

**Chart Correction Information Collected by MV *Baidarka*
August 2001, West Coast Queen Charlotte Islands**

Prepared for Fine Edge Productions LLC

By

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1. Datum Shifts

Datum Shifts were evaluated for the following CHS charts:

3864 Tasu Sound (NAD 83)

3859 Gowgaia Bay (NAD 27)

3858 Flamingo Inlet (unknown datum)

Equipment

Furuno GP-36 DGPS

Furuno FR-7112, X band, 3 cm radar (range resolution <20 m.)

Ocean PC Pentium II computer

Software

Nobeltec Visual Navigation Suite v. 5.0.425

NDI Digital Ocean electronic raster charts v. 3.07

Methodology

The vessel was brought to a stop relative to the water, and radar ranges observed to a number of different radar conspicuous points. Radar targets were selected that had very little associated foreshore, so that ranges could be depended upon without it being necessary to account for the widths of the foreshore exposed by tidal fluctuations.

Positions were then plotted on the appropriate chart, using the radar ranges. Latitude and longitude of these positions were then read off the chart. DGPS positions in NAD 83 (WGS 84) were taken at the same time and plotted on the chart without compensating for datum shift.

At the same time the position of the vessel was observed in Nobeltec Visual Navigation Suite and ranges and bearings taken on the Nobeltec VNS display. Screen captures of these observations are attached.

Findings

Chart 3859 (TASU Sound) NAD83

One position was observed as follows:

Test #1, August 15, 2001

DGPS position	52° 46.106' N	132° 02.755' W
Radar position	52° 46.10' N	132° 02.77' W
Difference	0.01'	0.01'

This difference represents a distance of only **25 meters**. This difference is well within the possible resolution error of the radar. Thus the difference is not significant and it can be assumed that the charted datum is accurate.

During this test, four radar ranges were observed approximately 90° apart. The resulting position could not be resolved without assuming that the radar index error was 0.015 Nm. low. Once this assumed error was added to the observed radar ranges, the position was resolved virtually to a point.

As a result, all subsequent radar ranges were corrected for this index error by adding 0.015 Nm. to the observed ranges. In all cases, this corrected resolved the observed positions virtually to a point.

Chart 3864 (Gowgaia Bay) NAD27

In Gowgaia Bay, one position was observed as follows:

Test #1, August 17, 2001

DGPS position	52° 25.263' N	131° 34.266' W
Radar position	52° 25.28' N	131° 34.22' W

Difference	0.02'	0.05'
Or	1.2"	3.0"

Thus it appears that positions taken from DGPS must be moved 1.2" northwards and 3.0" eastwards (**70 meters**) to agree with this chart. This does not agree with the published datum shift of 0.2" northwards and 5.5" eastwards. Given the limitations of the equipment used, it is not possible to determine if this test demonstrates a significant departure from the published values or not.

Chart 3858 (Flamingo Inlet) There is no datum shift note anywhere on this chart It appears this chart was drawn to an unknown datum.

Three positions were observed as follows:

Test #1, August 18, 2001, 1830 hrs

DGPS position	52° 11.596' N	131° 21.218' W
Radar position	52° 11.62' N	131° 21.09' W
Difference	0.02'	0.13'

Test #2, August 19, 2001, 1345 hrs

DGPS position	52° 12.897' N	131° 21.437' W
Radar position	52° 12.92' N	131° 21.31' W
Difference	0.02'	0.13'

Test #3, August 19, 2001, 1409 hrs

DGPS position	52° 12.830' N	131° 21.126' W
Radar position	52° 12.86' N	131° 21.01' W
Difference	0.03'	0.12'

Average difference for tests #1, #2, and #3:

	0.023'	0.127'
or	1.38"	7.62"

It appears that positions taken directly from DGPS must be moved 1.38" northwards and 7.62" eastwards (**150 meters**) to agree with chart 3858. Given that the difference between DGPS and radar positions shows a remarkable consistency, I believe that this datum shift is accurate to within +/- 0.02 Nm (40 meters).

For this chart only, the position was also noted by placing an event mark at the present position in Nobeltec VNS, and then observing ranges and bearings to the electronic depictions of the same radar conspicuous points that were used to obtain the radar positions. (Figures 1 and 2) When these ranges were compared to the charted positions, it appeared that the position as recorded by Nobeltec VNS using the NDI Digital Ocean raster chart 3858, exactly coincided with the DGPS position drawn on the chart. It thus appears that the NDI raster chart assumes that the original paper chart is drawn to NAD83. This is definitely not the case, as shown by the comparison of DGPS and radar derived positions.

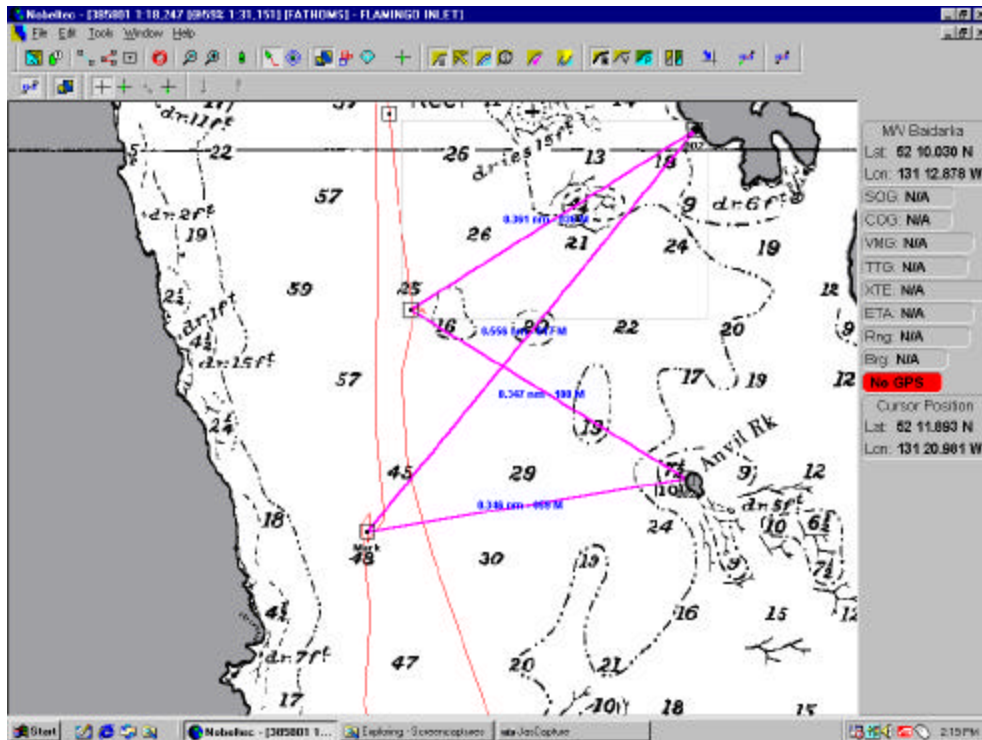


Figure 1 (Flamingo Inlet—Datum Tests 1 and 3)

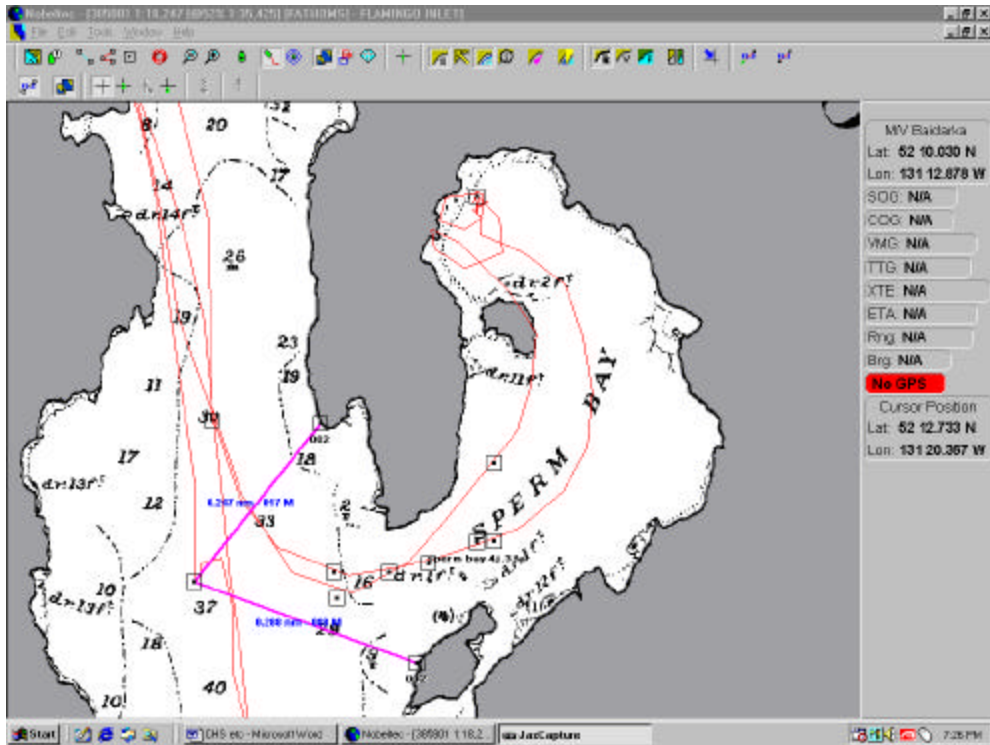


Figure 2 (Flamingo Inlet—Datum Test 2)

A simple observation of the Nobeltec VNS software attests to the error in the NDI raster version of chart 3858. A screen capture is attached of the vessel track passing over the land portion of the raster chart while the vessel was actually in mid channel. (Figure 3)

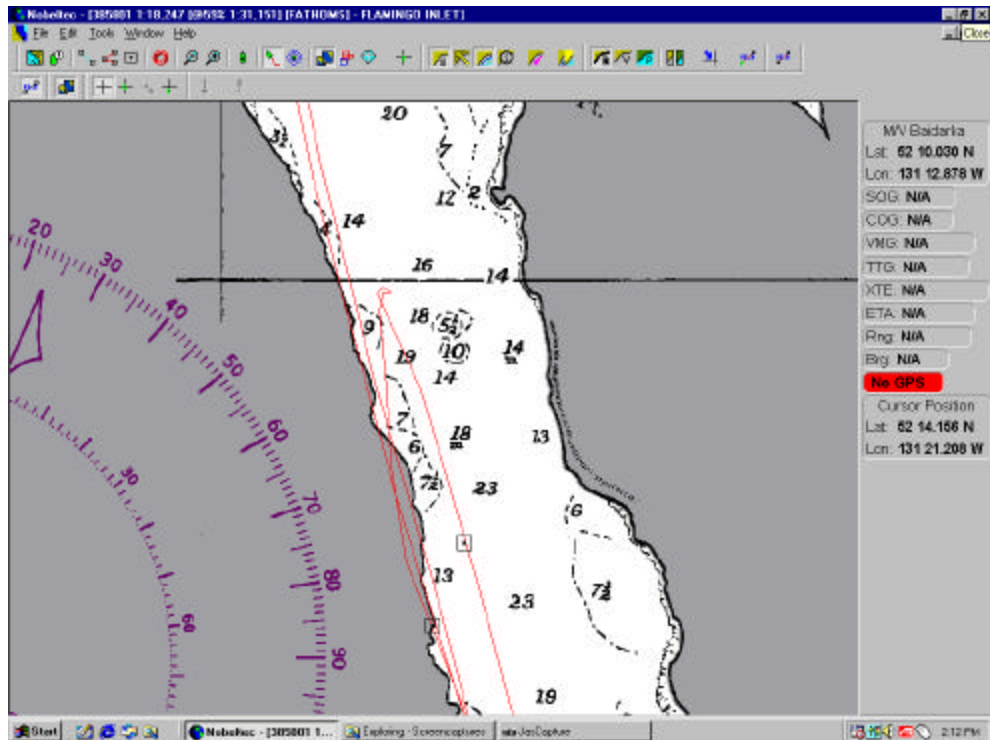


Figure 3 Vessel track observed passing over the land portion of raster chart 3858.

2. Observed Hazards

Unless otherwise indicated, positions are taken from the indicated chart. All positions approximate.

Chart 3854

Off Kaisun Harbour, near Annesley Point

10 fm shoal observed on sounder 0.3 Nm. SW of the point of a small bay to the Northwest of Annesley Point. Between this 10 fm shoal and Annesley Point an area of attached kelp was also observed.

Position of 10 fm shoal— $53^{\circ} 01.85' N$ $132^{\circ} 31.10' W$

Position of kelp patch — $53^{\circ} 01.80' N$ $132^{\circ} 30.50' W$

Entrance to Bottle Inlet

A dangerous breaker was observed in less than 1 meter seas at 1300 hrs 13 August 2001 at

$52^{\circ} 54.35' N$ $132^{\circ} 20.40' W$

Tidal height approximately 8 ft.

Vessel position by DGPS at time of observation

$52^{\circ} 54.465' N$ $132^{\circ} 20.397' W$

range and bearing to breaker 50 meters approx $070^{\circ} T$.

Chart 3865

Mitchell Inlet, Thorn Rock

Thorn Rock is actually a large sandy shoal with a couple of rocky peaks visible from the vessel. At the time of observation, the peak of the rock was at less than 1.5 fathoms when the tide was at approximately 6 ft height. This depth includes a draft correction of 3 ft.

This peak of the rock is actually northeast of the charted position at position

$52^{\circ} 57.52' N$ $132^{\circ} 10.81' W$.

The presence of this shoal was confirmed by visual observation.

Mitchell Inlet, Thetis Anchorage.

The rock marked PA in Thetis Anchorage, could not be found.

Chart 3853

Entrance to Sunday Inlet

The two rocks shown on this chart in positions

$52^{\circ} 38.4' N$, $131^{\circ} 57.6' W$ and

$52^{\circ} 38.6' N$, $131^{\circ} 57.4' W$

were not observed, nor were breakers or kelp observed at these locations on August 15, 2001 when the tide level was approximately 7 ft. and swell less than 1 meter.

Independent testimony indicates that these rocks are awash at LLW.

Chart 3859

Tasu Sound, Lomgon Bay

A sandy shoal with depths of less than 1.5 fm (corrected for draft of 3 ft.) in at least 2 separate places, was observed at approximately 1500 hrs on August 14 2001, at 52° 47.12' N, 132° 05.41' W

The presence of this shoal was confirmed by visual observation.

Near Winnifred Rocks

A shoal with depths of less than 1 fathom (corrected for draft of 3 ft.) was observed at approximately 1715 hrs on August 14, 2001 at

52° 47.92' N, 132° 02.02' W

The presence of this shoal was confirmed by visual observation.

3. General

In general, given the small scale of charts 3853 and 3854, and the fact that the area has not been surveyed, the charts give a fair representation of the general nature of landforms on the outer coast. Specific uncharted navigational hazards were only discovered in a very few locations. However, in the inlets and approaches to the inlets and bays of the west coast, (most of which have not been surveyed) these charts are not adequate for navigation. Certain inlets, as depicted on these charts, suffer not only from geodetic offsets, but also from distortion in shape. Kootenay Inlet is an example of this distortion. Near the mouth of Kootenay Inlet, the chart is relatively accurate in terms of positioning, but less than 2 miles to the east, the chart error is very significant. Mariners must exercise extreme caution and must not depend on these charts for precise positioning, especially with GPS and raster electronic charts viewed at large scale.

In addition, there is a serious datum error in chart 3858 (Flamingo Inlet). It also appears that the depths recorded on this chart, especially in shoal areas are consistently deeper than those we observed.

I strongly recommend that CHS be encouraged to issue a Notice to Mariners for this chart (3858). The form of this notice could be as simple as a statement that positions plotted on the chart may be up to 200 meters in error. Positioning should be achieved by ranges and bearings from known geographic features. Positions taken from GPS should not be plotted on the chart.

I also strongly recommend that NDI be encouraged to apply a different correction to future editions of the electronic raster version of this chart. In the absence of a published datum shift for this chart, it appears that NDI has simply assumed that this chart is drawn to NAD83, which is definitely not the case.