MAKAI OCEAN ENGINEERING, INC
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June 4, 1990

MEMO

TO: Vince Peterson, John Learned
COMPANY: High Energy Physics, University of Hawaii

FROM: Joe Van Ryzin

SUBJECT: Progress, DUMAND Site/cable study Contract: 701

Attached is a summary of our progress to date on our cable lay analysis and route survey.

We are continuing to collect data for the DUMAND project, but basically our funds have been expended. We need to discuss further Makai's role in further work. We will, however, continue to chase down information as it becomes available and we have time.

CABLE RUGGEDNESS:

We have modeled the cable laying on the seafloor to determine the level of bottom roughness that the cable can withstand without excessive cable bends. A brief report and several plots are attached. We laid your cable over the roughest portions of the recent Tri-Island cable route survey (Maui, Molokai, Lanai) and had no unacceptable bends. We also laid your cable over simple step functions, typical of what we may see on the seafloor. Only at 20m steps and above did we have small bend radii. At 20 m we encountered a 0.14m bend radius, just short of the 0.15m value George Wilkins feels comfortable with.

It is difficult to quantify roughness, but the cable is sufficiently light and stiff that it can be laid on a very rough bottom without excessive bending. Only with a cliff at 20m or more do we begin to be concerned.

SITE DATA COLLECTION:

Makai has been working with Bob Mitiguy in collecting data on the DUMAND site and cable route. This has been a long-term collection effort and the data available is summarized in the attached outline. Some we are still in the process of obtaining.

The most significant data available are the Sea Beam bathymetry which maps the entire Dumand area from 1000m and below. Attached is a copy of this bathymetry, in 20m contours, with the first choice DUMAND site identified (figure 1) and the sites of other data pointed out (figure 2).

Cable Route:

We have indicated our choice for the cable route to the DUMAND site. This route is selected to avoid primarily the steep regions identified in the SeaBeam bathymetry. The route characteristics are as follow:

1. The shoreline is a lava cliff. There are currently lots of pipelines over this cliff and several different successful designs through this region. There are engineering solutions and I don't believe it is a concern relative to a cable route.

2. For the first kilometer, the bottom is predominantly sandy and smooth. There are very few natural obstacles, and none are significant relative to your cable. There are several pipelines in the area and these will have to be avoided. A dedicated corridor for your cable will have to be established with NELH.

3. At about 1 km offshore, the bottom abruptly becomes very steep, up to 30 deg, at a depth of 160m. If there are problem areas, the region from 160m to 500m is most likely to be it. These observations are based on several submarine dives in the region (some have found a smooth, uniform bottom, others have found large escarpments).

4. The best data available from 1000m and above are from a SSI survey last November. These data have not been reduced, and the schedule for the processing is not now known. Hopefully this survey, which concentrated from Keahole Pt. south and from 1000m into shore will be adequate to select a route. Because this survey has concentrated on an area South of the point, we should bring the cable into this area. To go North would require another survey.

5. Below 500m we have a few submarine dives which have all observed smooth, fine sediment on the bottom. The deepest dive in the region has been at 3000' just off Keahole Pt. No significant obstacles were observed during these dives.

6. Below 1000m we have high resolution data from SeaBeam. The contours are 20m. We do not know for sure whether there are 20m ledges along the selected deep water cable path (>1000m), but it is unlikely based on the smooth SeaBeam bottom profiles and comparing these profiles to other Hawaiian areas where we have performed extensive underwater surveys. The likely rough areas clearly show on the SeaBeam data. The probability of the cable having a problem along this path is very low - particularly when you take into account the large number of successful communication cable lays that

are performed with bathymetry data that cannot approach SeaBeam for resolution.

7. The width of the cable path is 1.5 km below the 1000m contour. This is quite wide and adequate for laying cable. Above 1000m depth we can not say and should wait for the SSI data. It is probably wide in this region also except in the region from 170m to 500m. As water becomes shallower, it is easier to more precisely place a cable. At this time, we have not identified any problems relative to cable path width.

8. The total cable length is 27 km. We should add another 10% to allow for slack cable during laying (we will probably pay out 10% excess cable - real cable ships pay out less excess but we should be more conservative considering our experience). This brings the total to 30 km. We should also add some extra (for now) because of our uncertainty on the characteristics of the DUMAND site. See the following.

DUMAND Site:

Our candidate for the DUMAND site is shown on the SeaBeam bathymetric chart. This is the nearest deep water site close to Keahole and with a reasonable cable path to shore. We know the following:

1. The depth is 4770 meters. Location is 19° 44.1'N; 156° 18.5'W.

2. The bottom is fairly flat according to the SeaBeam data. The average slope is 20m/km or 1.2 degrees.

3. We do not have any data (other than SeaBeam) on the immediate site, but have information that may be representative. A paper by P. W. Lipman; *The Giant Submarine Alika Debris Slide, Mauna Loa, Hawaii - 1988* describes the immediate area below the Hawaii slope as "smooth sediment." See figure 3 (at approximately the same scale and orientation as the SeaBeam data).

4. HIG has one core sample which was taken approximately 23 km WNW of the recommended DUMAND site. This is in the same "smooth sediment" region defined in the Lipman paper. This sample Bob Mitiguy and I inspected at UH and observed a fine clay of uniform color and texture for the top meter. The uniform color indicates lack of deposits from turbidity slides. The clay is sufficiently stiff to support vehicles, anchors, etc. Upon mixing the clay with water, it settles fairly quickly.

5. NOSC has some ROV experience in the area. Approximately 14 km south of the proposed site, the RUWS vehicle was lost and was the site of extensive searches several years ago and just recently with their new vehicle. The video tapes from these most recent dives will be made available to the DUMAND team. They were diving in a very rough area (also shown to be rough in the SeaBeam data). Note: NOSC has expressed doubt on the accuracy of the SeaBeam data; we need to check this.

6. While the SeaBeam data implies the bottom is flat, the roughness in not known. It could, for example, be a boulder field with 4m rocks and not be detected by SeaBeam. Depending upon the final connection methods for the DUMAND array, the level of roughness may be important. More survey work is needed at the site. Makai recommends the following:

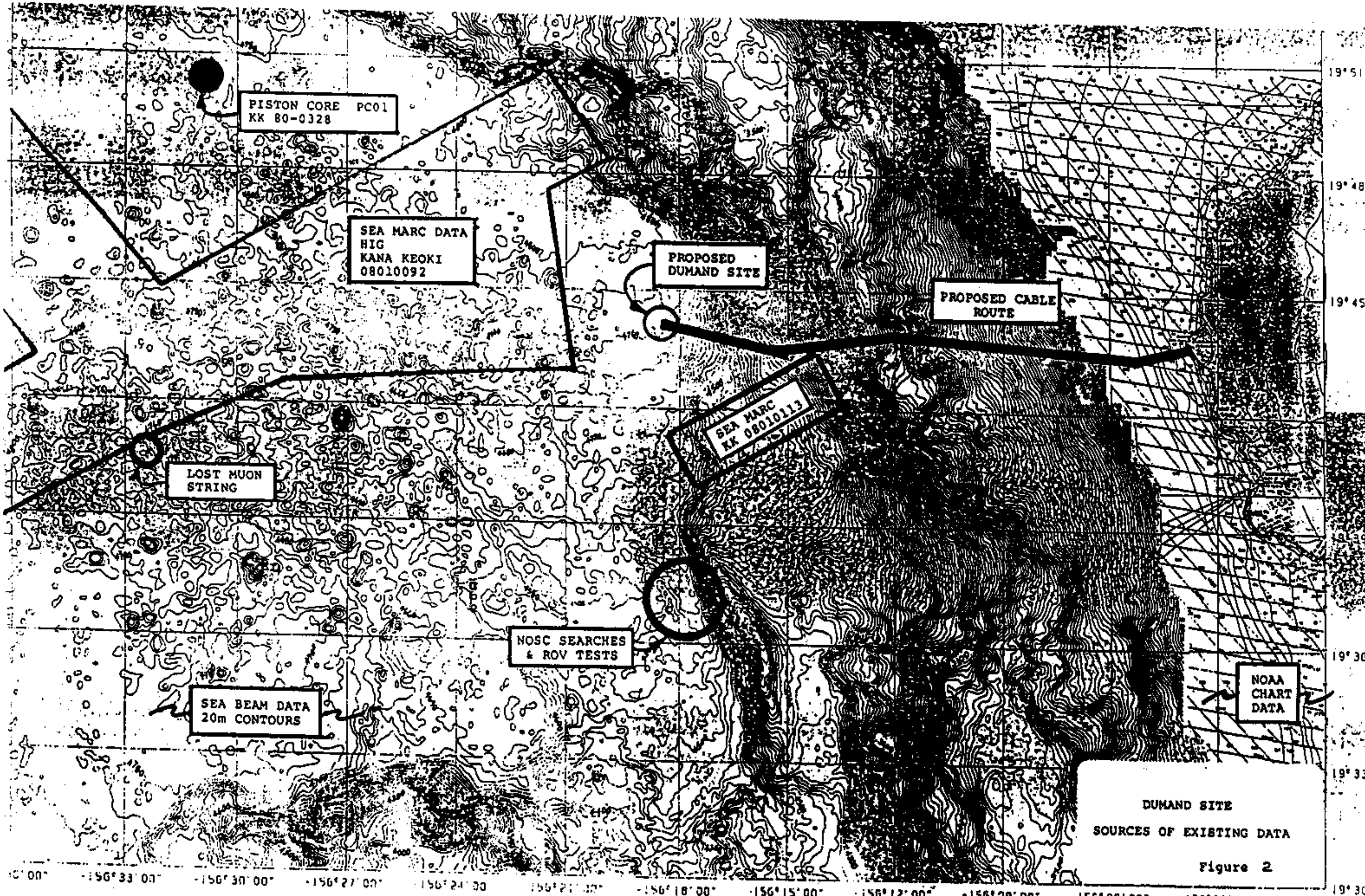
    a. Bob Mitiguy has made arrangements for the Kila to take core samples in the area while towing the HURL pisces to and from Loihi. The cost to DUMAND would be the materials only. This should be done as soon as possible. Consistent core data would confirm a wide sediment covered area.

    b. A towed sled over the area providing photographic coverage of the bottom should be sufficient to define bottom roughness. Equipment exists at UH that can do this survey. If a rough bottom is found, and a smooth bottom is required for deployment (depending upon the support vehicle), the search may have to be expanded to the N or S.

7. HIG's SeaMarc has made two cruises in the area. The survey areas are indicated in figure 2. These surveys were used in the Lipman paper and provided evidence of the "smooth sediment" area.

8. The GLORIA system (low frequency wide swath side scan) has also surveyed the west coast of Hawaii. These images were used by Lipman. The Gloria resolution is very poor, the data are qualitative, and the images probably will not shed any further light on the site characteristics. The data has, however, been requested

9. We do not know for sure what the bottom characteristics are. It is most likely smooth clay sediment, but it could be rougher.

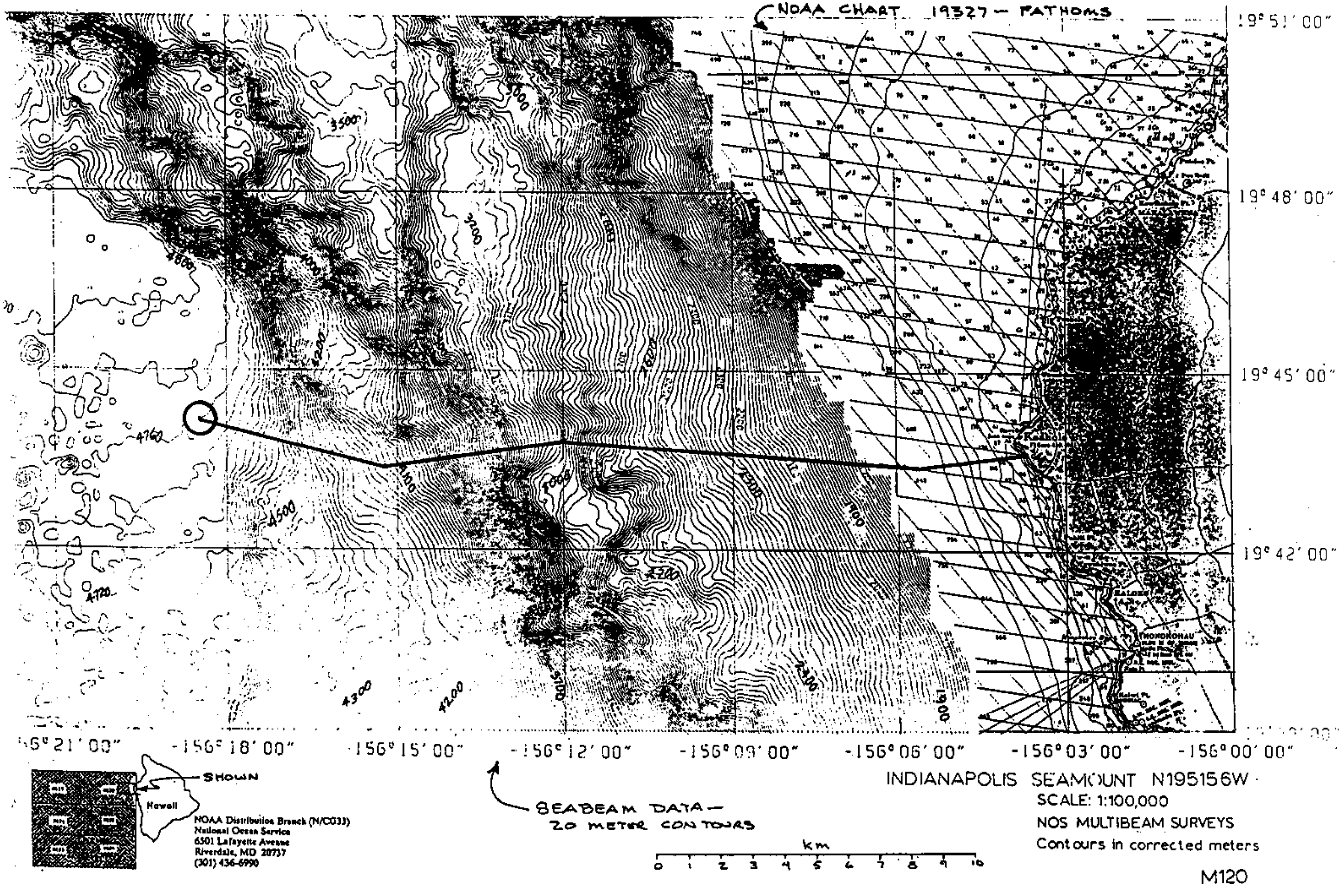


DUMAND SITE

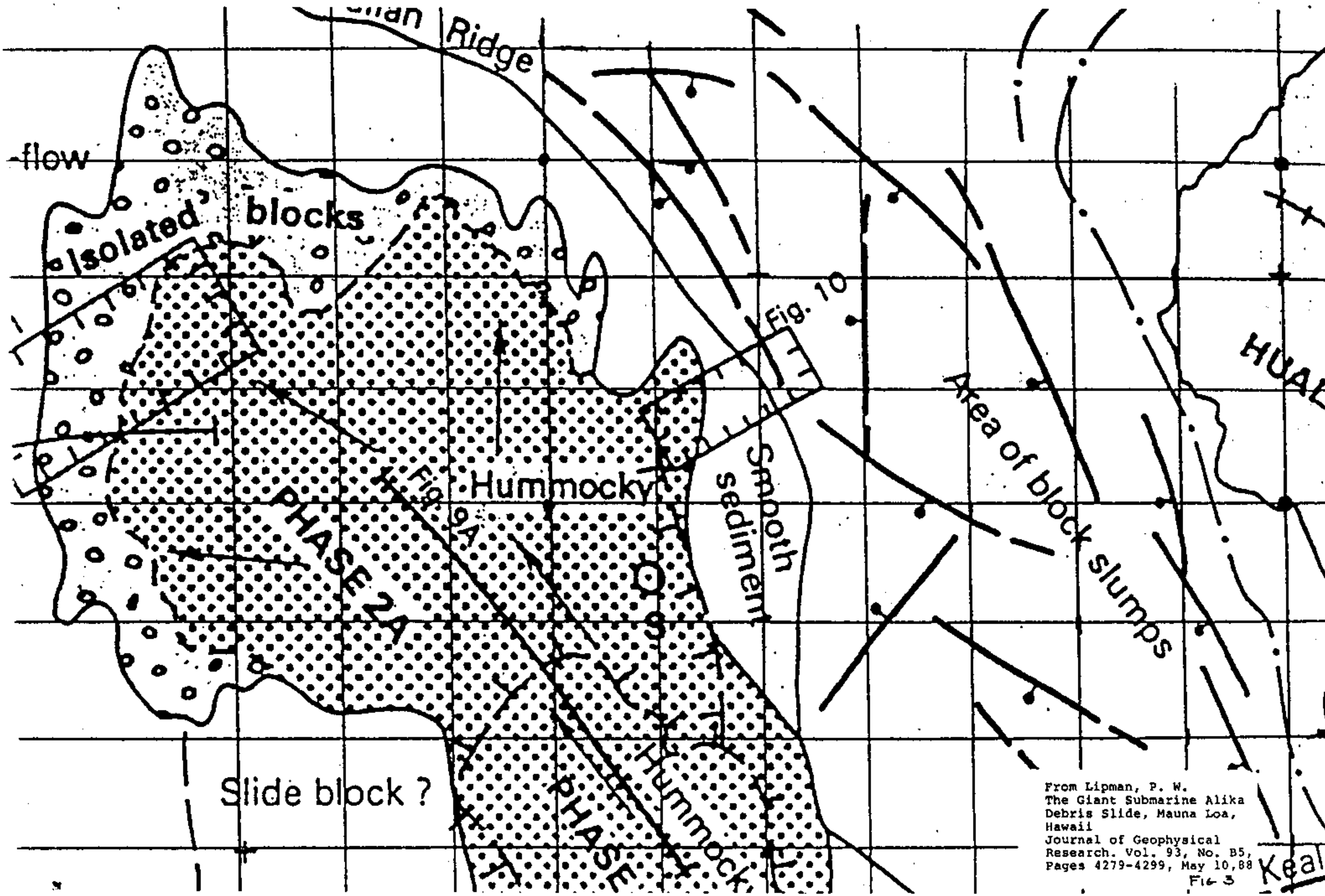
SOURCES OF EXISTING DATA

Figure 2

INDIANAPOLIS SEAMOUNT N195156W



NOAA CHART 19327 — FATHOMS
19°51'00"
19°48'00"
19°45'00"
19°42'00"
3500
3700
4000
4200
4300
4500
4720
4760
4800
-156°18'00"
-156°15'00"
-156°12'00"
-156°09'00"
-156°06'00"
-156°03'00"
-156°00'00"
SHOWN
Hawaii
NOAA Distribution Branch (N/CG33)
National Ocean Service
6501 Lafayette Avenue
Riverdale, MD 20737
(301) 436-6990
SEABEAM DATA —
20 METER CONTOURS
km
0 1 2 3 4 5 6 7 8 9 10
INDIANAPOLIS SEAMOUNT N195156W
SCALE: 1:100,000
NOS MULTIBEAM SURVEYS
Contours in corrected meters
M120



From Lipman, P. W.
The Giant Submarine Alika Debris Slide, Mauna Loa, Hawaii
Journal of Geophysical Research. Vol. 93, No. B5, Pages 4279-4299, May 10,88
Fig 3

Makai Ocean Engineering: DUMAND work summary
5/10/90

I. Sources for Dumand Site Data:
   A. Gloria Data
      1. Side Scan, qualitative
      2. Covers site, resolution 50 m?
      3. Source:
         a. Reference #1, Peter W. Lipman, US Geological Survey, Federal Center, Denver, Colorado.
         b. Hi GLORIA project - US Geological Survey, David Clague, Mark Holmes, Robin Holcomb
         c. Collected by R/V Farnella, 1986, days 310, 311, 329
   B. Sea MARC II - HIG, UH
      1. Three cruises in area: 8010090, 8010092, 8010113
   C. SeaBeam -
      1. Have: from National Ocean Service
      2. 20 m contours
      3. Not close to shore, starts at about 1000 m depth
   D. Geology Papers:
      1. Have
         a. Lipman, P. W.; *The Giant Submarine Alika Debris Slide, Mauna Loa, Hawaii - 1988*
         b. Moore, J. G.; *Prodigious Submarine landslides on the Hawaiian Ridge*
         c. Campbell, J. Frisbee; *Rapid Subsidence of Kohala Volcano and its Effect on Coral Reef Growth.*
         d. Moore, James G., Fiske, Richard S; *Volcanic Substructure Inferred from Dredge Samples and Ocean-Bottom Photographs, Hawaii*
      2. To Get
         a. Call Fornari at Lamont - he has several papers
         b. Wilde, Pat: Oceanographic data off southern Hawaiian Islands, Publ 359, Lawrence Berkeley Lab, Earth Sci. Div., Berkeley, Calif - 1980
   E. Submarine Dives - Turtle and SeaCliff
      1. Fornari. - lots of dives along W hawaii, perhaps 15?
         a. Need to contact
   F. Makai Submarine Dives
      1. Turtle
         a. 3000', due W of Keahole Pt. (Mini OTEC site)
         b. 2000', base of 12" CWP
         c. Up slope, 2000' to 1000'?
      2. Star II dives 200' to 1200'
      3. Pisces V dives, 2300'
   G. RM Towill survey, bathymetry. HOST sites
      1. Best that is available now for S of Keahole Pt.
   H. SSI surveys, Dec '89
      1. South of Keahole Pt, out to 1000m depth
      2. Unprocessed at this time, SSI delaying processing (very busy), cannot predict when completed. Much

less than one year away.
3. Data quality unknown. Campbell indicated problem in taking data. Invitied over to look at raw data. Must do to know what to expect.

I. Ed Noda survey, to 3000', off Keahole - uncorrected.
   1. Approx '72?

J. Ed Noda Star II dive
   1. filmed, poor quality, underexposed
   2. 1200' depth to 500' depth (stuck on bottom)

K. Dames and Moore survey for Parson's Brinkerhoff: Best that is available directly off Keahole: area of pipeline routes.

L. Scripps
   1. recovery of DUMAND array
      a. No data on bottom (Talked to Bogeman)
      b. Was S of presently considered site
   2. Spiess provided deep tow side scan and photographs to Lipman, reference #1 - probably from RUWS search

M. TRIEST dive on RUWS.
   1. Location: South of site
   2. Was in very rough bottom.

N. Geology samples - cores, samples.
   1. Bob M has identified several cores and dredges N of site. One is applicable, others too far North.
      a. Core near "old" Dumand site: ~19° 50.5', 156° 30.8' Shows as same "Smooth Sediment" layer as identified in Lipman paper
      b. Bob/Joe observed sample: Soil is a clay, fairly firm, could apply 8 to 10 psi with little indentation.
      c. Color and consistency uniform for top meter. According to Roy Wilkins, color bands are indicators of past turbidity flows.
      d. Have two samples from this core. Need to test in water: will it cloud camera lenses, etc.? (unlikely, have never heard of this problem)
   2. Roy Wilkins: general deep soils in Hi waters are heavy clay from mineral sources, not biogenic which can be very light and fine. Should have good soil support. Clay very adhesive.

O. NOSC 1990 ROV dives on RUWS loss site and old DUMMAND site
   1. Lots of video available. Bob M getting
   2. Did most of dives in rough area S of our site
   3. Some indication that SeaBeam is incorrect: NEED TO CHASE THIS DOWN
   4. Old Dumand site reported as rough? NEED TO CONFIRM

P. 1. Other cruises
      a. Some Lamont cruises. None real close.

II. Site:
   A. Cable Route:
      1. Route identified through SeaBeam data: most probable.

2. Slope uniform: from 8° avg to 10° max in SeaBeam area below 1000m.
3. Slope steep: about 30° in nearshore areas at 177m depth. These areas recently surveyed by SSI, awaiting data.

B. DUMAND site:
1. LIttle data other than SeaBeam (20 m resolution) and Lipman paper (Gloria, 50m resolution) says is smooth sediment.
2. Need cores of area. Bob M has arranged for cheap cores to be taken by KILA. Must take advantage of this now.
3. Bottom roughness still not known. Important for anchoring, array geometry, and installation.
4. Recommend survey of this area:
   a. Camera sled OK
   b. BRS good, needs some updating. Could combine with camera sled.
   c. New UH ROV's - could use.
   d. Survey relatively small area. Will have problems if the whole region is not uniformly smooth. Will need to pinpoint your area.

III. Summary of Cable Lay Tolerance Study:

A. Characteristics of DUMAND cable: light and flexible

B. Analysis of cable on bottom
1. 20m cliffs OK, 10 m single contact pinacles are limit.

C. Conclusions:
1. Risk is small for damaging cable on the bottom:
   a. Based on long communication cable history: no failures except at Hurricane Iwa: landslide
      (1) No better surveys for these cables
      (2) Cables similar in vulnerability, stiffness, etc.
   b. Only very steep region is near Keahole at 500' depth. These areas recently surveyed by SSI, can probably find route through this region that is safe.
   c. Ran over much of Tri-Island cable bottom bathymetry (rougher areas) and had no small bend radii except where obviously bad data.
2. Cost of survey is high:
   a. To get better than 10 m countours, need to do better than SeaBeam. Not much exists - need to tow package close to bottom.
   b. Need to cover wide swath, because laying accuracy is not good.

CABLE RUGGEDNESS: DUMAND CABLE LAY

SUMMARY

Calculations show that the cable could lay over a 15 meter cliff or a 10 meter point outcrop without an unacceptable bend radius.

EXPERIMENTAL DETERMINATION OF EI

The weight and the acceptable bend radius were supplied to us by the DUMAND group.

The cable stiffness (EI) was measured by horizontally deflecting a short cantilevered section of cable with similar stiffness to the DUMAND cable.

The following properties were used to analyze the DUMAND cable:

EI = 0.144 kg*m**2 (cable stiffness)
w = .4175 kg/m (cable wet weight)
Rc = 6 inches (0.15m) (acceptable bend radius)

ANALYTICAL CABLE LAYING

The program ROLL was used to simulate the bend radii that would occur by laying the cable over a real bottom. A summary of how ROLL works is attached.

The cable was laid over the roughest portions of the Tri- Island Survey -- a recent survey done by Makai Ocean Engineering and Sea Floor Surveys between the islands of Molokai, Lanai, and Maui (see attached plots).

The cable was also laid over some theoretical bottom profiles to examine some limiting conditions (see attached plots).

One limiting condition is a theoretical outcrop of zero width. This can be approximated by a single point displaced above a flat bottom. This was performed for three different outcrop heights -- 5, 10, and 20 meters. The resulting bend radii were 0.19, 0.13, and 0.09 meters respectively.

Another limiting condition is a theoretical outcrop of infinite width -- which corresponds to a step function. This was performed for heights of 10 and 20 meters. The resulting bend radii were 0.19 and 0.14 meters respectively.

Since the minimum acceptable bend radius is 0.15 meters, and the zero width outcrop is probably a worst case scenario, a 10 meter high outcrop is deemed safe, a 20 meter is just barely beyond the limit at 0.14 m radius.

EXPERIMENTAL VERIFICATION

Because the physical properties of the DUMAND cable are so different than the tri-island power cable, an experiment was performed to verify the results of the analytical program. Note also that the analytical program assumes small angles -- an assumption that is violated in the extreme theoretical limits tested above.

The experimental setup consisted of a 2 meter step function. The sample cable provided by DUMAND was laid over this step and the resulting bend radius measured. Also measured were the distances between various touchdown points and the maximum height of the deflected cable (see figure).

For the 2m step, the calculated minimum bend radius was 0.39m. The measured value was 0.41m. Thus the program calculations are sufficiently accurate despite the violation of the basic assumptions.

NOTES RE ROLL

For an extremely flexible cable such as the DUMAND (ie where EI is very small), occasionally a data point will end up above the cable profile (this occurs occasionally in the attached plots). This feature is due to the algorithm of iterative addition and deletion of touchdown points. Any given point is only added a certain number of times (user controlled). If it still gets removed on the next go-around, it will never be considered for addition again. This is necessary for convergence. In reality it is not a major problem since there is so much uncertainty in the data anyway; however, it is somewhat aesthetically unpleasant.

June 5, 1990
SRJ

SUMMARY OF ROLL PROGRAM

ROLL solves exactly the fourth order differential equation for the deflected shape of a stiff cable as laid over a window of N raw data points. The small angle approximation is used to simplify the governing equation and there must be several spans within the data window.

The four boundary conditions on the data window are the known depths and assumed (zero) moments. Because the moments are actually not known, the first couple of spans at each window edge are inaccurate. (It was shown that conditions over any given span are unaffected by conditions more than 2 or 3 spans away.)

The complete solution within the data window requires both the points where the cable touches down and the moments at these points (the depth is available from the raw data). These are found in two steps:

1) A set of touchdown points are assumed. The resultant moments at those touchdown points are then calculated by iteration.

2) Following convergence of the moments, the set of touchdown points is adjusted using one of the following algorithms:

The shear force is calculated (from the derivative of the moment) at each touchdown point. If this force is downward then that point is not a touchdown point for the next iteration.

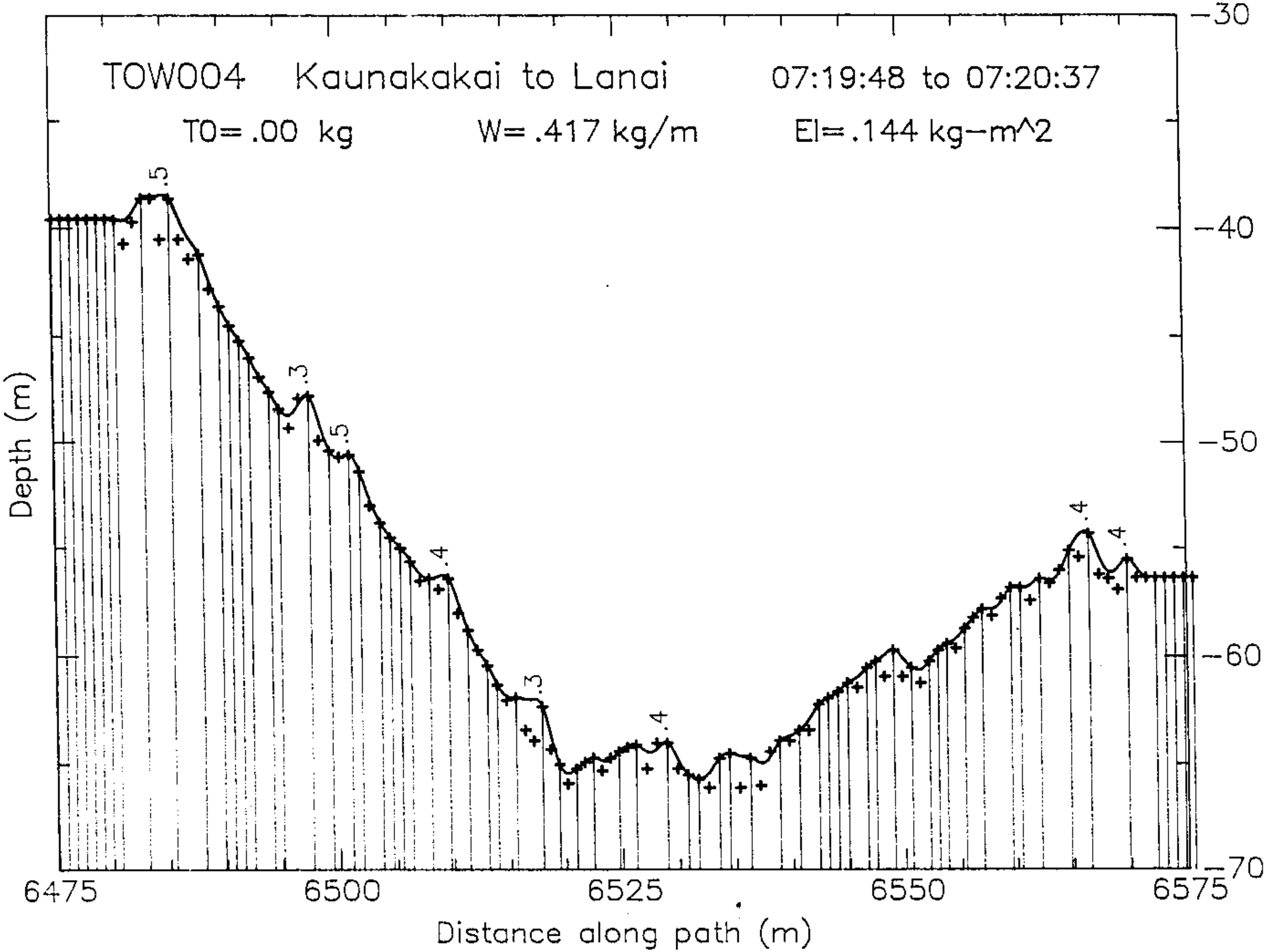
If a raw data point lies above the deflected cable then that point becomes a touchdown point for the next iteration.

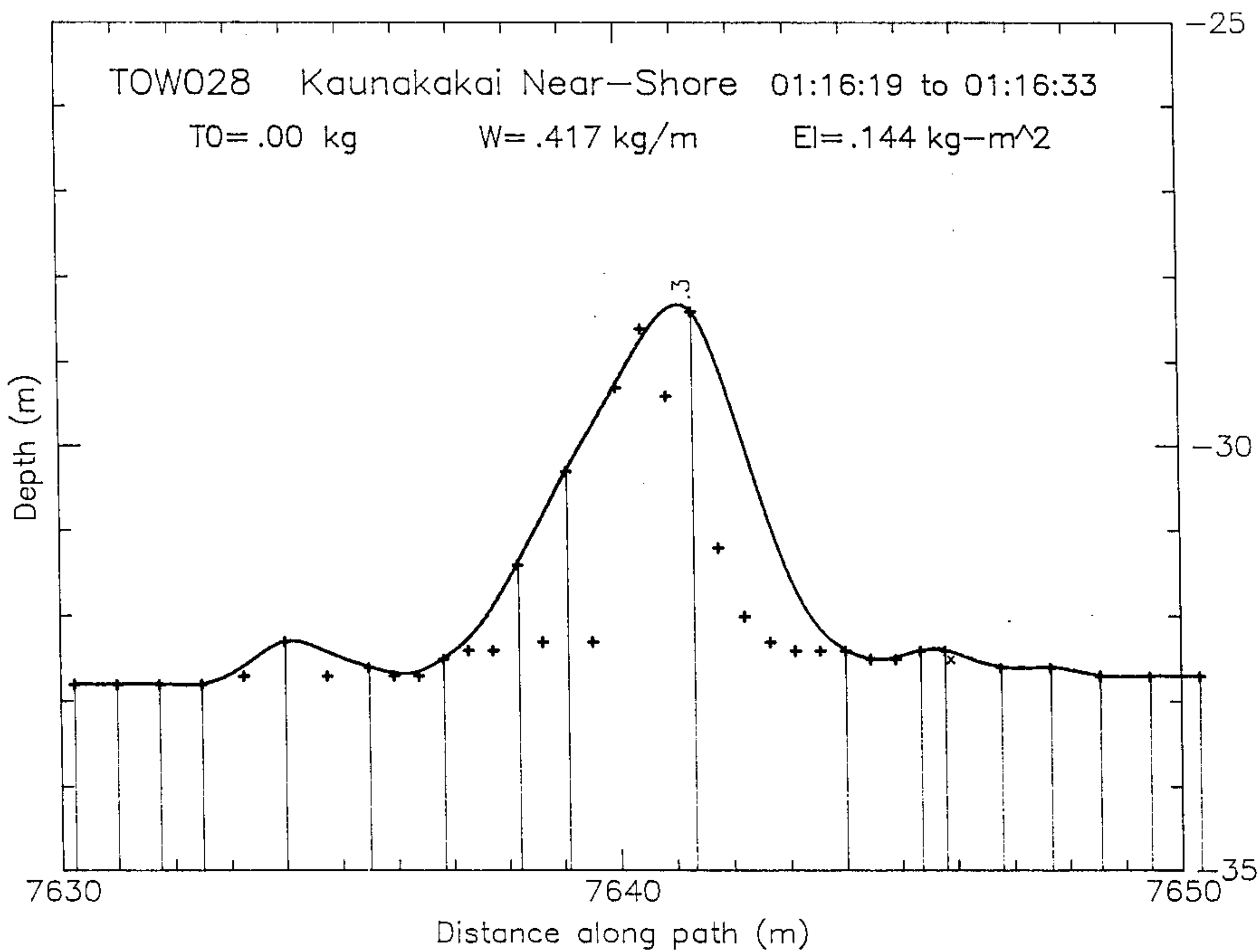
The above algorithm is repeated until the set of touchdown points remain constant. The solution for that window is then displayed graphically on the screen with spans and bend radii that exceed certain criteria noted.

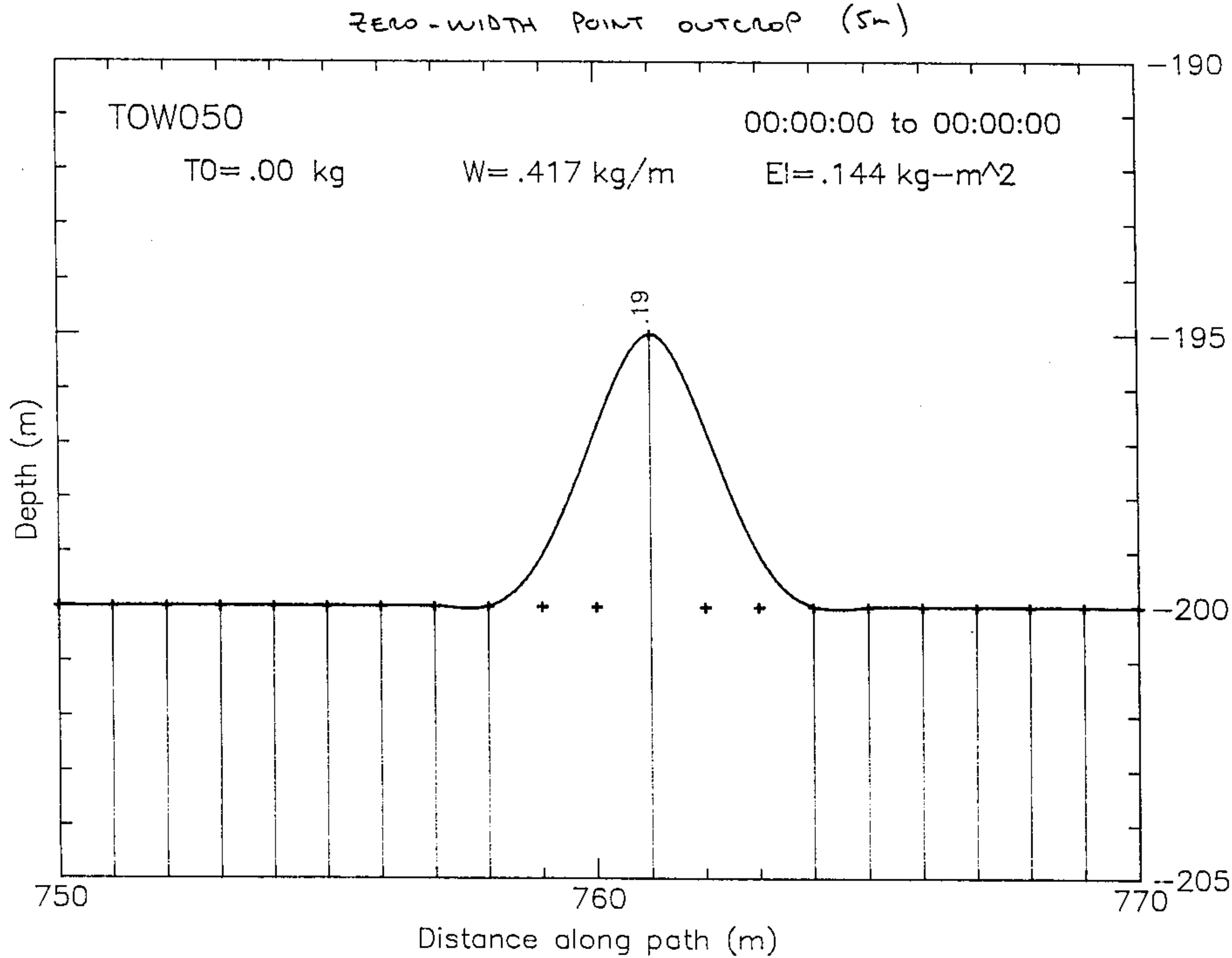
* * *

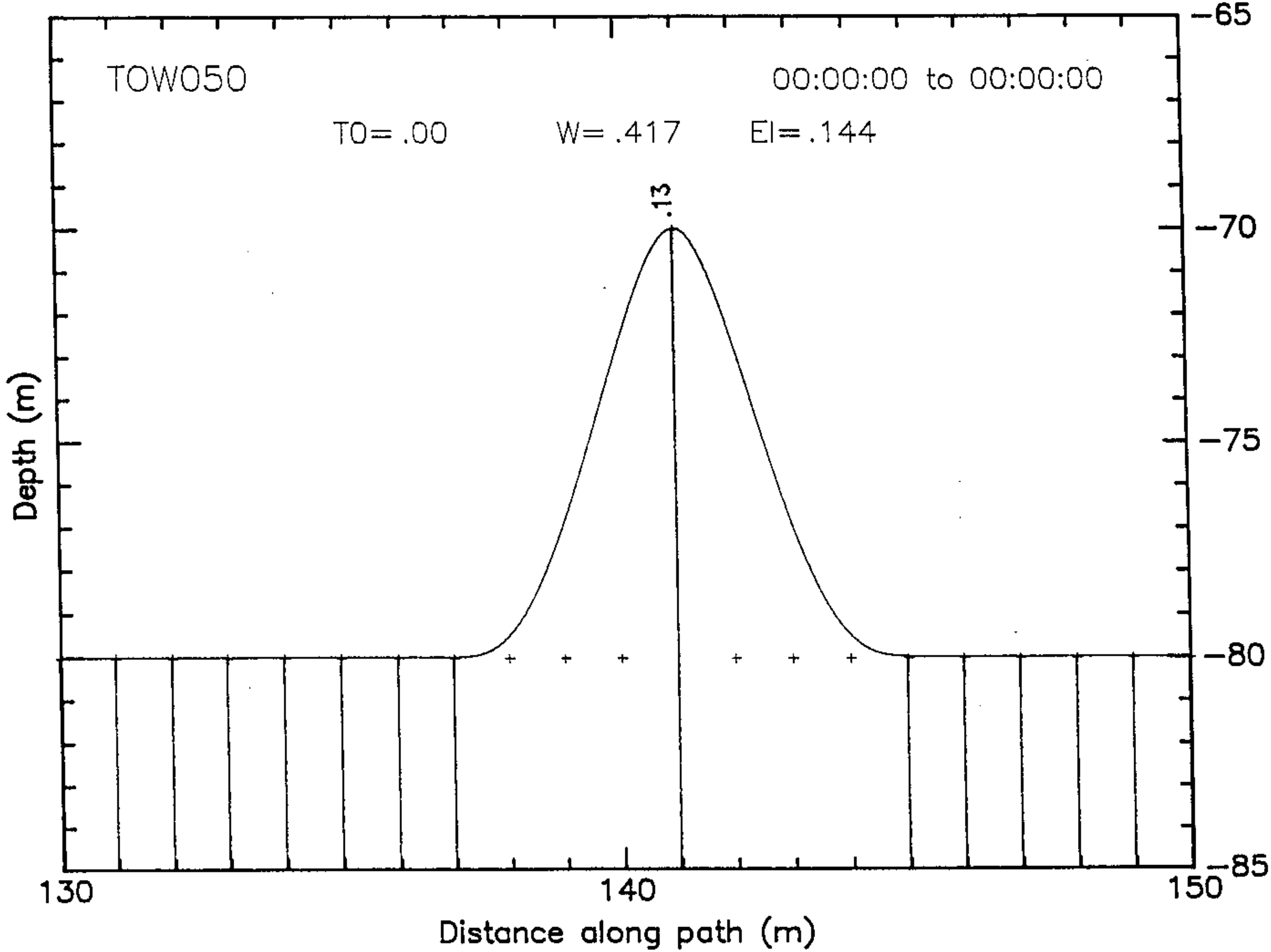
In this manner the raw data is scanned through by windows, each of which overlaps the preceding by a suitable amount. The program allows the user to select the window width, starting location in file, and to manually delete (or undelete) raw data points that appear to be garbage. Pre-processing subroutines attempt to eliminate the garbage data but this is not always possible. Summary files are optionally created which can be accessed by other programs to create summary listings and plots.

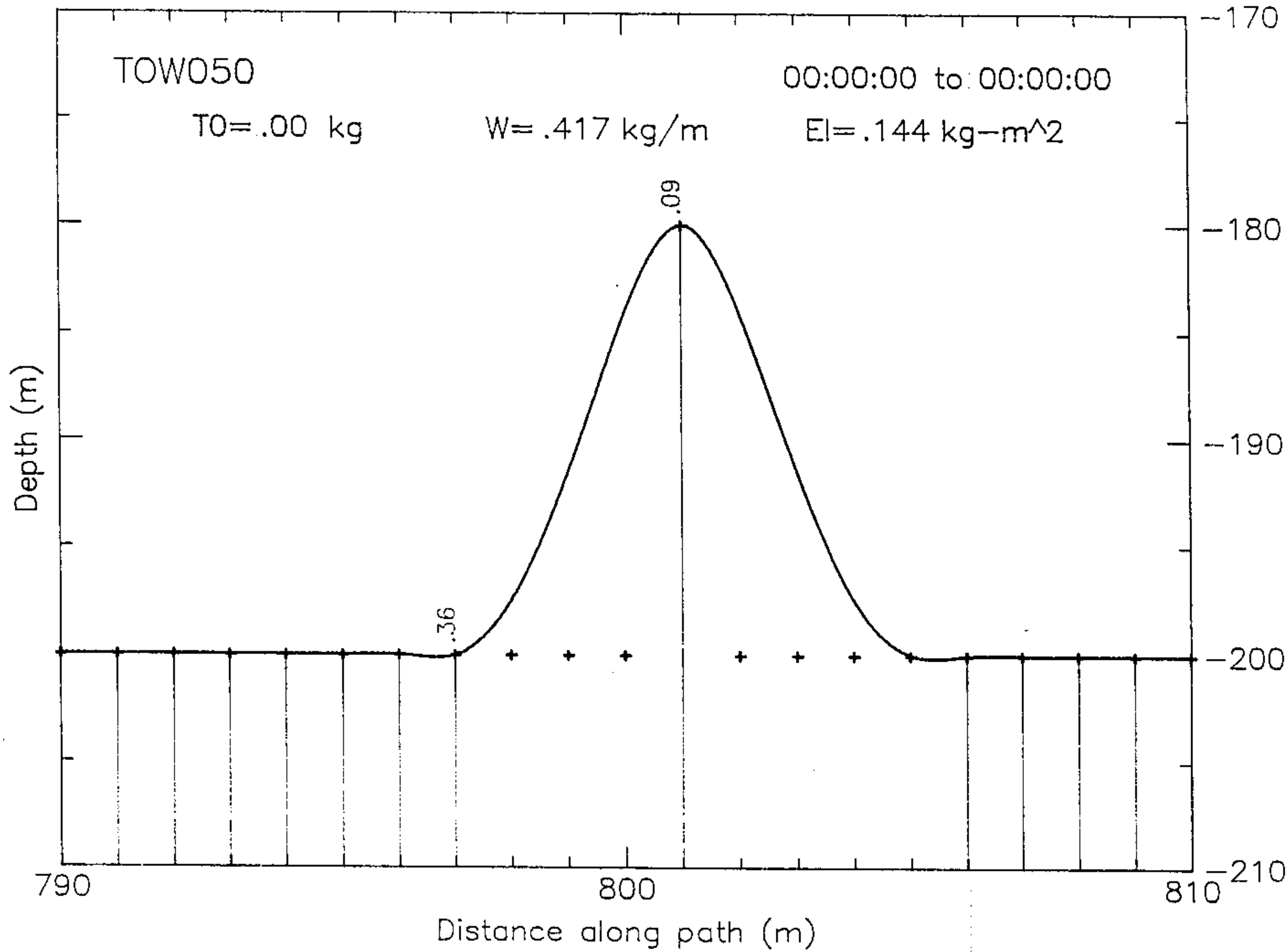
May 31, 1990
SRJ

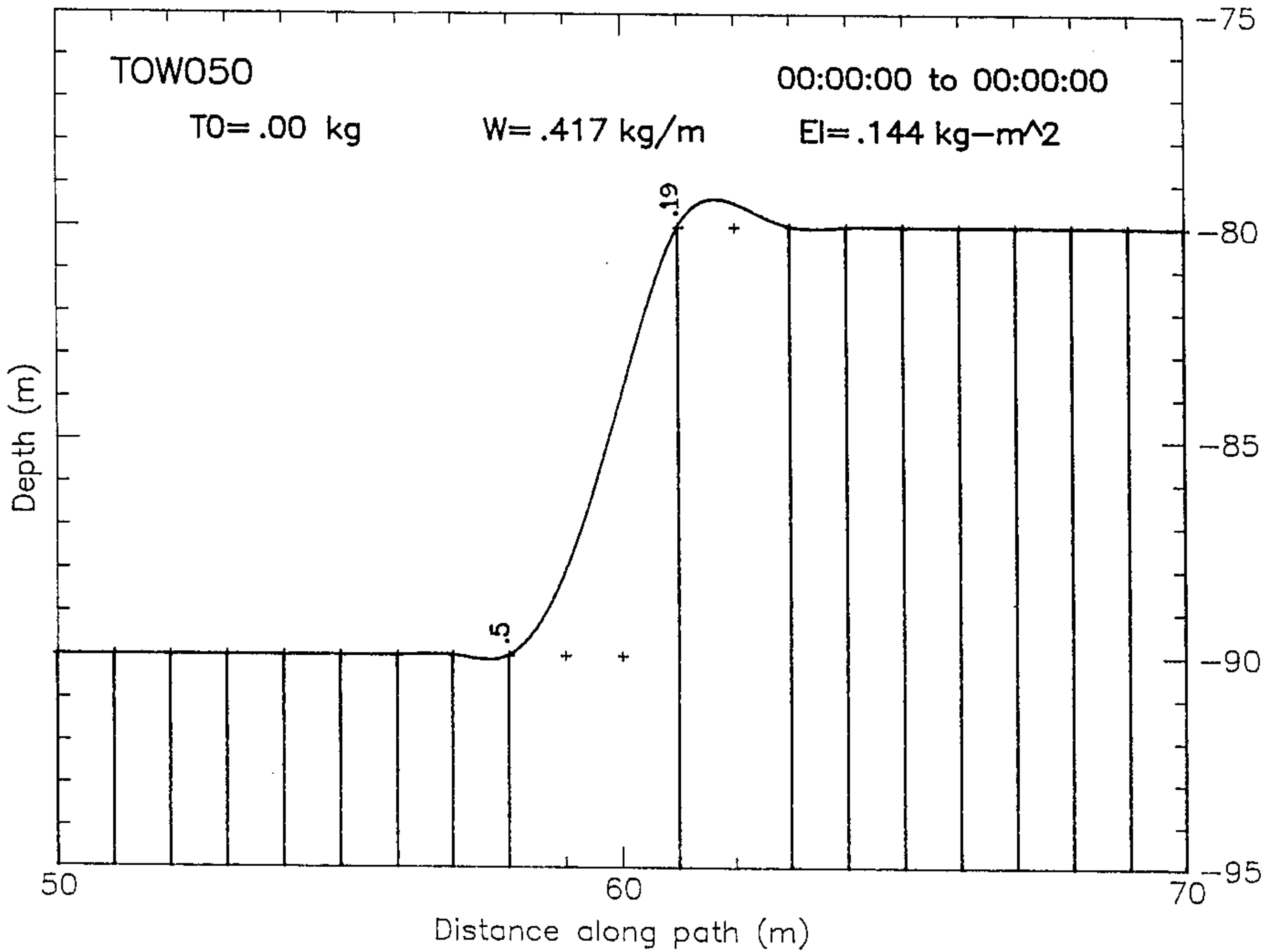

TOW004 Kaunakakai to Lanai
07:19:48 to 07:20:37
T0=.00 kg
W=.417 kg/m
El=.144 kg-m^2
Depth (m)
Distance along path (m)
6475
6500
6525
6550
6575
-30
-40
-50
-60
-70
.5
.3
.5
.4
.3
.4
.4
.4


TOW028 Kaunakakai Near—Shore 01:16:19 to 01:16:33
T0=.00 kg
W=.417 kg/m
EI=.144 kg—m^2
Depth (m)
Distance along path (m)
−25
−30
−35
7630
7640
7650
3


ZERO-WIDTH POINT OUTCROP (5m)
TOW050
00:00:00 to 00:00:00
T0=.00 kg
W=.417 kg/m
EI=.144 kg-m^2
.19
Depth (m)
-190
-195
-200
-205
750
760
770
Distance along path (m)


TOW050
00:00:00 to 00:00:00
T0= .00
W= .417
EI= .144
.13
-65
-70
-75
-80
-85
130
140
150
Depth (m)
Distance along path (m)


TOW050
00:00:00 to 00:00:00
T0=.00 kg
W=.417 kg/m
EI=.144 kg-m^2
.09
.36
-170
-180
-190
-200
-210
790
800
810
Depth (m)
Distance along path (m)


TOW050
00:00:00 to 00:00:00
T0=.00 kg
W=.417 kg/m
EI=.144 kg-m^2
.19
.5
Depth (m)
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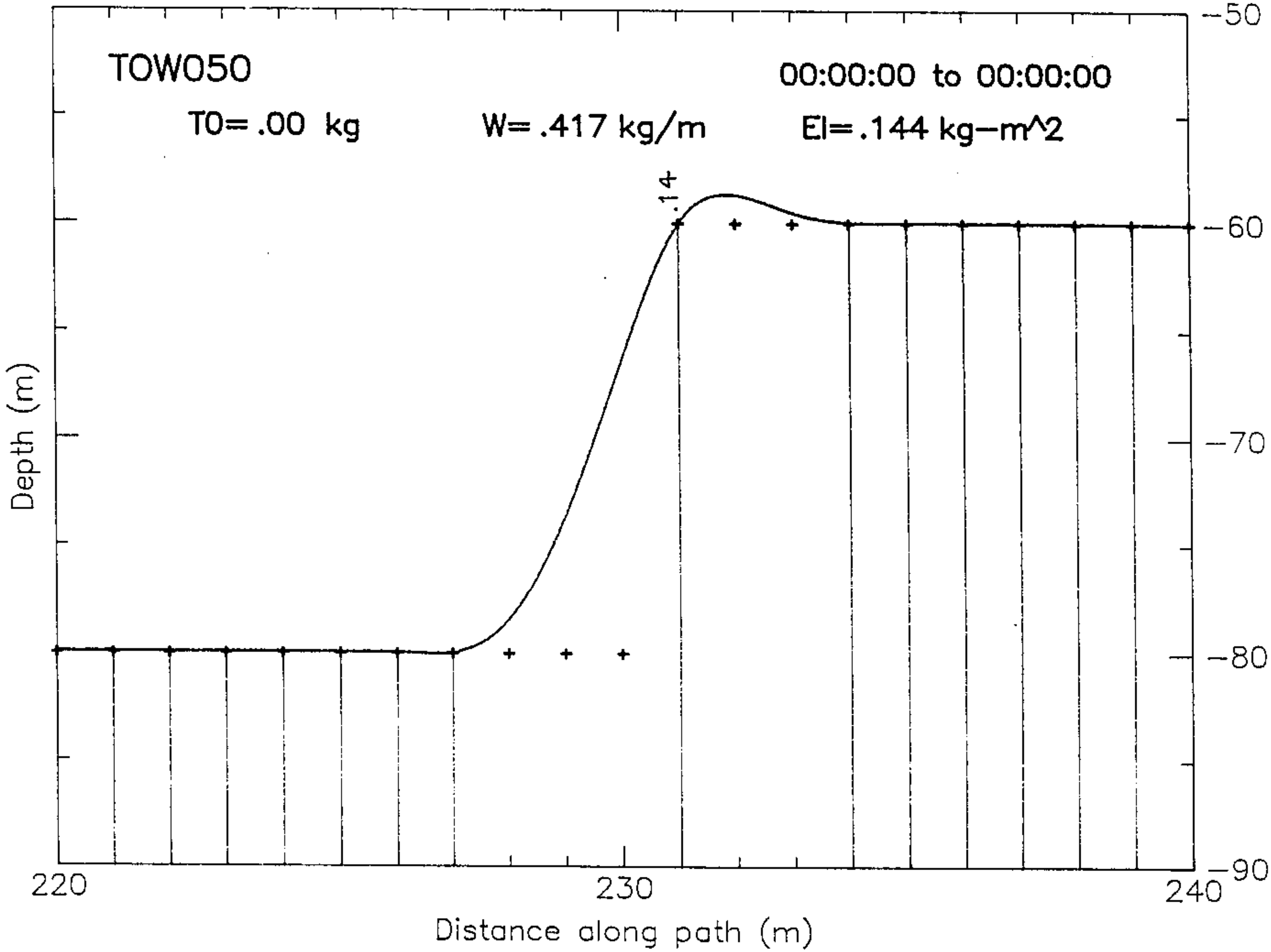
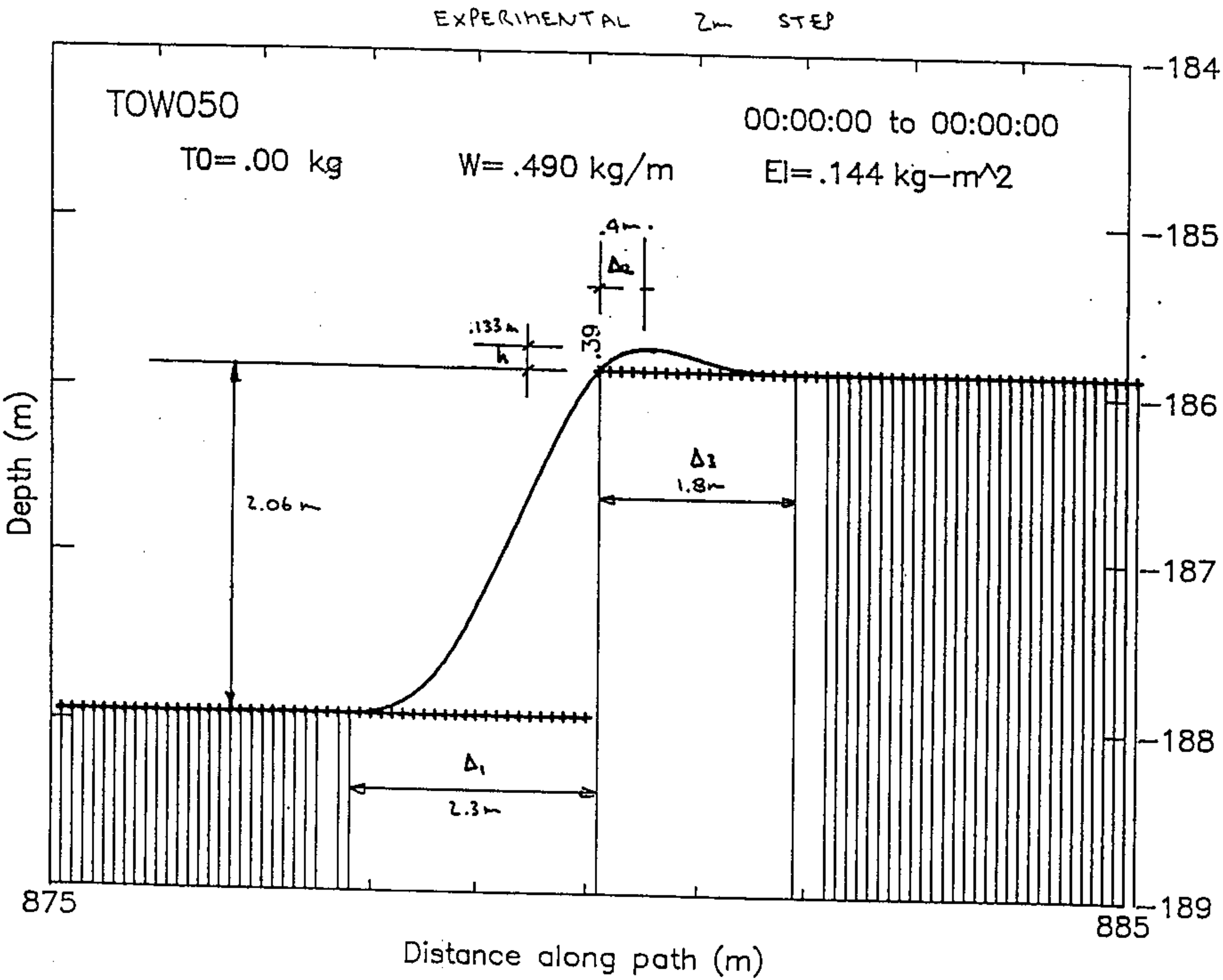
-95
50
60
70
Distance along path (m)


TOW050
00:00:00 to 00:00:00
T0=.00 kg
W=.417 kg/m
EI=.144 kg-m^2
.14
Depth (m)
-50
-60
-70
-80
-90
220
230
240
Distance along path (m)


EXPERIMENTAL 2m STEP
TOW050
T0=.00 kg
W=.490 kg/m
00:00:00 to 00:00:00
EI=.144 kg-m^2
.4m
Δ2
.133m
h
.39
2.06m
Δ3
1.8m
Δ1
2.3m
-184
-185
-186
-187
-188
-189
875
885
Depth (m)
Distance along path (m)

MAKAI OCEAN ENGINEERING, INC.
TELEPHONE CONFIRMATION

June 5, 1990
Time: 11 am
Outgoing Call

TALKED TO: Dr Peter W. Lipman
COMPANY: USGS - Denver Colorado
ADDRESS:

Tel no: 303 326-1020
Fax no:

MOE Rep: Joe Van Ryzin

SUBJECT: DUMAND site

Contract: DUMAND

Had tracked him down via NOAA (Gloria data, Dr Sloss, NOAA, 303-497-6119.

He is primary author of "The Giant Submarine Laika Debris Slide ...". I wanted to get information of the Gloria project, raw survey data. Explained DUMAND project (he not familiar).

He referred me to two people who handle the Glorai data, and the other Hawaii geology data:

David Claig, USGS, Menlo Park, Calif: 415 354-3207
Chris Gutmacher (co author), Menlo Pk, 415 354-3071

MAKAI OCEAN ENGINEERING, INC.
TELEPHONE CONFIRMATION

June 5, 1990
Time: 11:10
Outgoing Call

TALKED TO: David Claig
COMPANY: USGS — Tel no: 415 354-3207
ADDRESS: Mail stop 999, 345 Middlefield Rd — Fax no:
Menlo Park, calif 94025
MOE Rep: Joe Van Ryzin

SUBJECT: DUMAND site — Contract: DUMAND

Claig is the person responsible for the Hawaii data.
He felt almost positive that there is a 5m contour version of the SeaBeam data - we should check with John Wiltshire or Alex Malahoff, they would know. He thought the 5m is the limit of the SeaBeam accuracy (although he didn't sound very positive on this)

The Gloria interpretation is difficult. There is penetration into the sediment 5 to 25 m and the resulting image is a complex combination of the surface and whatever is below. For the sand we have in these areas, we probably have 5 m penetraton.

The smooth sediment is interpreted from a uniform return from Gloria and also from sub-bottom profiling transects of the area. They have lots of those, one example is shown in the paper.

The resolution of Gloria is not good. The pixel is 50 x 100m - objects smaller than that cannot be seen.

Three other people who can help relative to other data that is available in the area. They are still collecting information off Hawaii - not all of it was available for the Lipman paper.
Jim Moore, USGS, Menlo Pk., 415 329-5244
Bill Normark, USGS, Menlo Pk, 415 329-5101
Terry Hoffman at NOSC, rel RUWS search.

Relative to the Navy search: they had Scripps, Deep Tow, Nautile, Sea Cliff, etc. in the area. Jim Moore could help with this data.

They have two box cores in the area:
4780m 19 49.6' N; 156 40.2' W
4720m 19 43.6' N; 156 24.1' W (3 graded layers of sediment)
I discussed the HIG core we looked at, he felt that was typical of their second box core in the "hummocky" area. The area has lots of deposits, much of it aeral fines from the eruptions. The major slide occurred 110k yrs ago; lots of time for deposits to build. The coarser sand, he called turbidites, come off slope. The amount of debris that goes down slope - and our risk of problems over a 10 yr lifetime he felt was small. There is some volcanic

activity around 19 50'; 156 40' - but nothing large in 25 yrs. If we were south of Kealakekua, there is lots of down slope activity - but not off Keahole Pt.

He recommended writing a letter requesting Gloria image. They have lots of other data, but it is not available for release. We would have to go there to look at it. They do their science first, then release the data. I said I would write, describe our area of interest, and request the Gloria and other data. He said he probably has a sub-bottom profile across our area of interest.

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ACTION ITEMS: By:

Call Alex Malahoff or John Wiltshire re 5 m contour SeaBeam.
Write Jim Moore
Write Claig

Distribution: Learned, Mitiguy

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MAKAI OCEAN ENGINEERING, INC.
TELEPHONE CONFIRMATION

June 5, 1990
Time: 2 pm
Outgoing Call

TALKED TO: Dr Sandy Shore
COMPANY: HIG
ADDRESS: UH

Tel no: 956-7796
Fax no: 956-2538

MOE Rep: Joe Van Ryzin

SUBJECT: DUMAND site, SeaMARC data   Contract:

Requested data from two KK cruises: 08010092 and 08010113. Gave coordinates of interest for SeaMarc. Shore will give coordinates to processing group to find out where SeaMarc was operating in the area. He is very familiar with Lipman paper, he had provided to DUMAND group.

He did not know if any of this earyl SeaMARC data had been processed. I indicated I was less interested in bathymetry, since we have SeaBeam data. The side scan image should be valuable.

He will be leaving for 4 wks after 20th of this month. He can get process started. Karen Sender, head of processing group, will be in charge - I could work directly with her.

Very cooperative, familiar with needs of DUMAND. No discussion of who pays for processing.

Sending our chart of known data.

ACTION ITEMS: By: jvr
Call Thursday to check on progress (his request)
Distribution:

MAKAI OCEAN ENGINEERING, INC.
P.O. BOX 1206, KAILUA, OAHU, HAWAII 96734

June 6, 1990

David Claig
U. S. Geological Service
Mail Stop 999
345 Middlefield Road
Menlo Park, CA. 94025

Subject: Geological Information - West of Hawaii

Dear David:

Thank you for spending so much time with me on the telephone discussing submarine geology west of Hawaii.

Makai Ocean Engineering is providing support for the high energy physics group of the University of Hawaii in their Deep Underwater Muon And Neutrino Detection (DUMAND) project. The two individuals we work most closely with at the University are Drs. Vince Petersen, Department Chairman, and John Learned. Makai is providing ocean engineering support for this project to install an array of muon detectors in very deep water and connect that array via a fiber optic cable to the laboratory at Keahole Point. I have included some illustrations illustrating our primary areas of interest. Figure 1 shows the tentatively selected DUMAND site and a proposed cable route to shore. Figures 2 and 3 are at the same scale and orientation; these briefly summarize the data we currently have available.

Figure 3 is enlarged illustration from the Lipman paper we discussed on the telephone. We have been highly influenced by this illustration as well as the SeaBeam data in selecting our DUMAND site. We prefer a flat bottom with smooth sediment which will make installation easier.

I would like to request a copy of the GLORIA Image Mosaic provided in figure 5 of the Lipman paper. We do not particularly care about the scale - whatever you can provide that gives us the clearest image would be fine. Secondly, you indicated that you might have a transverse seismic reflection profile across our site. If you do, that would be most valuable. Lastly, you have taken a box core sample in the Hummocky region just south of our DUMAND site. If there is any written analysis or summary of this core, that too would be helpful.

OCEAN ENGINEERING AND NAVAL ARCHITECTURAL SERVICES
LOCATED AT MAKAPUU POINT, OAHU, HAWAII
(808) 259-8871 • FAX (808) 259-8238

I've also attached an outline of the various data sources that we are tracking down. You are several years ahead of us in collecting data and have an interest in a much wider region than we do. If there is anything in this list that you don't have, we will be happy to provide it. It's probably much more likely that you will see some major omissions. If you could point us in the right direction, we would be most thankful.

Thank you again for your support.

Sincerely,

JC Van Ryzin

Joseph C. Van Ryzin
Senior Ocean Engineer

JVR:nr

MAKAI OCEAN ENGINEERING, INC.
P.O. BOX 1206, KAILUA, OAHU, HAWAII 96734

June 6, 1990

Dr. James Moore
U. S. Geological Service
Mail Stop 999
345 Middlefield Road
Menlo Park, CA. 94025

Subject: Geological Information - West of Hawaii

Dear Dr. Moore:

Makai Ocean Engineering is providing support to the high energy physics group at the University of Hawaii in their Deep Underwater Muon and Neutrino Detection (DUMAND) project. This project is a physics experiment placing a large array of photosensitive tubes in very deep water in order to detect and measure the source of neutrinos impinging on the earth. Makai's role is to provide engineering support for the installation of this array and a fiber optic cable from the array to the laboratory on shore at Keahole Point, Hawaii.

One of our first steps is to collect existing sea floor data on the west coast of Hawaii. Several people have suggested that I contact you - the most recent is David Claig at U.S.G.S. He indicated that you are continuing to collect data in this region.

I have enclosed several maps illustrating our proposed site and cable route together with some of the information that we have gathered in the immediate area. Note that the third illustration is an enlarged portion of a figure from your paper on the Alika Debris Slide. This figure, together with the latest SeaBeam data, has most influenced our current site selection. We prefer a smooth sediment bottom with clear water and with a reasonable and short cable path to Keahole. The "smooth sediment" areas identified in your paper appear to be likely candidates. David Claig has indicated that he can provide some GLORIA images for us as well as any transverse seismic reflection profiles that might be close to our proposed site. He also indicated that there was a core sample to the south of our proposed site and I have asked for information on that.

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My main reason for writing to you: is there anything else that is available that we should know? I have enclosed a working outline of the information that we either have or are currently pursuing. Your comments would be very welcome.

Incidentally, on an unrelated subject, Friz Campbell asked me the other day if I could provide information to you on the Alenuihaha Channel. He indicated that you were coming to Hawaii in July and were looking for data on the Alenuihaha Channel from the Hawaii Deep Water Cable program. We had been working with that program and Friz for many years and have much of the data here. We would be happy to provide it to you. We have generally found that it is very easy to get permission to release data. If you want to speed up the process, you could write a letter to me now requesting information and I could have it approved before you get here.

I am looking forward to meeting you in July.

Sincerely,

Joseph Van Ryzin
Senior Ocean Engineer

JVR:nr

Enclosures