

ORKUSTOFNUN
Landmælingar

Niðurstöður nákvæmnisfallmælinga

við Dettifoss 1971 og 1972

Desember 1972

NIÐURSTÖÐUR

Niðurstöður mælinganna eru gefnar til kynna á tveimur meðfylgjandi teikningum, FNR-10922 og FNR-10921.

Lárétti ásinn á teikningunum er kvarði fyrir línulengd, þ. e. fjarlægð merkis frá fyrsta merki í línunni.

Lóðrétti ásinn er kvarði fyrir mælda aukningu á hæð merkis (á rúmu ári), ef gert er ráð fyrir að fyrsta merkið í línunni hafi óbreytta hæð.

Á teikningunum eru gefin skekkjumörk fyrir þrjú tiltekin líkindagildi, sem póstítív tala, háð fjarlægð merkis í línu. Þeirri tölu á að bæta við og draga frá mæligildinu, til að fá bilið, sem mælda stærðin liggur í, með tilteknum líkum.

Hitapanstuðull mælistanganna er lítill, og í niðurstöðunum hefur verið reiknað með að hann sé núll. Eysteinn Tryggvason hefur gert athuganir á hitapenslu, og slíkar athuganir verða væntanlega gerðar aftur síðar.

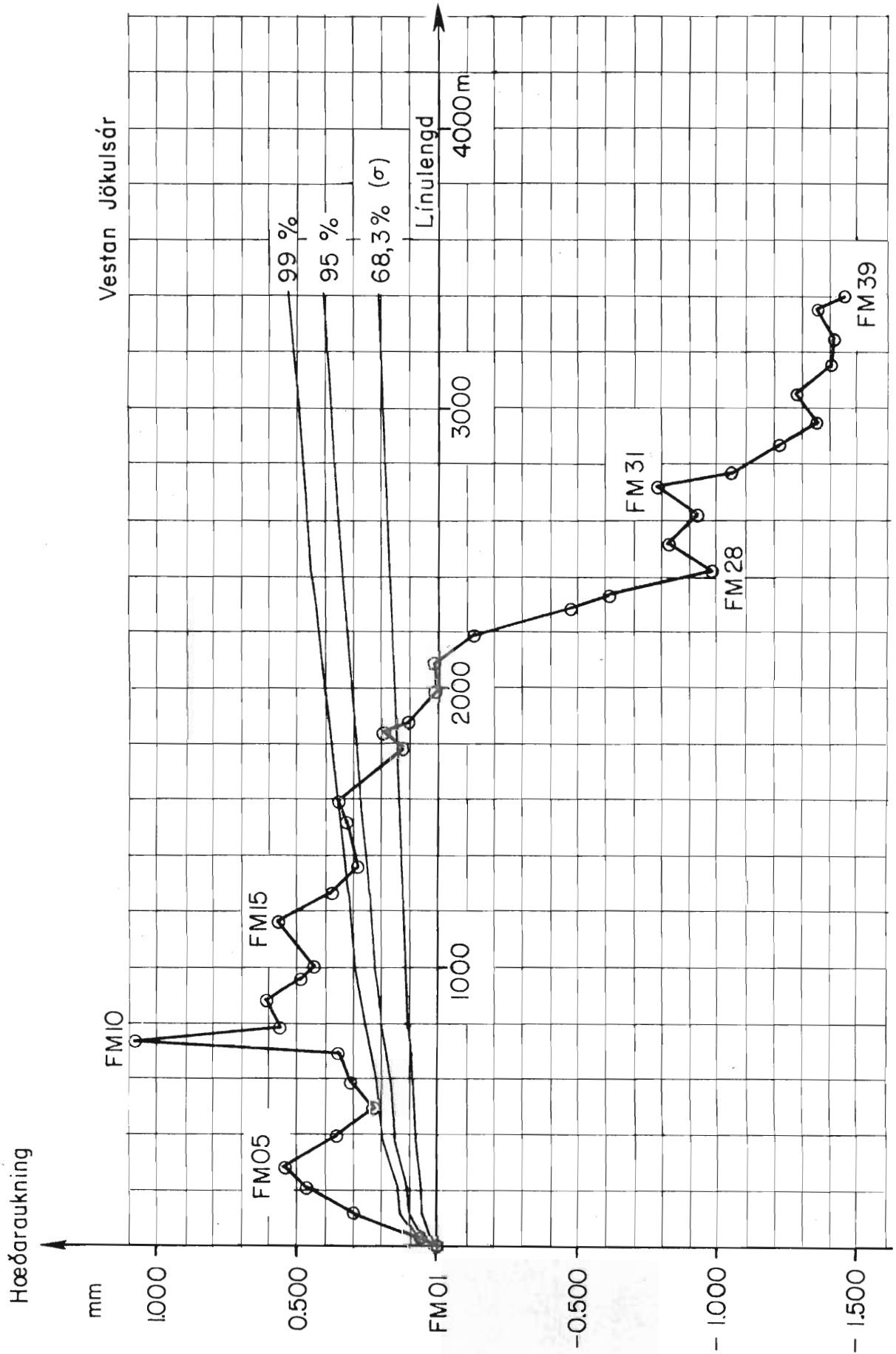
Við túlkun á niðurstöðum mælinganna, ber að hafa í huga að skekkjumörkin eru reiknuð út frá þeirri forsendu, að engar reglubundnar eða grófar skekkjur eigi sér stað. Skekkjur, sem stafa af sigi mælistanga og af mismunandi ljósbroti, eru þær, sem sennilega er erfiðast að útiloka, enda eru öll bilin mæld bæði fram og aftur.

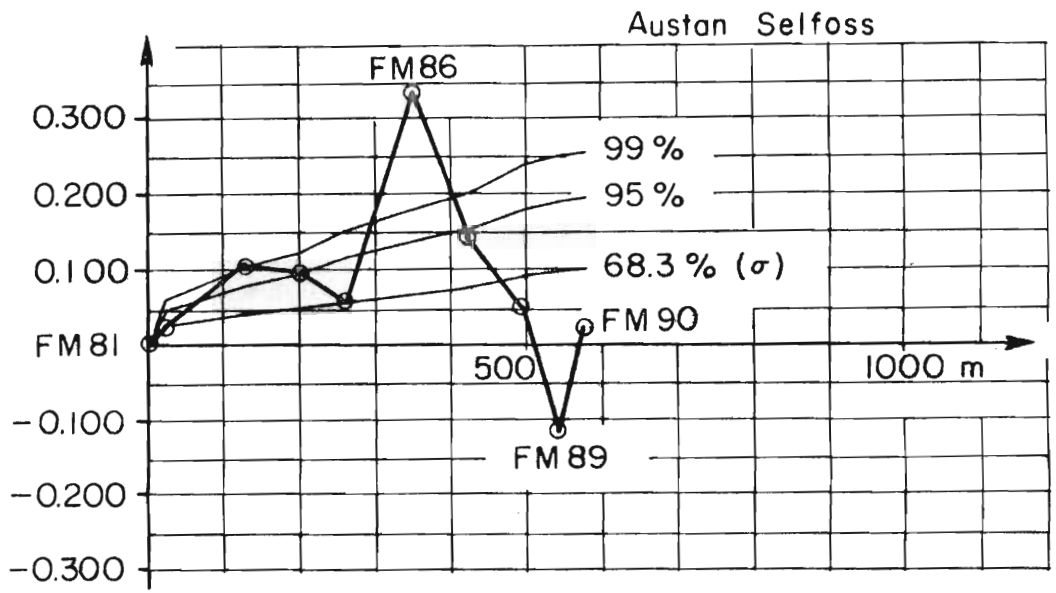
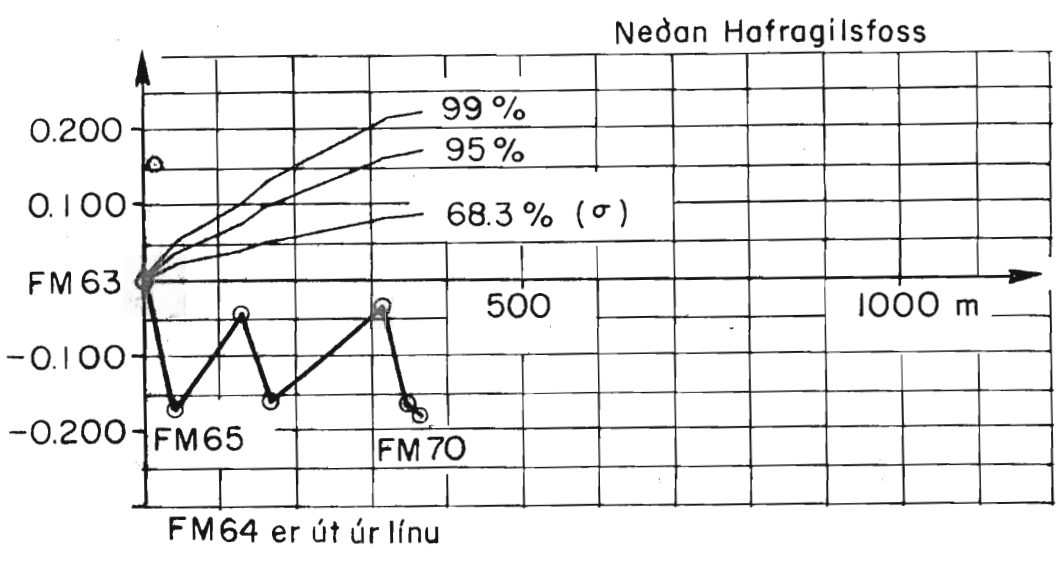
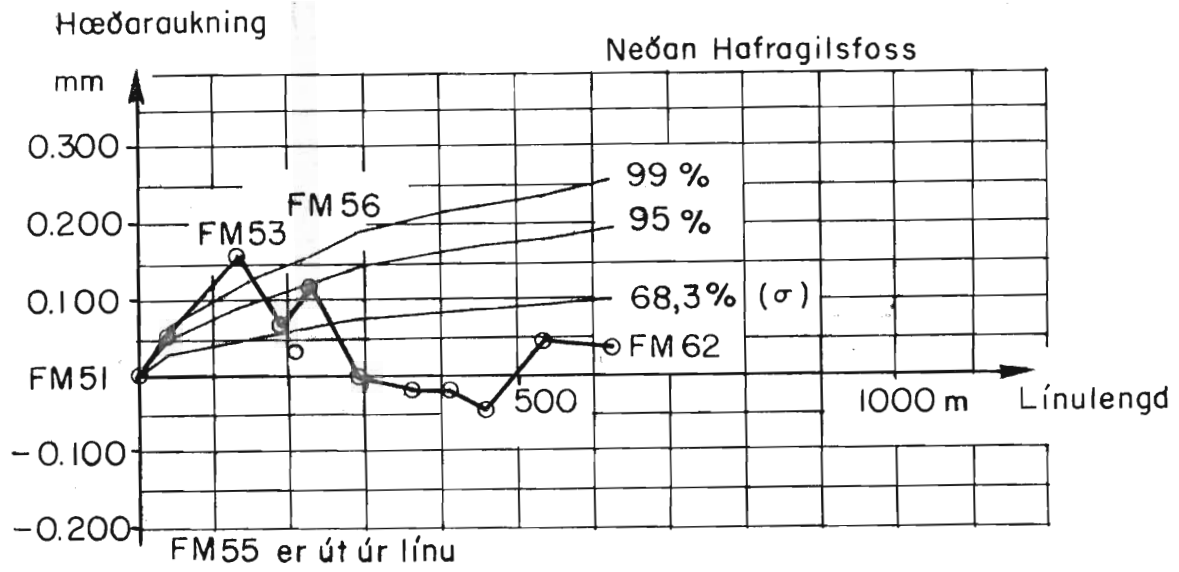
Gera má ráð fyrir að einhver merkjanna hafi hreyfzt miðað við nánasta umhverfi sitt (merki í hreyfanlegum steini), og er líklegt að FM10 sé eitt slíkra merkja. Ástæða er til að skoða merkin, sérstaklega með þetta í huga, næsta sumar.

Þriðja teikningin, sem hér fylgir með, sýnir legu merkjanna. Hún er tekin úr skýrslu Eysteins Tryggvasonar.



Nákvæmnisfallmæling við Dettifoss
Mæld hæðaraukning frá ágúst '71 til sept. '72





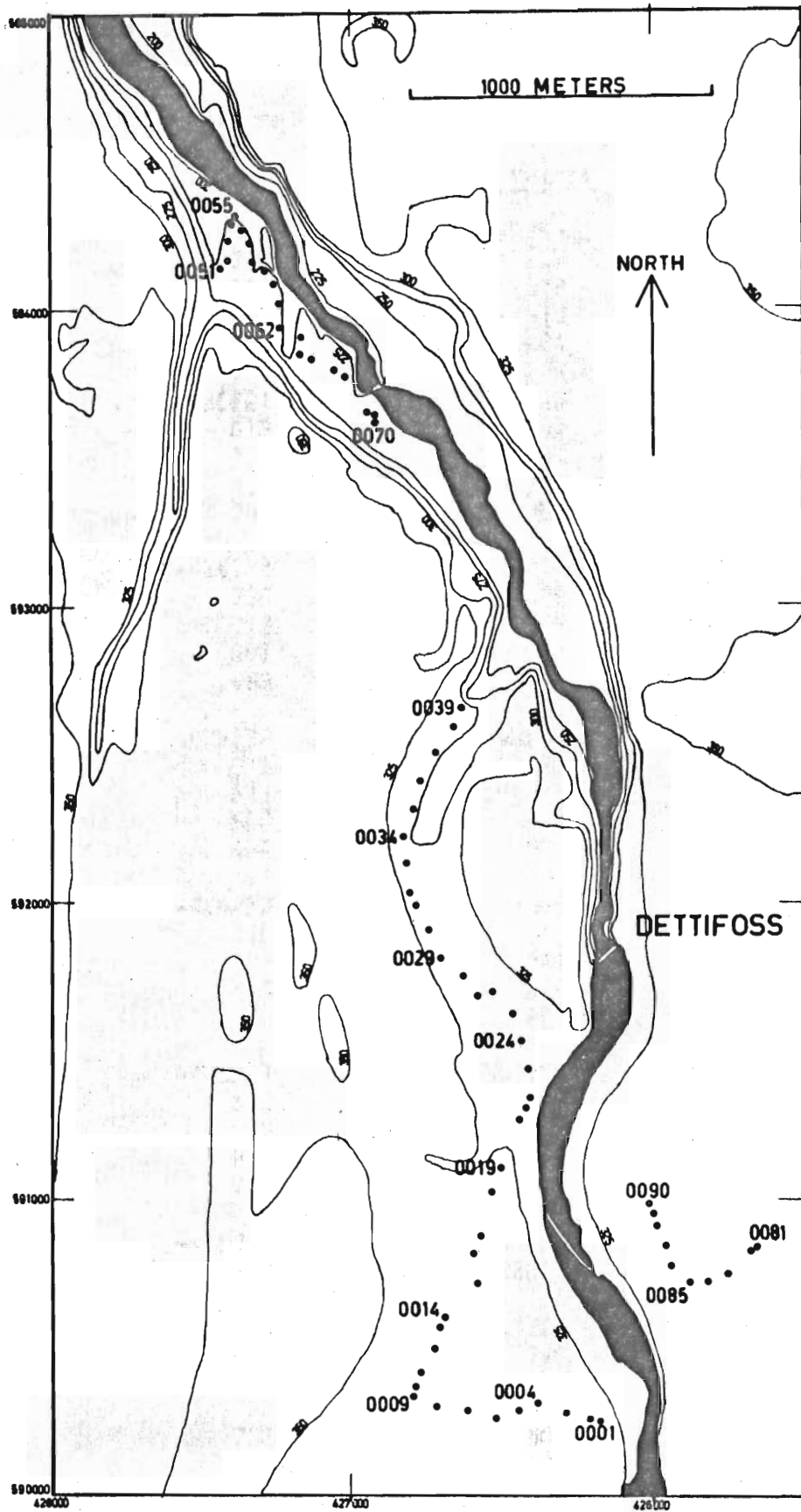


Figure 1. Locations of levelling markers in the Dettifoss area

FRAMKVÆMD

Í júlí og ágúst 1971 voru sett 69 fastmerki í nágrenni Dettifoss og hæðarmismunur þeirra mældur með nákvæmnisfallmælingu. Prófessor Eysteinn Tryggvason stjórnaði því verki og gerði grein fyrir legu merkja og niðurstöðum mælinganna í skýrslu, sem nefnist PRECISION LEVELLING IN THE DETTIFOSS AREA 1971. Skýrslan er til fjölrituð á bókasafni Orkustofnunar.

Orkustofnun keypti invar mælistangir, sem notaðar voru við mælingarnar 1971. Veturinn 1971-72 var einnig keyptur nákvæmnisfallmælir og þrífótur. Mælitæki Orkustofnunar fyrir nákvæmnisfallmælingar eru þá sem hér segir:

Wild N3, no. 183335	fallmælir
Wild GPL 3, no. 2539A, 2539B	mælistangir
Wild GST 20	þrífótur

Í ágúst og september 1972 endurtók Ásgeir Gunnarsson mælingarnar, ásamt nokkrum öðrum starfsmönnum Orkustofnunar. Mælingarnar voru gerðar á nákvæmlega sama hátt og árið áður. Einfaldast er því að vísa til skýrslu Eysteins, en tvær fyrstu síður hennar fara hér á eftir.

PRECISION LEVELLING IN THE DETTIFOSS AREA DURING THE SUMMER OF 1971

The bench marks A total of 69 permanent bench marks were established along three separate levelling profiles (Figure 1). Each bench mark consists of a brass marker with slightly convex surface, about 38 mm in diameter. These markers are placed in solid rock by drilling a hole 16 mm in diameter and about 50 millimeters deep for the tip of the marker which are fastened into these holes with concrete. Bench marks made this way have proven to be quite stable in other areas in Iceland, and less than one percent of the bench marks constructed during the last six years have become unusable due to shifts relative to the foundation of as much as 0.5 millimeters. Smaller shifts can usually not be detected. The configuration of the profiles is shown on Figure 1, and the coordinates of each bench mark is given in Table 5. Each bench mark is indicated in the field by a small rock cairn and the bench mark number is stamped in the surface of each marker.

Method of levelling The levelling was done with Wild N-3 precision level using Wild 21-A fixed legs tripod and two invar levelling rods (Wild GPL-3). Whenever the distance between adjacent bench marks was less than 60 meters, and the elevation difference of these was less than 2.5 meters, the level was placed at equal distance (preferable with 10 centimeters accuracy) from both bench marks, with the invar rods on both bench marks. The height of the level was more than 0.5 meters above the highest ground along either sight line. If the distance between adjacent bench marks was greater than 60 meters or the elevation difference was greater than 2.5 meters, one or more rod stations were selected between the bench marks. The level position

relative to the rods was the same as before.

The levelling rods have two scales, one offset relative to the other. The readings of the scales were made in the following order:

1. Lower scale on backward rod.
2. Lower scale on forward rod.
3. Higher scale on forward rod.
4. Higher scale on backward rod.

Reading 2 is subtracted from reading 1, and reading 3 is subtracted from reading 4, so two individual elevation differences between the two rods are obtained. The average of these two values is calculated, to obtain the elevation difference of the two rods.

This whole procedure is usually repeated three times without moving the rod or the level, except for turning the level towards the two rods. In case the three elevation values obtained this way differ from each other by more than 0.1 millimeter a fourth observation is made.

As the observations are finished at one level site, the backwards rod is moved to a forward location and the level is moved to a location midway between the rods and the same sequence of readings is made.

When a levelling profile has been completed from one end to the other end, the whole profile is levelled in the same way by moving in opposite direction along the profile. The average elevation differences of adjacent bench marks as obtained by the two traverses of the profile are compared, and if there is a difference of 0.2 millimeters or more between the two values, a third levelling is conducted on the bench mark interval where this excessive difference was observed.

ÚRVINNSLA

Mælingar sem þessar verða endurteknar við Dettifoss og sennilega framkvæmdar víðar. Þar sem vinna þarf úr allmiklu talnamagni, var ákveðið að gera úrvinnsluna í rafreikni. Forritin, sem gerð voru á Orkustofnun, nefnast í einu lagi GTPREC.

Mælispjöld eru götuð, eftir að niðurstöður hafa verið dregnar saman og færðar á sérstök eyðublöð. Framan við mælispjöld í einni línu er sett línuspjald með númeri fyrsta og síðasta punkts, hæð fyrsta punkts og dagsetningu. Spjöldin eru síðan lesin af forriti, sem nefnist GTPRET, sem listar spjöldin (LISTING OF INPUT TO PROGRAM GTPREC) og leitar jafnframt að villum.

Eftir að villur hafa verið leiðréttar, ef einhverjar eru, eru spjöldin lesin af forriti GTPREC, sem prentar lista með yfirskriftinni MEASURED ELEVATIONS IN CM. Hitapanstuðli hafa verið valin nokkur gildi, og fyrir hvert þeirra prentast listi með yfirskriftinni ADJUSTED ELEVATIONS IN CM.

Hér fer á eftir sýnishorn útskriftar úr rafreikni á fimm blöðum. Það eru niðurstöður mælinga í línunni FM81 til FM90 austan Selfoss sumarið 1972.

Slíkar útskriftir úr rafreikni, fyrir allar mælingarnar, verða bundnar inn og geymdar sem handrit á Orkustofnun.

STATION	TEMP	DIST	CM	DECIMAL PART OF MEASURED ELEVATION DIFFERENCES	NOTES
81 0	50	48	118	118	**
82 0	48	48	260	263	**
82 1	48	48	272	271	**
83 0	48	55	176	175	**
83 1	55	53	180	182	**
84 0	53	53	305	306	**
85 0	55	55	188	187	**
85 1	50	35	266	266	**
86 0	-20	-15	247	246	**
86 1	-15	-12	115	115	**
87 0	-12	-10	168	167	**
87 1	-10	0	175	177	**
88 0	10	10	243	243	**
89 0	15	15	175	175	**
90 0	8	15	175	175	**
89 0	15	15	243	243	**
88 0	20	22	177	175	**
87 1	22	25	167	168	**
86 1	30	38	115	115	**
86 0	40	48	246	247	**
86 0	50	52	266	266	**
85 1	52	55	187	188	**
85 0	58	55	306	305	**
84 0	58	52	182	180	**
83 1	52	58	175	176	**
83 0	60	60	271	272	**
82 1	60	60	263	260	**
82 0	62	60	118	118	**
99990					**

MEASURED ELEVATIONS IN CM

STATION	TEMP	DIST	ELEVAT.	ERROR	BENCH MARKS	TEMP	DIST	ELEVAT.	ERROR
81 0	4.90	23.60	43.8995	.0029	81	4.90	23.60	43.8995	.0030
82 0	4.80	52.30	64.7383	.0016	82	4.80	106.60	192.0614	.0030
82 1	4.80	54.30	127.3231	.0024	83	4.80	106.60	192.0614	.0030
83 0	5.15	35.10	-72.9033	.0012	84	5.30	71.30	36.3016	.0016
83 1	5.40	36.20	109.2050	.0009	85	5.30	61.10	-144.6610	.0019
84 0	5.30	61.10	-144.6610	.0019	86	4.60	90.70	-78.9241	.0035
85 0	5.50	37.50	-22.2230	.0014	87	-1.65	72.30	-306.5046	.0048
85 1	4.25	53.20	-56.7011	.0031	88	-1.65	72.30	-306.5046	.0048
86 0	-1.75	49.30	-238.5250	.0042	89	1.00	48.60	-59.4165	.0039
86 1	-1.35	23.00	-67.9796	.0022	90	1.50	35.00	1.5828	.0020
87 0	-1.10	33.50	-112.1718	.0034	89	1.50	35.00	1.5828	.0020
87 1	-1.50	35.20	-48.8021	.0026	90	1.15	35.00	-1.5811	.0023
88 0	1.00	48.60	-59.4165	.0039	89	1.50	48.60	59.4191	.0035
89 0	1.50	35.00	1.5828	.0020	88	2.27	68.70	160.9958	.0048
90 0	1.15	35.00	-1.5811	.0022	87	4.18	72.30	306.4978	.0023
89 0	1.50	48.60	59.4191	.0034	86	4.18	72.30	306.4978	.0023
88 0	2.10	35.20	48.8128	.0019	85	5.17	90.70	78.9248	.0038
87 1	2.35	33.50	112.1830	.0044	84	5.65	61.10	144.6508	.0022
87 0	3.40	23.00	67.9305	.0020	84	5.50	71.30	-36.2996	.0021
86 1	4.40	49.30	238.5673	.0010	83	6.00	106.60	-192.0646	.0040
86 0	5.10	53.20	57.6430	.0018	82	6.10	23.60	-43.9066	.0011
85 1	5.35	37.50	21.2818	.0032					
85 0	5.65	61.10	144.6508	.0022					
84 0	5.50	36.20	-109.2321	.0010					
83 1	5.50	35.10	72.9325	.0018					
83 0	6.00	54.30	-127.2753	.0031					
82 1	6.00	52.30	-64.7893	.0024					
82 0	6.10	23.60	-43.9066	.0010					

PROFILE 81 90 ADJUSTED ELEVATIONS IN CM TC= 0.000000 20/09/1972

BENCH MARKS	DIFFERENCE	ERROR	NOTE	BENCH MARK	ELEVATION	ERROR
81				81	10000.0000	0.0000
82	43.9030	.0018		82	10043.9030	.0018
83	192.0630	.0024		83	10235.9661	.0031
84	36.3006	.0013		84	10272.2668	.0033
85	-144.6559	.0020		85	10127.6109	.0039
86	-78.9244	.0024		86	10048.6864	.0046
87	-306.5012	.0027		87	9742.1851	.0054
88	-160.9849	.0045		88	9581.2002	.0070
89	-59.4178	.0025		89	9521.7824	.0075
90	1.5819	.0014		90	9523.3644	.0076


```

PROFILE 81 90 ADJUSTED ELEVATIONS IN CM TC= .000002 20/09/1972
=====
BENCH MARKS 81 82 83 84 85 86 87 88 89 90
DIFFERENCE 43.9022 192.0593 36.2999 -144.6531 -78.9229 -306.4928 -160.9803 -59.4161 1.5819
ERROR .0018 .0024 .0013 .0020 .0024 .0025 .0046 .0025 .0014
NOTE
BENCH MARK 81 82 83 84 85 86 87 88 89 90
ELEVATION 10000.0000 10043.9022 10235.9616 10272.2615 10127.6084 10048.6855 9742.1927 9581.2124 9521.7962 9523.3781
ERROR 0.0000 .0019 .0031 .0033 .0039 .0046 .0053 .0070 .0075 .0076
=====

```

```

PROFILE 81 90 ADJUSTED ELEVATIONS IN CM TC= .000004 20/09/1972
=====
BENCH MARKS DIFFERENCE ERROR NOTE BENCH MARK ELEVATION ERROR
-----
81 82 43.9014 .0018 81 10000.0000 0.0000
82 83 192.0557 .0024 82 10043.9014 .0019
83 84 36.2992 .0013 83 10235.9571 .0031
84 85 -144.6504 .0020 84 10272.2563 .0034
85 86 -78.9213 .0024 85 10127.6059 .0039
86 87 -306.4844 .0025 86 10048.6846 .0046
87 88 -160.9756 .0047 87 9742.2002 .0053
88 89 -59.4145 .0025 88 9581.2245 .0071
89 90 1.5819 .0014 89 9521.8100 .0075
90 90 1.5819 .0014 90 9523.3919 .0077

```