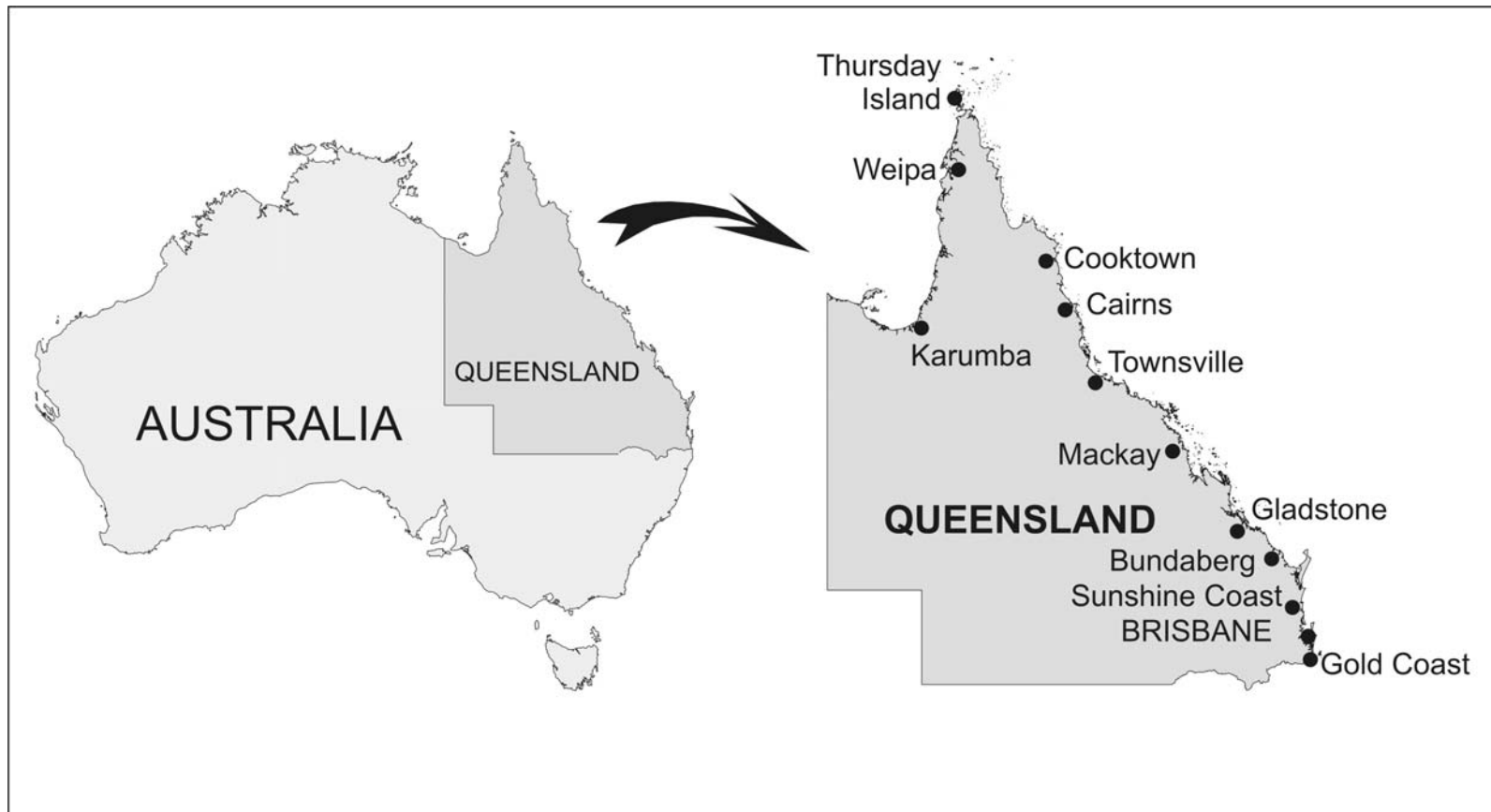
A tall, black, cylindrical offshore port beacon stands in the middle of the ocean. The beacon has a red top section and a white navigation light. It is surrounded by a metal ladder and platform. In the background, two large ships are visible on the horizon under a blue sky with light clouds.

Tides Within Queensland

Hay Point Offshore Port Beacon No2 South East From Mackay

Selected Stations of the Queensland Network



Tidal Observation Within Queensland Waters is:-

- Undertaken co-operatively by:-
 - The Environmental Protection Agency (EPA):-
 - Twenty two Storm Tide stations, a number of which contribute readings for port operations.
 - Port Authorities:-
 - Three operated in conjunction with the EPA
 - Maritime Safety Queensland:-
 - Six, two operated in conjunction with the EPA
 - National Tidal Centre
 - Two SEAFRAME high precision stations for sea level monitoring

The Equipment Presently Deployed



**Typical Radar Sensor Mounting
Environmental Protection
Agency**



**C Ferguson Storm Tide
Station Environmental
Protection Agency**

**Half Tide Tug Harbour
Maritime Safety
Queensland**



**Rosslyn Bay SEAFRAME Station
National Tidal Centre**

Data Validation and Storage.

- Maritime Safety Queensland is custodian of the tidal recordings and predictions for the Queensland State agencies:-
 - Recordings are validated against water level checks, predictions, and non-tidal residuals at adjacent stations.
 - Recordings, predictions, datum information, and other (limited) metadata are held in the TIDES database.

Tidal Predictions

- The Official Standard Port tidal predictions are prepared under contract by the Australian National Tidal Centre, Bureau of Meteorology, in Adelaide.
- Secondary port predictions prepared, by Maritime Safety Queensland, to supplement the Official predictions.

Other Activities

- Maritime Safety Queensland has two initiatives in place relating to the tidal datum of Queensland ports:-
 - The Tidal Reference Frame
 - The AUSHydroid

The tidal reference frame

- The frame is essentially a control mechanism, the time element of which is the tidal datum epoch.
- The frame consists of the tidal stations for which a long series of readings is available and for which a primary determination of the tidal parameters has been completed.
- It is intended that the frame provides a snapshot of the tidal conditions at a point in time. Accordingly the readings extend over the same time span at each reference station
- The stations are situated along the Queensland coast from Karumba to the Gold Coast.

The tidal parameters

Datum and sea level:-

- The datum of the station (with the associated navigation chart datum and the AUSHydroid);
- The tidal constituent constants (as well as the seasonal constituents S_a and S_{sa}); and,
- the allowance for sea level rise.

The mean tidal planes:-

- highest astronomical tide;
- mean higher high water;
- mean high water spring tide (semidiurnal waters);
- mean high water;
- mean high water neap tide (semidiurnal waters);
- mean lower high water;
- mean sea level;
- mean higher low water;
- mean low water neap tide (semidiurnal waters);
- mean low water;
- mean low water spring tide (semidiurnal waters);
- mean lower low water; and,
- lowest astronomical tide.

Primary Determination of the Tidal Parameters

- The parameters will be calculated for the primary stations:-
 - from 19 years of observed tides
 - strictly in accordance with the definition (as published in Queensland)
- The result is the **primary determination** of the height of each parameter
- The primary determination of the heights forms the basis for the determination of the parameters at secondary and tertiary level stations

The AUSHydroid

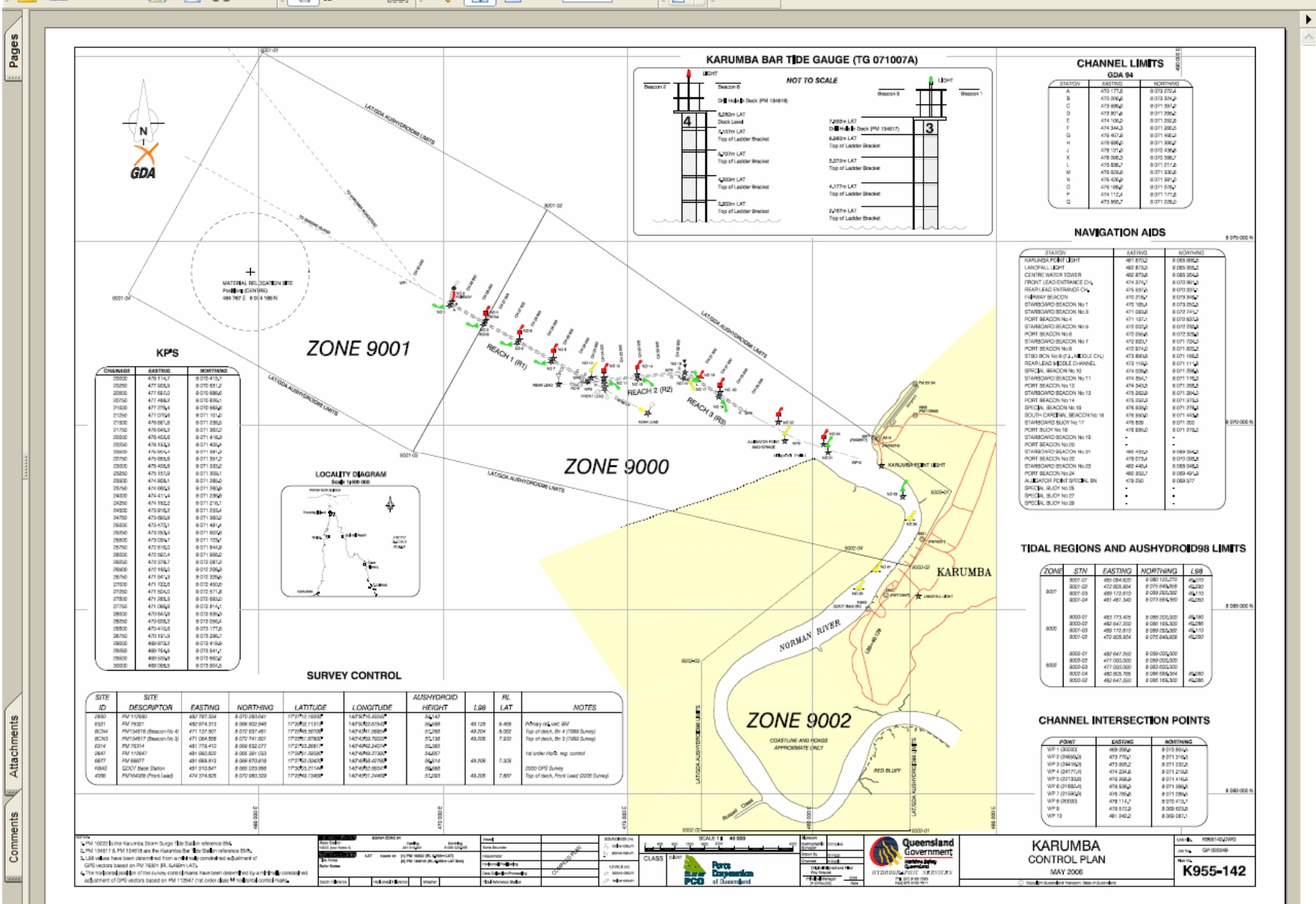
- Is the height separation “L” between the WGS84 ellipsoid and chart datum.
- Is the marine equivalent of the AUSGeoid, the geoidal separation “N”
- WGS84 is the reference frame

The Datum Separation Model

- AUSGeoid
Ellipsoid to Geoid which has
 - a grid of points at which the height of the geoid is known
 - an interpolating process whereby the height of the geoid is estimated at any place within the grid
- AUSHydroid
Ellipsoid to Chart Datum which has
 - a grid of points at which the height of the chart datum is known
 - an interpolating process whereby the height of the chart datum is estimated at any place within the chart

Determination of the AUSHydroid

- Is a two step process:-
 1. Determination of the height of the AUSHydroid at the tidal stations; and,
 2. Preparation of an interpolation process by which the height of the AUSHydroid is estimated everywhere within a chart.
- It is important to recognize that the
 - AUSGeoid;
 - Chart datum; and,
 - AUSHydroid;are not parallel to the WGS84 ellipsoid or with each other.



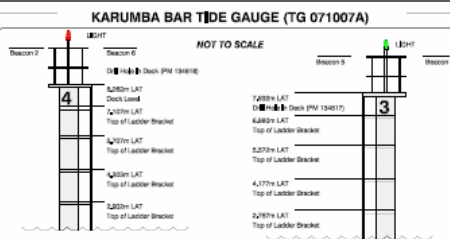
KPS

CHARGE	EASTING	NORTHING
0500	476 114.7	8 076 476.7
0501	477 002.0	8 076 511.2
0502	477 697.0	8 076 686.6
0503	477 686.2	8 076 686.1
0504	477 779.4	8 076 666.6
0505	477 073.9	8 076 191.4
0506	476 987.3	8 076 738.0
0507	476 945.2	8 076 352.2
0508	476 452.3	8 076 416.3
0509	476 193.3	8 076 456.4
0510	476 985.4	8 076 391.4
0511	476 882.3	8 076 391.2
0512	476 456.3	8 076 333.2
0513	476 197.3	8 076 333.1
0514	476 985.4	8 076 386.6
0515	476 193.3	8 076 386.6
0516	476 456.3	8 076 286.6
0517	476 197.3	8 076 286.6
0518	476 985.4	8 076 333.1
0519	476 193.3	8 076 333.1
0520	476 456.3	8 076 386.6
0521	476 197.3	8 076 386.6
0522	476 985.4	8 076 433.1
0523	476 193.3	8 076 433.1
0524	476 456.3	8 076 486.6
0525	476 197.3	8 076 486.6
0526	476 985.4	8 076 533.1
0527	476 193.3	8 076 533.1
0528	476 456.3	8 076 586.6
0529	476 197.3	8 076 586.6
0530	476 985.4	8 076 633.1
0531	476 193.3	8 076 633.1
0532	476 456.3	8 076 686.6
0533	476 197.3	8 076 686.6
0534	476 985.4	8 076 733.1
0535	476 193.3	8 076 733.1
0536	476 456.3	8 076 786.6
0537	476 197.3	8 076 786.6
0538	476 985.4	8 076 833.1
0539	476 193.3	8 076 833.1
0540	476 456.3	8 076 886.6
0541	476 197.3	8 076 886.6
0542	476 985.4	8 076 933.1
0543	476 193.3	8 076 933.1
0544	476 456.3	8 076 986.6
0545	476 197.3	8 076 986.6
0546	476 985.4	8 076 1033.1
0547	476 193.3	8 076 1033.1
0548	476 456.3	8 076 1086.6
0549	476 197.3	8 076 1086.6
0550	476 985.4	8 076 1133.1
0551	476 193.3	8 076 1133.1



SURVEY CONTROL

SITE ID	SITE DESCRIPTOR	EASTING	NORTHING	LATITUDE	LONGITUDE	AUSHYDROID HEIGHT	LSB	RL LAT	NOTES
2800	RF 12060	482 787.324	8 076 280.621	17°27'43.1530"	147°57'51.2202"	74.147			
2801	RF 12021	482 619.513	8 066 452.949	17°28'02.1118"	147°58'01.8148"	154.018	48 128	6.488	1st survey 1/4/02 2M
2802	RF 13418 (Beacon No 4)	471 137.307	8 076 237.487	17°28'45.2616"	147°57'41.2886"	151.268	49.204	8.202	Top of back, BH 4 (1989 Survey)
2803	RF 13417 (Beacon No 3)	471 056.389	8 076 743.287	17°28'17.2763"	147°57'52.7233"	151.136	49.206	7.532	Top of back, BH 3 (1989 Survey)
2804	RF 12034	481 724.452	8 066 622.077	17°27'53.2817"	147°58'02.2767"	151.263			1st order 1/4/02, exp. control
2805	RF 12067	481 966.820	8 066 281.033	17°28'17.2628"	147°58'01.2768"	148.617	48.708	7.308	2002 GPS Survey
2806	RF 16017	481 668.913	8 066 470.918	17°28'03.0208"	147°58'03.0208"	148.614			Top of back, Front Level 2002 Survey
2807	RF 12067	481 513.947	8 066 033.989	17°28'03.2114"	147°58'03.2114"	148.614			
2808	RF 16049 (Front Lead)	474 574.825	8 076 983.329	17°28'03.7340"	147°58'03.7340"	151.263	49.206	7.507	



CHANNEL LIMITS

STATION	EASTING	NORTHING
A	473 177.2	8 073 372.4
B	473 334.6	8 073 384.9
C	473 386.0	8 073 391.4
D	473 307.6	8 071 296.2
E	474 182.0	8 071 282.2
F	474 344.3	8 071 265.3
G	476 407.2	8 071 466.2
H	476 866.0	8 071 386.2
I	478 107.4	8 075 436.0
J	478 282.3	8 075 386.7
K	478 582.7	8 071 211.2
L	478 636.2	8 071 336.8
M	478 636.2	8 071 391.2
N	478 186.9	8 071 376.7
O	478 186.9	8 071 176.2
P	474 112.4	8 071 176.2
Q	473 386.2	8 071 236.2

NAVIGATION AIDS

EASTING	NORTHING	NOTHING
KARUMBA PORT LIGHT	487 870.2	8 088 392.2
LANDFALL LIGHT	488 870.2	8 088 392.2
CENTRE WATER TOWER	488 870.2	8 088 392.2
FRONT LEAD ENTRANCE CH	474 274.7	8 073 987.4
REAR LEAD ENTRANCE CH	478 339.4	8 073 356.4
RAILWAY BEACON	476 276.7	8 073 346.4
STARBOARD BEACON No 1	476 186.4	8 073 252.2
STARBOARD BEACON No 3	471 688.8	8 073 191.2
PORT BEACON No 4	471 187.1	8 073 482.2
STARBOARD BEACON No 5	476 259.4	8 073 356.4
PORT BEACON No 6	472 386.6	8 073 256.6
STARBOARD BEACON No 7	472 382.7	8 071 242.2
PORT BEACON No 8	472 374.2	8 071 352.2
STARBOARD No 9 (JUGGLE CH)	473 886.9	8 071 162.2
STARBOARD BEACON No 10	473 119.6	8 071 111.4
SPECIAL BEACON No 11	474 286.9	8 071 356.4
STARBOARD BEACON No 11	474 384.1	8 071 176.2
PORT BEACON No 12	474 342.3	8 071 282.2
STARBOARD BEACON No 13	473 262.9	8 071 292.2
PORT BEACON No 14	473 262.9	8 071 372.2
SPECIAL BEACON No 15	476 386.6	8 071 376.6
SOUTH-CENTRAL BEACON No 16	476 386.6	8 071 456.6
STARBOARD BUOY No 17	476 386.6	8 071 222.2
PORT BUOY No 18	476 386.6	8 071 272.2
STARBOARD BEACON No 19	-	-
PORT BEACON No 20	-	-
STARBOARD BEACON No 21	486 436.9	8 088 392.2
PORT BEACON No 22	478 572.4	8 073 356.4
STARBOARD BEACON No 23	482 446.4	8 088 346.2
PORT BEACON No 24	482 332.7	8 088 462.2
SPECIAL BEACON No 25	-	-
SPECIAL BUOY No 26	-	-
SPECIAL BUOY No 27	-	-
SPECIAL BUOY No 28	-	-

TIDAL REGIONS AND AUSHYDROID98 LIMITS

ZONE	STN	EASTING	NORTHING	LSB
9001	2801-01	482 664.800	8 066 232.200	48.200
9001	2801-02	472 858.204	8 075 444.808	48.200
9001	2801-03	488 172.919	8 066 232.200	48.200
9001	2801-04	481 481.340	8 073 664.800	48.200
9002	2802-01	483 773.428	8 066 032.000	48.200
9002	2802-02	482 647.200	8 066 163.000	48.200
9002	2802-03	482 773.810	8 066 252.000	48.200
9002	2802-04	473 858.204	8 073 664.800	48.200
9003	2803-01	482 647.200	8 066 032.000	48.200
9003	2803-02	477 000.000	8 066 032.000	48.200
9003	2803-03	477 000.000	8 066 032.000	48.200
9003	2803-04	482 647.200	8 066 163.000	48.200
9003	2803-05	482 647.200	8 066 163.000	48.200

CHANNEL INTERSECTION POINTS

POINT	EASTING	NORTHING
WP 1 (2003)	482 396.6	8 071 356.4
WP 2 (2006)	473 771.7	8 071 376.2
WP 3 (2007)	473 262.2	8 071 232.2
WP 4 (2017)	474 262.4	8 071 236.4
WP 5 (2018)	476 266.6	8 071 436.6
WP 6 (2018)	476 266.6	8 071 386.6
WP 7 (2018)	476 266.6	8 071 336.6
WP 8 (2003)	478 114.7	8 076 476.7
WP 9	473 386.2	8 066 036.2
WP 10	481 242.2	8 066 071.1

KARUMBA CONTROL PLAN
MAY 2006

Scale 1:4000

Queensland Government
Port Department of Queensland
Quality Safety

Project: KARUMBA CONTROL PLAN
Drawing: KARUMBA CONTROL PLAN
Revision: 1

Author: [Name]
Checked: [Name]
Approved: [Name]

1 of 1

HAY POINT RTK CONTROL
MGA/GDA94 DATUM AND AUSHYDROID HEIGHTS
CO-TIDAL ZONE 3800

SITE	EASTING	NORTHING	LATITUDE	LONGITUDE	RL (LAT)	AUS-HYDROID HEIGHT (L98)
NW CORNER ZONE 3800	738312.15	7650901.91	-21°13'40.381"	149°17'45.887"	0.00	51.39
NE CORNER ZONE 3800	754296.76	7650901.91	-21°13'32.587"	149°26'59.943"	0.00	51.35
SE CORNER ZONE 3800	754259.29	7648378.82	-21°14'54.6000"	149°27'00.000"	0.00	51.35
SW CORNER ZONE 3800	738330.51	7645166.13	-21°16'46.792"	149°17'49.415"	0.00	51.39
PM 38627 (Port & TGBM)	738336.283	7645872.193	-21°16'23.8415"	149°17'49.2585"	18.040	51.382

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