualitative analysis by XRF Method; no results for copper because of tube emanations.
70/A3094 Supplement 1	Copper determinations on 3 samples by AAS Method.
70/A3094 Supplement 2	Copper determinations on 11 samples by AAS Method; two samples repeated from Supplement 1.

PRESENT RESULTS

<u>Sample</u>	<u>% Copper (Atomic Absorption)</u>
King River 500 yds.	0.071
— Kelly's Basin Interior	0.055
— Kelly's Basin Wharf Coarse	0.012
King North 1000 yards	0.070
Fines Kelly's Basin Wharf	0.025
— Birch Interior Channel	0.003
— Birch Inlet Interior	0.027
Phillip Island	0.004
Settlement Island	0.004
No. 1	0.004
Kelly's Wharf Coarse	0.012

008

SAMPLE NO.	SIZE DISTRIBUTION %			% HEAVIES IN -10 MESH +200 MESH	MAGNETIC ANALYSIS OF HEAVIES			
	+10 MESH	-10 MESH + 200 MESH	-200 MESH		% IN +10 MESH	% IN +200 MESH	HIGHLY MAGNETIC	WEAKLY MAGNETIC
1	0	95.9	4.1	1.6	0.4	62.65	10.44	26.50
2	0	95.7	4.3	0.6	0	59.57	12.77	27.66
3	0	71.2	29.8	0.6	0	45.00	27.50	27.50
4	0	39.4	61.6	0.6	0	25.00	25.00	50.00
5	0	66.5	33.2	0.5				
6	0	92.1	7.9	0.2	0	46.88	15.12	34.06
7	0	79.2	20.8	0.5	1.39	65.97	20.53	11.51
8	0	55.6	44.4	0.4				
9	0	89.3	9.7	0.5	0.06	46.39	31.93	21.04
10	3.4	46.5	50.6	0.2	11.11	11.11	22.22	55.56
11	11.5	75.8	12.7	1.2	0	52.14	22.22	25.64
12	0.4	47.5	52.1	0.4	0.11	39.33 2.11	31.46 37.33	25.09
13	0	16.6	53.4	2.0	0	16.67	0	33.33
14	32.4	17.1	0.5	3.7	0	50.0	1.44	15.56
15	14.3	66.7	23.5	1.9	0	79.43	17.14	3.43
16	21.4	63.5	14.4	1.0	0.5	73.33	5.64	20.51
17	64.1	24.1	11.3	2.2	3.23	90.32	4.34	1.61
18	0	51.1	18.9	1.5	0.74	51.44	13.33	4.44
19	0	61.4	33.6	2.2	0.52	59.69	12.57	27.23
20	65.1	24.5	10.4	20.1	0.48	97.62	1.90	0
21	6.5	55.6	7.9	4.6	0.50	55.50	4.00	7.00
22	77.6	?	30.6	1.9	0.4	36.5	57.1	6.0
23	1.3	69.7	29	0.7	0.4	43.2	42.9	13.5
24	51.7			1.2	0	75.00	4.33	16.67
25	9.1	75.1	15.4	0.5	0.64	50.00	24.66	24.66
26			4.0	0.6	2.94	44.12	23.53	29.42
27	45.3	51.3	3.4	36.2	0.6	91.5	3.5	4.1
28	0	99.3	0.7	0.2	0	74.5	13.4	11.8
29	36.1	63.7	0.2	0.7	1.7	67.1	9.4	1.7
30	0	99.7	0.3	0.4	3.6	55.1	26.4	9.6
31	0	96.3	3.7	0.5	0.5	60.4	16.9	22.2
32	0	93.4	6.6	0.4	0.4	60.4	14.4	24.0
33	0	99.9	0.2	0.6	0	67.2	15.7	17.2

009

908057

SAMPLE NO.	+10 MESH	-10 MESH		% HEAVIES IN -10 MESH +200 MESH	MAGNETIC ANALYSIS OF HEAVIES IN -10 MESH +200 MESH			
		+200 MESH	-200 MESH		HIGHLY MAGNETIC	MAGNETIC	NEARLY MAGNETIC	NON MAGNETIC
34	0	96.5	1.5	0.3	0	63.3	16.4	16.4
35								
36	0	92.5	7.5	1.1	1.9	6.7	25.2	66.2
37	0	97.0	3.0	<del>1.2</del> 0.5	0	56.3	16.9	26.9
38	0	70.0	30.0	1.2	0	73.3	6.7	20.0
39								
40	1.6	68.6	29.4	0.3	3.7	40.7	11.1	44.4
41	0	17.6	62.2	0.6	0	60.0	0	20.0
42	6.6	80.6	62.4	0.3	0	56.6	11.1	33.3
43	0	90.0	10.0	0.6	0	32.5	16.7	51.6
44	0	90.0	<del>10.0</del> 10.0	0.4	0	<del>32.5</del> 54.1	14.3	31.1
45	0	99.8	0.2	0.3	0.6	55.4	12.0	26.7
46	0	82.9	17.1	0.3	2.7	51.4	8.1	37.4
47	0	97.0	3.0	0.1	0	60.0	14.3	25.7
48	0	96.5	1.5	0.3	0	71.1	11.1	17.6
49	0			0.7	0	75.6	7.6	12.0
50	0	99.3	0.7	0.4	0	87.4	5.6	7.1
51	0	98.4	1.6	0.4	5.9	68.2	7.6	14.2
52	0	96.9	3.1	0.7	1.3	66.4	11.5	21.4
53	0	97.4	2.6	0.6	12.3	43.4	24.2	19.6
54	0	99.8	0.2	0.3	1.6	74.5	10.9	12.7
55	0			0.9	0	66.7	0	33.3
56	0	64.3	15.7	0.4	0	83.2	8.6	8.1
57	0	67.4	32.6	0.6	0	72.6	12.6	15.0
58	0	12.2	47.4	0.3	0	66.7	16.7	16.7
59	0	20.8	79.2	0.1	0	25.0	25	50.0
60	0	32.9	66.1	0.6	0	71.2	18.6	10.2
61	0	11.7	88.3	0.5	0	62.6	0	37.6
62								
63	16.0		-	0.2	0	61.5	7.7	30.8
64	0	31.3	68.7	0.2	0	50.0	16.7	33.3
65	0	4.4	95.6	0.3	0	71.4	3.6	25.0
66	16.7	21.7	59.6	12.1	34.9	50.0	9.6	1.4

SAMPLE NO.	+10 MESH	-10 mesh +200 MESH	-200 MESH	% HEAVIES IN -10 MESH +200 MESH	MAGNETIC ANALYSIS OF HEAVIES IN -10 MESH +200 MESH			
					HIGHLY MAGNETIC	MAGNETIC	WEAKLY MAG.	NON MAGNETIC
67	0	4.6	91.4	1.8	2.5	12.5	75.0	10.0
68	2.7	71.9	25.4	0.1	0	65.9	14.6	19.5
69	2.4	32.9	64.7	0.4	0	63.6	14.3	22.1
70	0	12.0	88.0	0.2	2.2	32.6	21.7	43.5
71								
72	0.6		2.3	1.8	0.8	76.5	15.4	7.1
73	0	83.6	16.4	14.3	1.6	55.9	10.4	31.7
74	0	59.8	40.2	21.4	1.1	36.9	12.5	49.4
75	6.9	86.4	6.7	22.5	1.4	45.7	11.1	32.2
76	2.9	83.4	13.7	3.8	9.3	73.2	7.8	9.7
77								
78	0	94.8	5.2	9.8	2.4	66.6	9.1	23.0
79	0	45.2	54.8	0.1	20.0	40.0	30.0	10.0
80	5.4	74.1	20.1	4.1	12.1	71.6	9.3	7.1
81	6.8	69.0	24.2	7.6	5.3	79.7	6.7	9.2
82	2.0	99.8	18.2	0.3	0	75.4	11.5	13.1
83	4.7	65.9	29.4	0.3	1.5	73.1	10.4	14.9
84	2.8	43.9	53.3	0.4	1.2	71.6	14.4	12.3
85	0	65.4	34.6	0.3	0	76.00	12.5	12.5
86	2.9	44.8	52.3	0.2	0	56.6	25.0	19.4
87	0	16.1	81.9	0.3	5.9	5.9	47.1	41.2
88	4.4	64.4	31.2	2.6	0	60.0	27.5	12.5
89	90.2			3.8	7.1	78.6	3.6	10.7
90	0	21.7	78.3	0.4	3.9	54.9	33.3	7.8
91	17.0	78.9	4.1	0.06	3.7	59.3	18.6	18.6
92	15.2	79.9	5.1	0.03	12.5	37.5	12.5	37.5
93	0	94.5	5.5	0.2	1.0	62.0	15.0	22.0
94	52.9	31.8	15.3	9.3	0.4	94.4	4.3	0.9
95	73.0	3.1	23.9	3.9	0	90.4	8.6	0.6
96	53.7			15.6	3.6	62.3	33.3	0.4
97	43.0	4.1	52.9	14.7	7.0	60.9	29.1	3.1
98	0	96.7	1.3	0.2	1.0	61.0	17.3	30.6
99	7.7	70.2	22.1	0.6	0.4	66.4	21.3	11.5
100	42.3	8.2	49.5	0.3	0	77.1	8.6	14.3

MACQUARIE HARBOUR  
TASMANIA

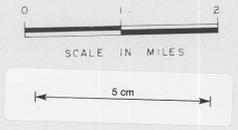
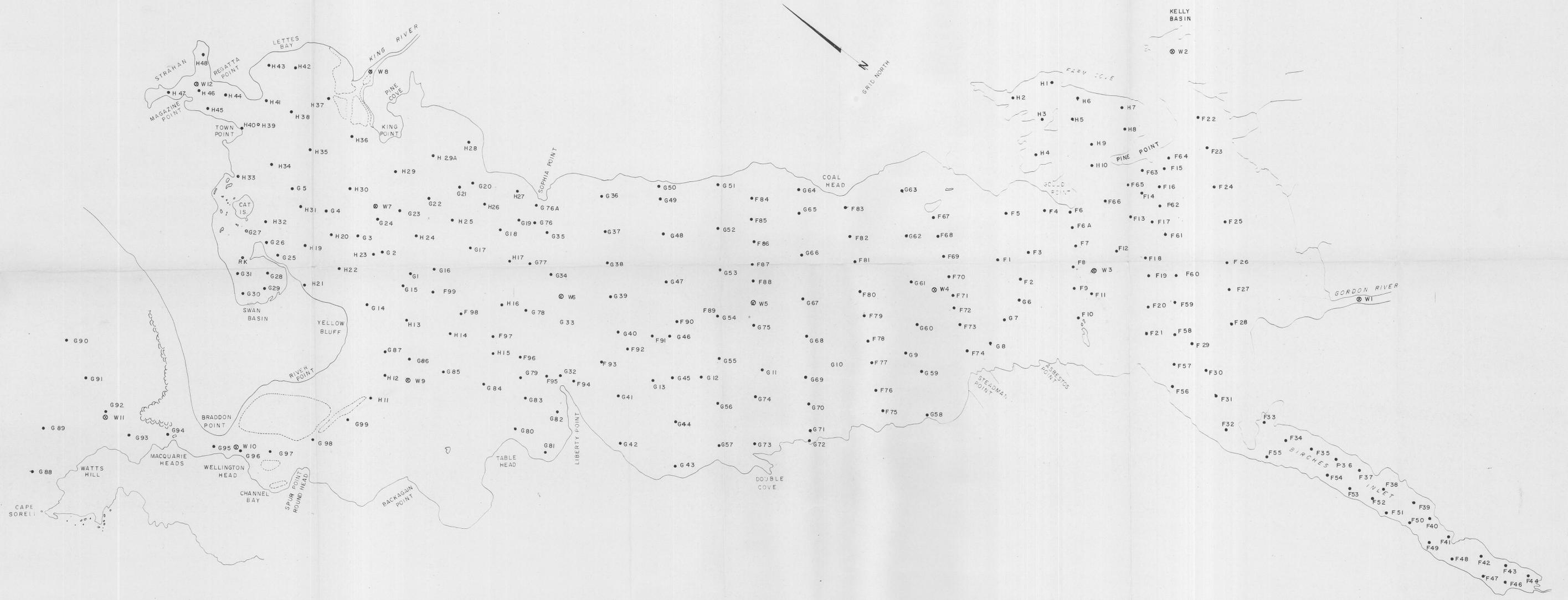


FIGURE 1  
BOTTOM SAMPLE STATIONS

1123

- F10 BOTTOM SAMPLE
- G60 BOTTOM SAMPLE
- H10 BOTTOM SAMPLE
- ⊙ W10 WATER SAMPLE

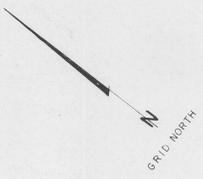


MACQUARIE HARBOUR  
TASMANIA



FIGURE 2  
SEDIMENT DISTRIBUTION

1124



26-2-71

MACQUARIE HARBOUR  
TASMANIA

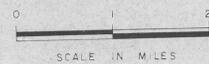
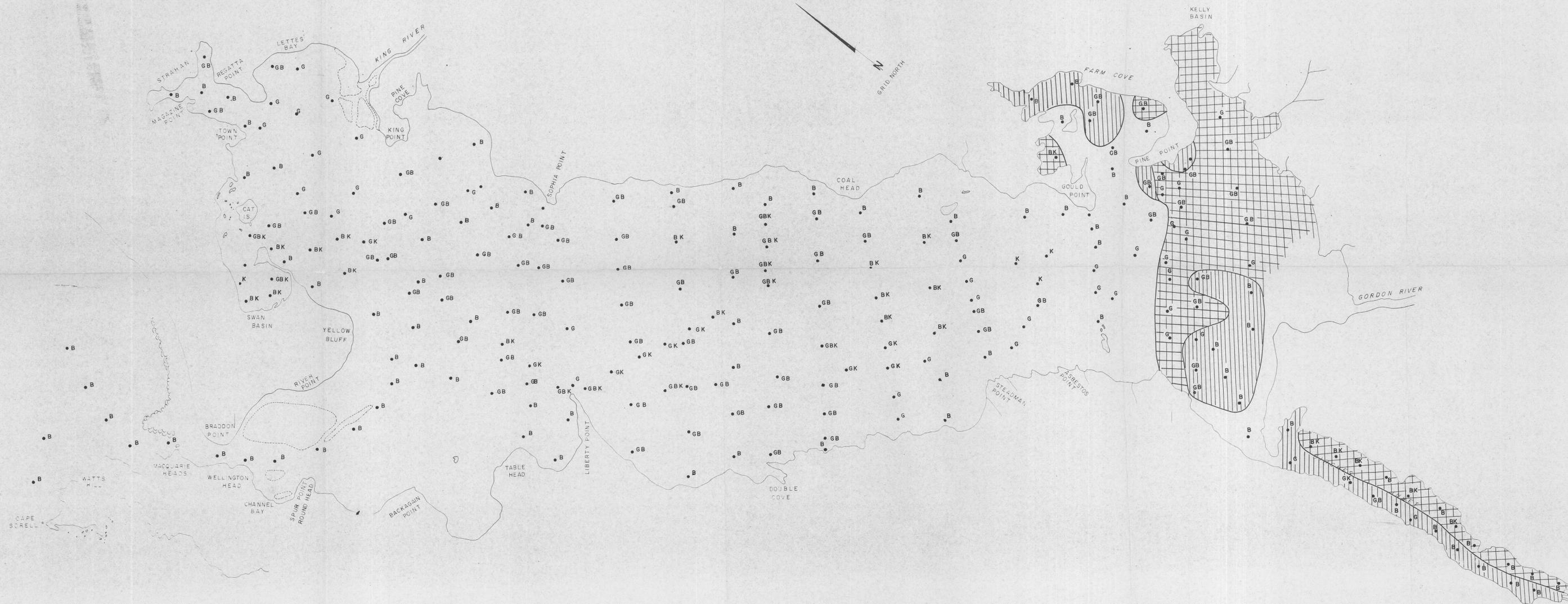


FIGURE 3  
SEDIMENT COLOUR  
AND H<sub>2</sub>S CONTENT

1125

COLOUR  
G - GREY  
B - BROWN  
K - BLACK

H<sub>2</sub>S CONTENT  
HIGH  
LOW  
NONE



MACQUARIE HARBOUR  
TASMANIA

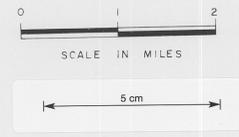
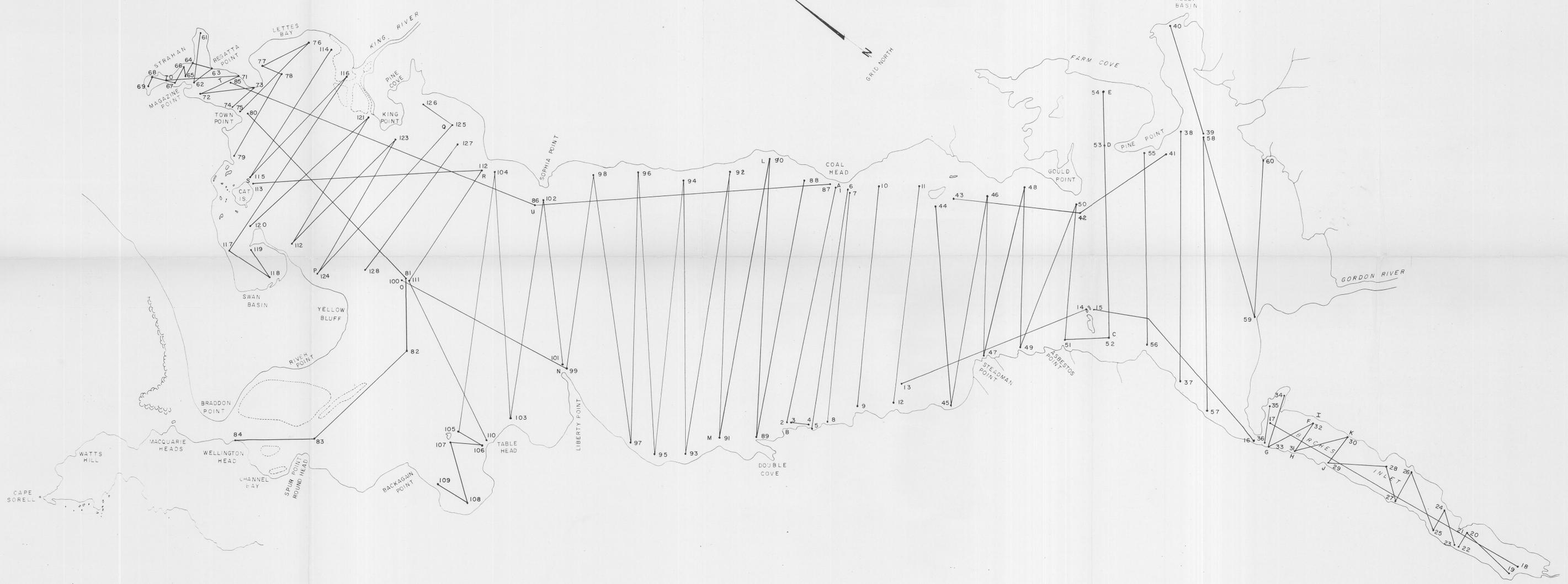
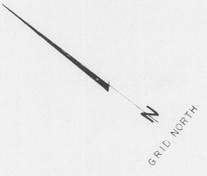
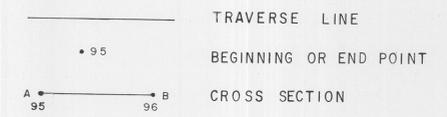


FIGURE 4  
BATHYMETRIC TRAVERSES

1126

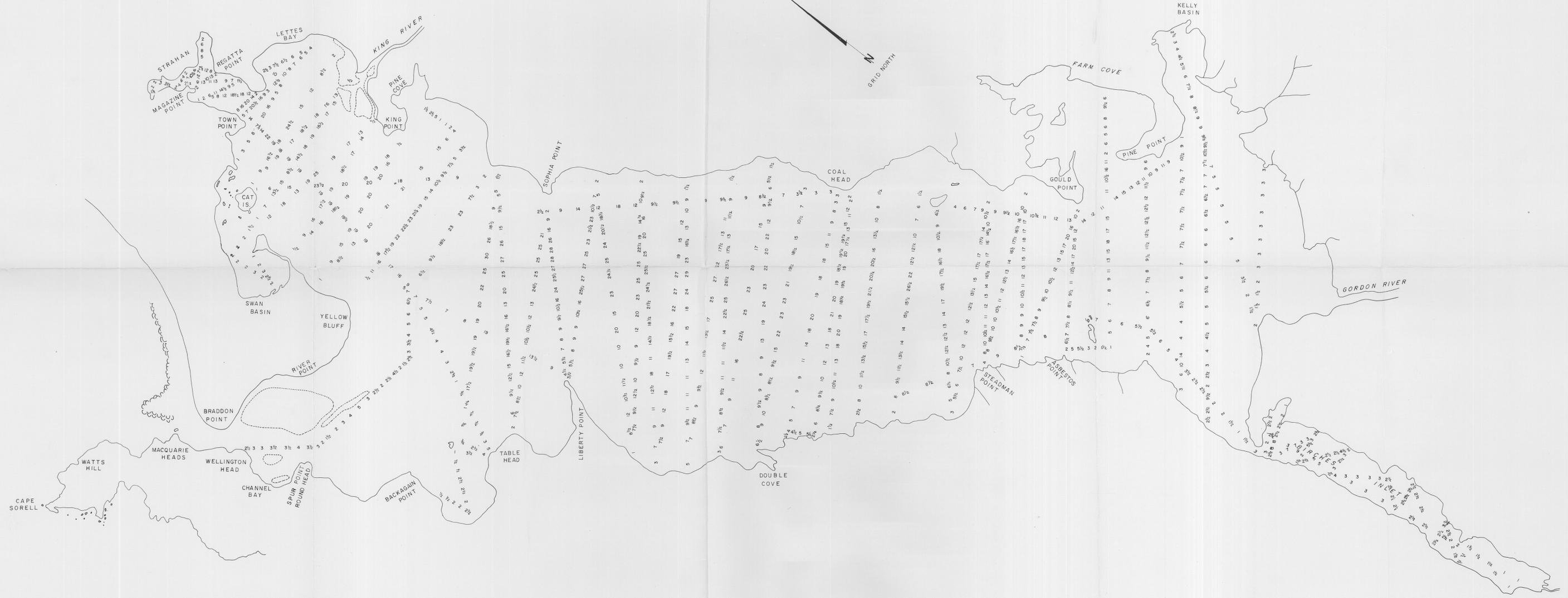


MACQUARIE HARBOUR  
TASMANIA



FIGURE 5.  
BATHYMETRIC TRAVERSES  
DEPTHS IN FATHOMS.

1127



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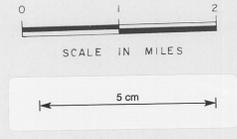


FIGURE 6  
BATHYMETRIC CONTOURS

1128

— 10 — CONTOURS IN FATHOMS  
- - - CONTOUR INTERVAL 5 FATHOMS



INTERIM REPORT ON MACQUARIE HARBOUR

During late November and December 1970, a comprehensive programme of bottom sampling and echo sounding profiling was initiated at Macquarie Harbour, Tasmania. This programme is approximately two-thirds completed and I expect the field aspect of it to be completed before the end of January 1971. Evaluation of the data obtained and the compilation of this data in the form of maps and charts will proceed upon completion of the field study and should be available sometime in February 1971.

To date, one hundred and thirty bottom samples have been collected, predominantly from the eastern half of Macquarie Harbour. Owing to the fact that with the equipment available positioning is somewhat inaccurate. I have attempted to overcome this by taking a large number of samples at closely spaced intervals. The samples collected are predominantly muds and appear to be derived from the Tertiary sediments surrounding the harbour. The far eastern end of the harbour appears to be a highly reducing environment, this effect decreasing in a westerly direction.

Echo sounding profiles, although incomplete owing to inclement weather, substantiates the belief, especially in Birches Inlet, that the area is a graben and the included sediments suggest a post Tertiary age for the movement. Maximum depth is 180 feet which is substantially greater than the previously reported maximum depth (120 feet).

The results of this study, although incomplete, are encouraging in that a relatively accurate assessment of the hydrodynamic environment of Macquarie Harbour is emerging which when completed will enable the source and extent of any mineral values to be delineated.

Signed: Robert H. Goodwin.

December 29, 1970.

012

EL 37/70 Macquarie Harbour

FIMISTON MINERALS

908066

# GEOCHEMICAL AND MINERALOGICAL LABORATORIES PTY. LTD.

76 McLACHLAN AVE., RUSHCUTTERS BAY, N.S.W. 2011 TEL. 31 9011 TELEX: 21757 TELEGRAMS: "GEOCHEM" SYDNEY.

REGISTERED  
LABORATORY  
NUMBER 743



This laboratory is registered by the National Association of Testing Authorities, Australia.

The test(s) reported herein have been performed in accordance with its terms of registration.

Company: Sydney Geological & Geophysical Services Pty. Limited

Date Received: 23.12.70

Day Book and Sheet No. 11883/1

Batch No. T/F = To Follow

Date Despatched: 18.1.71

Analyst's Remarks: Precision = 10% @ 500ppm level

CLARKE RIVER TRIBUTARIES →

Analyst	E.T.	C.E.	C.E.
Method	AAS HClO <sub>4</sub>	AAS HClO <sub>4</sub>	AAS HClO <sub>4</sub>
Limit of detection	2	2	2
Precision ± %	10%	10%	10%
Sample No.	Cu	Pb	Zn
1	22	50	48
2	32	124	114
3	4	16	52
4	2	14	38
5	4	16	54
6	2	16	32
7	24	40	66
8	10	24	28
9	26	58	94
10	14	52	60
Geological Standard	101	73	170
11	4	24	34
12	4	16	30
13	16	44	118
14	8	32	74
15	22	52	116
16	16	38	86
17	46	T/F	200
18	6	26	36
19	10	26	46
20	10	30	92

All results in parts per million unless otherwise indicated.  
"X" indicates that the content of the element sought is below the limit of detection.  
"Tr" indicates element detected but too low a concentration to be measured.  
"—" means not determined.

*P. Larynt*  
N.A.T.A. SIGNATORY



014

908068

GEOCHEMICAL AND MINERALOGICAL LABORATORIES PTY. LTD.

76 McLACHLAN AVE., RUSHCUTTERS BAY, N.S.W. 2011 TEL. 31 9011 TELEX: 21757 TELEGRAMS: "GEOCHEM" SYDNEY.

REGISTERED  
LABORATORY  
NUMBER 743



This laboratory is registered by the National Association of Testing Authorities, Australia.

The test(s) reported herein have been performed in accordance with its terms of registration.

Company Sydney Geological & Geophysical Date Received 24/12/70. Day Book and Sheet No.

Batch No. Services Pty Ltd. Date Despatched 15/1/71. 11891/1.

Analyst's Remarks: Cu Pb Zn = Precision 10%\* at 500ppm level. Typist S. Collins.

CLARKE RIVER TRIBUTARIES →

Analyst	E.T.	G.S.	F.B.
Method	AAS HClO <sub>4</sub>	AAS HClO <sub>4</sub>	AAS HClO <sub>4</sub>
Limit of detection	2	2	2
Precision ± %	10%*	10%*	10%*
Sample No.	Cu	Pb	Zn
22	4	22	32
23	4	22	28
24	6	20	24
25	2	16	14
26	4	14	22
27	2	14	18
28	2	16	20
29	18	28	78
30	2	20	14
31	2	14	10
Geological Standard	280	40	102
32	14	16	20
33	4	18	18
34	2	16	14
35	2	12	20
36	2	16	20
37	2	8	6
38	2	14	22
39	2	16	18
40	4	24	38
41	2	18	24

All results in parts per million unless otherwise indicated.  
 "X" indicates that the content of the element sought is below the limit of detection.  
 "Tr" indicates element detected but too low a concentration to be measured.  
 "-" means not determined.

*[Signature]*  
 N.A.T.A. SIGNATORY

015

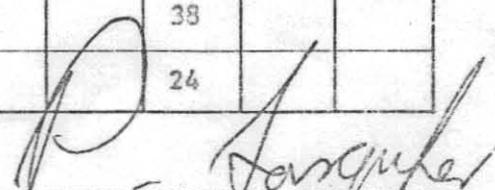
908069

DAY BOOK AND SHEET NO ..... 11891/2.

Analyst	E.T.	F.B.	C.E.
Sample No.	Cu	Pb	Zn
42	2	10	14
43	2	12	14
44	2	14	16
45	2	18	24
46	2	10	10
47	2	16	24
48	2	18	28
49	4	14	20
50	4	16	28
51	10	22	36
52	10	22	26
53	12	26	40
54	10	20	30
Standard	92	78	94
55	2	12	28
56	14	26	50
57	4	18	50
58	6	22	50
59	2	12	30
K 1	32	36	100
K 2	26	30	90
K 3	34	42	122
K 4	28	30	92
K 5	32	34	104
K 6	8	20	48
K 7	6	16	38
K 8	2	14	24

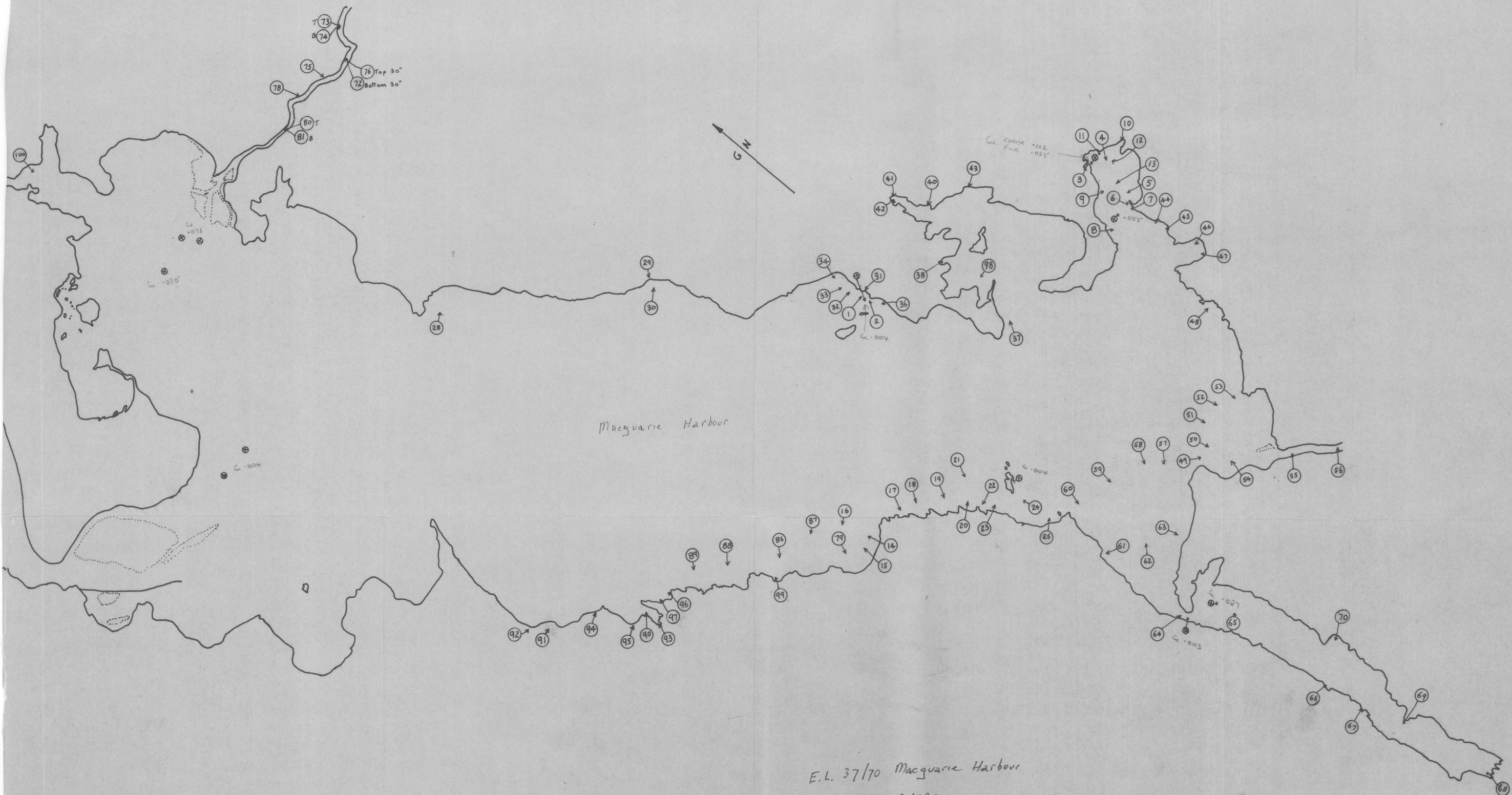
CLARKE RIVER TRIBUTARIES  
 KING. R. TRIBUTARIES

All results in parts per million unless otherwise indicated.  
 "X" indicates that the content of the element sought is below the limit of detection.  
 "Tr" indicates element detected but too low a concentration to be measured.  
 "--" means not determined.

  
 N.A.T.A. SIGNATORY







Macquarie Harbour

E.L. 37/70 Macquarie Harbour  
 P. S. LAVERS  
 Sydney Biological & Geophysical Services Pty. Ltd.

908072 112

- ⊗ INITIAL SAMPLES
- ⊙ CORED SAMPLES

NOTE: Samples prefixed with 1, i.e. 168, refer to the above locations and denote exact splits of long cores.

Samples No. 14, 17, 24, 55, 89, 97. Recovery from these cores was too small to split, and no reserve split is held.

Shaded numbers - total analysis.

(112, 118, 119, 122, 123, 158, 159, 167, 168, 169, 170, 179, 186, 187, 188, 190, 190)



- Missing
- 26
  - 27
  - 35
  - 39
  - 71
  - 77
  - 82
  - 83
  - 84
  - 85

