Sheetlines

The journal of
THE CHARLES CLOSE SOCIETY
for the Study of Ordnance Survey Maps

"Odd rocks in the Outer Hebrides"

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Sheetlines, 114 (April 2019), pp8-15

Stable URL:
www.charlesclosesociety.org/files/OddrocksinOuterHebrides.pdf

Published by
THE CHARLES CLOSE SOCIETY
for the Study of Ordnance Survey Maps
www.CharlesCloseSociety.org

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Odd rocks in the Outer Hebrides

Michael Spencer

Certain rocks and clusters of rocks exist off the west coast of Scotland that are not shown consistently at all scales on the map. Before pointing the finger at the OS, we should perhaps decide what we want the map to show. And as usual, with any question relating to the sea, we have to start with the tides.

1. Tides

It is well known that the diurnal variation in the height of the tide is a result of the gravitational fields of the sun and the moon, their effects moderated by the motion of the earth in these fields. It is perhaps not always realised that meteorological processes, and the shape of the sea bed leading to resonances in the tidal flow, have their influences too: for example, a good Atlantic storm makes the whole concept of "sea level" no more than what is technically called a "mathematical fiction." It is of course perfectly reasonable simply to look at the results, without worrying about the causes, and to make a table of average heights as observed over some defined period. This is what the Ordnance Survey did in arriving at the average height of *mean sea level,* MSL, at Newlyn near Penzance, making a measurement of the height of the tide every hour for the six years from May 1915 to April 1921. The eventual mean figure, after some corrections, was taken as the *Ordnance Survey Datum*, and is the value to which all heights on the mainland of Great Britain published by the OS are referred.

Clearly the height of the tide is below this datum half the time, which could lead to a difficulty of presentation. In the Bristol Channel the *range of the tide*, the difference between the heights of low tide and the next successive high tide, can be more than forty feet, the third highest in the world, so that the low tide mark will be twenty feet below mean sea level. Suppose there were a substantial rock in the sand at or close to the low water mark, say fifteen feet high. If the OS wanted to show the height of the top of this rock, the printed figure would have to be negative. Not pretty. The OS avoids this problem by closing its eyes; but the mariner needs to know things like this. He doesn't want to be surprised by such an obstruction if the tide is just high enough to hide it. What can he do?

The mariner doesn't use the OS map: he has his own map of the sea bed, called a nautical chart and published by a different arm of government, the Hydrographic Office—the clue's in the name. The chart takes into account the whole range of the tide under normal meteorological conditions, and chooses a datum which is as low as the sun and moon working together can force the sea level to be. This is called the *Lowest Astronomical Tide*, LAT, below which the tide will go only under extreme storm conditions, which happen so infrequently as to be disregardable and whose results are anyway unpredictable. All depths of water shown on the chart, and all tide tables which show height of the tide anywhere at any time, are referred to LAT, so that the depth of water under the keel can be quickly found by adding the two together and correcting for the draught of the ship. There are no negative heights anywhere.

The concept of *range of the tide*, which is cyclical between limits for a particular place, is not to be confused with the *height of tide*, a time-dependent variable which is the height of the sea surface at a given moment above chart datum. The chart shows LAT instead of low-water mark, though the two are sometimes almost indistinguishable; the district between LAT and the high-water mark is coloured green.

The chart isn't always totally reliable, though it is updated when a vessel discovers an uncharted rock the hard way. There are a number of eponymous names in this morose category, as for example Whale Rock near St Kilda and Muirfield Seamount in the Indian Ocean—the latter must have been one heck of a surprise to the MV *Muirfield*, for she damaged her keel in an area where the chart suggested that the water was about three miles deep. This leads us to speculate that no ship of that size (180,000 tons deadweight, draught about 55 feet, which is a pretty big ship) had ever been in that bit of ocean before, and neither had any ship with a working echo sounder, and we can go on to philosophise about how big the ocean really is, and how unfrequented, and by similar excursions through "gardens of bright images" we can begin to realise how tenuous a hold philosophers have on the real world, and therefore—ah, nuts, back on the horse.

2. Geodesy

It is well known that the shape of the earth is that of an *oblate spheroid*, that is an almost spherical object exhibiting a degree of flattening at the poles, the points where its axis of revolution intersects its surface. Its figure, however, is not wholly regular, but rather is modified by hills and valleys on a grand scale: the continental mountain massifs and the abyssal basins of the sea. In order to accommodate these irregularities into the mathematic basis of their maps, cartographers have posited the concept of the *ellipsoid of revolution*, a mathematically regular figure which as closely as possible approximates to the fundamental almost spherical surface.

The representation of heights on the map must be referred to a datum surface, which ideally would be that of the ellipsoid; but any datum would do so long as it remained always parallel to the ellipsoid and so long as its departure from the ellipsoid was known. The problem of the determination of the ellipsoid is the province of geodesy, and was essentially solved by the beginning of the nineteenth century.

Once the Ordnance Survey datum had been established, surveyors carried it forward through the country, using levelling techniques dependent in the end on the spirit level. This is a device controlled by gravity, and its function is to mark the direction at right angles to the force of gravity at a point: two such devices themselves at right angles can define a plane, the *horizontal*. Because of the mass anomalies set up by the existence of the masses of the continents and the depressions in the crust where the oceans lie, the pull of gravity is to a slight degree deflected locally away from the direction of the centre of mass of the earth, so that the horizontal is not always parallel to the ellipsoid.

The horizontal therefore defines a surface which is in effect a smoothed version of the irregular figure of the earth: this surface is called the *geoid*. Because there are no masses above the surface of the sea (if we neglect the relatively insignificant mass of the atmosphere), the mean level of the sea is part of the geoid. In the continental areas the continuation of the geoid is an imaginary sea-level surface.

The vertical distance between the surface of the ellipsoid and the surface of the geoid may under continental mountain structures be as much as a mile; under Britain, with its much less massive structures, the difference is at most a metre or so. The difference is important anywhere, because the datum follows the geoid while the computations can only be carried out on the ellipsoid. The determination of the differences worldwide was the geodetic problem of the twentieth century, finally solved only by the use of artificial satellites.

A further difficulty arose because the surveying techniques of the early twentieth century were not able to carry the datum forward across a wide expanse of sea. Altitudes in the Outer Hebrides therefore, were expressed relative to a *local datum*, marked by a bolt in the wall of Bank Street Wharf in Stornoway harbour at NB 4228 3264. Such local datums, derived from a shorter and less intensive series of observations than those at Newlyn, are also in use for most other major island groups, and for Northern Ireland. The differences between local datums and OS Datum at Newlyn have not been established. One might have thought that this problem could be resolved by the use of GPS, which again relies on artificial satellites: but it seems that the vertical discrimination that can be achieved is not sufficiently precise.

3. Depictions on the chart

Now we need to consider how islands and rocks are shown on the chart. There are three classes. The first comprises those features which are visible at all states of the tide: they range from Great Britain itself, the eighth largest island in the world, to tiny things like The Clach in Millport Harbour, which shows just two feet of unattractive, black rock above local high water. All of them are characterised by exhibiting a high-water mark. On modern metric charts the area above the high-water mark is tinted buff. I suggest that the map needs to show all of them, if the scale allows.

Secondly there are those features which the chart annotates as "dries," which means that they are visible at chart datum, if the tide gets that low, and up to some point above it in the range, but are completely covered at or before high water. In the real world, they probably only "dry" in strong sunshine. On the chart, they are green islands with no buff area. Their height above chart datum, the *drying height*, is shown by an underlined figure. Obviously they don't show a high water mark, but equally obviously they protrude from the lowest water level and are islands at that time. One could take up a position on one of these at low water, and wait to drown as the tide rises. (Pirates were sometimes persuaded to do so.)

Finally, the chart shows rocks which are "awash at chart datum," that is, only if the tide gets down to that level can they be seen. The most exciting one of these is Hasselwood Rock about 200 yards north of Rockall, which the Sailing Directions says "has been seen in the swell of the waves," a phrase designed to send shivers down any navigator's spine. Since these are always covered under normal circumstances, they need not trouble the mapmaker. (Nevertheless, Hasselwood Rock must exert some sort of dreadful fascination for the Ordnance Survey, for it is marked on the Rockall insets on both *Explorer* 454 and *Landranger* 18. As may be expected, the level of detail is not great.)

4. Depictions on the map

Use of the "mean" sea level, identified as the Ordnance datum, completely obscures the very complex actual changes in the level of the tide, which varies between limits in various cycles which vary in length from about 12 hours to about 18 years. By far the most important of these cycles is the M_2 or lunar semi-diurnal cycle, which is about 12 hours and 25 minutes long, a figure arising from the time the earth takes to rotate once with respect to the moon. During this time, the tide cycles from a maximum level to a minimum level and back again. Because the moon is moving with respect to the earth during this time, successive maximum levels are not identical: the two high tides a day are unequal, and the pattern is repeated the next day, but with slightly different values.

When the earth, moon and sun are in the same straight line, the gravitational effects of the sun and the moon complement each other, and the tidal range is a maximum: this is called a *spring tide*. At this time, the difference between the two daily high tides is also a maximum. Two weeks later, when the vectors from earth to moon and earth to sun are at right angles, the tidal range is a minimum (*neap tides*): the difference between the "morning" and "evening" tides is the least, perhaps even zero. Because the distance of the moon from the earth varies, it can happen that spring tides occur just when the distance is least. These are called *perigean* spring tides, and the range and the departure from the mean are a maximum.

The Ordnance Survey does not concern itself with determining and plotting the outside range of the spring tide. Instead, it uses an average value, called mean high- and low-water mark (MHWS, MLWS). These levels are important to the Ordnance Survey, because anything between them (the *foreshore*) is the property of the Crown, and because the low-water mark is taken as the *extent of the realm*, the baseline for territorial waters, which legally extend for 12 nautical miles out to sea. The idea of the "foreshore" is clear enough when we consider holidaymakers innocently enjoying the sand in their picnics on the beach, but seems to have little meaning when we consider the vertical sides of a sea-stack like, for example, the five-hundred-foot Stac Lee off Boreray in the St Kilda group.

Richard Oliver has published an interesting note [1] that explains the basis for the Ordnance Survey's fixation on mean values. By the late 1840s the lines of high and low spring tides were being shown, but in 1854 the definition of the foreshore was legally determined as the area between the mean tide lines. This was based on an opinion of Sir Matthew Hale (1609-1676), to the effect that the areas above the average high and low water marks were respectively covered or exposed less often than those lying between the two averages and were therefore of less interest to the Crown.

It seems to me, and reading between his lines I suspect it seems to Richard Oliver also, that the unthinking adoption of this seventeenth-century opinion has damaged the Ordnance Survey's continual struggle to achieve precision. As Richard says, "[f]rom the point of view of many map users it was inconvenient, as a line of 'ordinary', 'medium' or 'mean' tides is often hard to identify on the ground . . ."

Fixing the high-water mark by survey is reasonably straightforward, for it is marked by a line of seaweed and small stones, pushed as high up the beach as the tide can reach. Finding the low-water mark is a different line in the sand altogether, because it leaves no trace of itself and until the advent of aerial photography using infra-red light surveyors risked wet feet or worse. In the forty-foot tides in the Bristol Channel, the water comes in across the gently shelving sands at Weston-Super-Mare faster than a man can run. Although MLWS is shown by the OS, it has only a very ephemeral reality.

I feel that a clear statement of the low-water mark would be better achieved by the OS' adoption of LAT as a lower limit of the tide, not least because it is dependent entirely on the motions of the sun and the moon, and can be precisely calculated rather than needing to be surveyed. Presumably an Act of Parliament would be required, to give a legal basis to the new definition of the foreshore. One must admit that LAT varies by place, and does not give the single nation-wide altitude datum that the OS requires, so that OS Datum would remain in effect.

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[1] 'The adoption of ordinary tides', *Sheetlines* 91, 46-48.

When we consider drying rocks, we arrive at a difficulty due to the different datums of the chart and the map: if such a feature dries only a small amount, it won't reach mean sea level, so its "OS altitude" is negative and the map will not show its height. There is no reason why the map should not show the position of everything down to the low water mark, though, using the conventional sign for "flat rock," as in fact it frequently does, since they are real islands if only part-time. Perhaps the OS needs a new symbol, or some other unmistakable method of showing less-than-MSL items.

As things stand, we need to be able to determine low-water mark on the chart, and hence the necessary "drying height" for a rock to break that line. This is easily done, for the chart explicitly tabulates the height of both MLWS and MHWS above chart datum, at selected ports on the chart. Thus anything whose drying height is greater than the height of Mean Low Water Springs should be shown on the map: objects with a lesser drying height can be ignored.

Further than this, it is valuable to be able to identify those features which dry above the Ordnance datum, for these will have a positive height. Again, for most of the same selected ports, the chart tabulates the height of the Ordnance datum, local or Newlyn as appropriate, above chart datum. A positive height is therefore found by subtracting the height of the Ordnance datum from the charted drying height. It is one of the aims of the present paper to present a list of such "OS heights", and to distinguish them we show them in red. They are presented here to the nearest 0.1 metre, because such precision is available; if they were printed on the map, they would doubtless be rounded to the nearest metre.

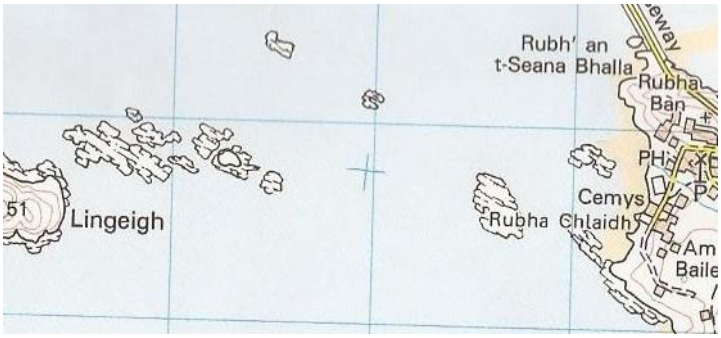
5. Salient differences between chart and map

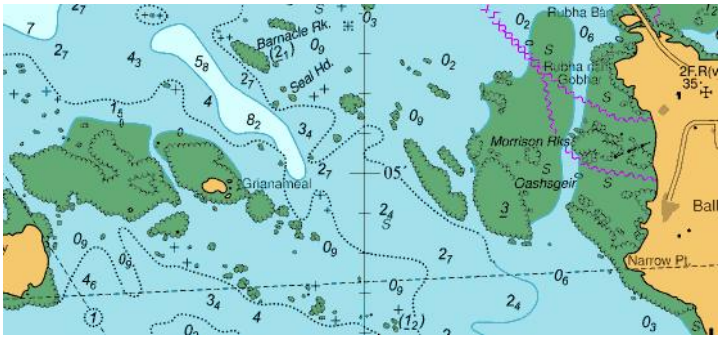
It should be noticed that the Admiralty charts refer altitudes to mean high water of spring tides, MHWS, in the local district, while OS altitudes on the mainland are always referred to mean sea level about 100 years ago on the south coast of Cornwall, which at 500 miles away could be said to have no real relevance to present-day conditions in the north-west of Scotland, even on the mainland, let alone on islands well out to sea. We must not forget the process of geological change, which in Britain has depressed the western coastline and raised the general relative level of the sea by about 0.2m (seven or eight inches) since the Newlyn datum was established.

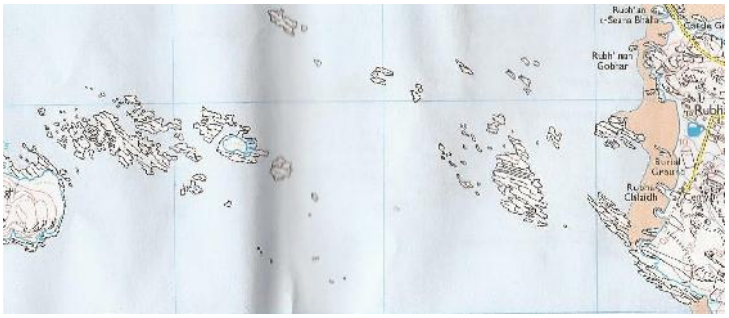
On the chart, MHWS is itself referred to LAT in the local district. LAT is not a fixed level, but varies from place to place, largely as a result of variations in the shape of the sea bed and the resultant forces acting on the tidal movements. As noted above, the difference between LAT and OS Datum, local or Newlyn as appropriate, is tabulated on the chart for various places, mostly ports currently in use.

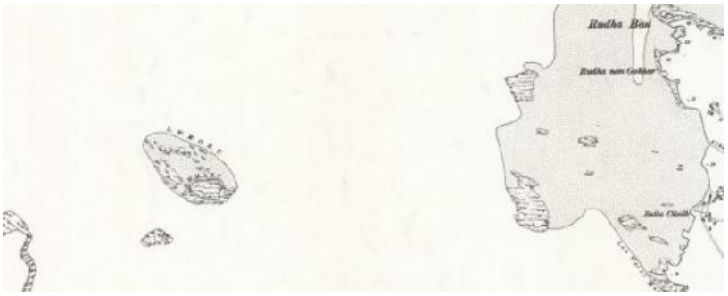
The chart explicitly shows both LAT, on a modern metric chart the border between blue and green, and MHWS, the border between green and buff. It therefore shows, and uses, two different datums at the same time, for different classes of feature, which needs clarity of thought.

On the other hand, the map shows both MHWS and MLWS, and MSL can be taken to be half-way between them in terms of height. But unless the slope between them is absolutely uniform, we cannot confidently infer the position of the line of MSL, and so we cannot draw it on the map; and in fact the map does not attempt to show it. Thus the map refers altitudes to a datum which is not drawn explicitly, a curious state of affairs to say the least.









Figures 1 to 4, from the top, as described in the text

To show the differences in rock drawing between the map and the chart, Figs. 1 to 4 are extracts from, respectively, *Landranger* (LR) No. 31 at 1:50,000, latest revision 2002; Chart No. 2770 at 1:30,000, latest revision 2016, but *in this area* 1911; *Explorer* (EX) No. 452 at 1:25,000, latest revision 2002 (my apologies for the dense fold in this one); and six-inch sheets Hebrides Nos. 60 and 61 at 1:10,560, latest revision admittedly much earlier at 1901; all showing part of the Sound of Barra, between the islands of Eriskay and Lingay (Lingeigh, the Gaelic spelling, on LR). The extracts are placed in this order to enable quick comparisons to be made, and it is expected that most comparisons will be made between adjacent pairs. The scales are adjusted to appear to be the same for all extracts, and to fit comfortably on the A5 sheet: it works out at about 1:25,000. The point where the causeway reaches Eriskay is NF 784124.

Chart 2770 states explicitly that MHWS lies at 4.2m, MLWS at 0.6m, above LAT, from which we deduce that MSL in the Sound of Barra is 2.4m above LAT. Remember that the local OS datum is 2.7m above LAT. Because of this difference, 0.3m or about one foot, it is possible that the lines of mean high and mean low water as shown on the map are wrong by that amount.

The differences between rock drawing on the four extracts are very marked. All four agree on the existence of the tiny islet named on the chart as Grianameal; but only *Explorer* agrees with the chart on the two minute yellow points close to the south-east corner of it, the other two unable to show any corresponding feature; and even *Explorer* disagrees with the chart about the existence of the tiny yellow point half-way to Lingay, while showing a tiny blue line (indicating HWM) close to NF 761116, an islet unknown to the chart.

The continuous areas bounded by LAT are shown on LR and EX as collections of tiny individual rock areas, which seems to indicate that the LAT-island is criss-crossed with channels dividing the rocks into areas each more than two feet above LAT. The user of the map is invited to consider how likely this is. The numbers shown seem to

depend on the scale of the map, with EX showing almost but not quite every green area more than a simple dot, while LR shows only those of more than some lower limit of area on plan. It would be very helpful if the map indicated explicitly what boundary is being shown. Neither LR nor EX gives a height for any point on a green area, not even those which the chart shows as drying more than 2.7m and therefore protruding above the Ordnance datum.

The six-inch shows the rock areas, where they are shown at all, apparently down to the line of LAT, and accentuates those areas given a rocky edge by the chart. There is no sense in which this edition of the six-inch can be said to be a data source for the smaller-scale maps, and we shall consider it no further.

The OS shows the high-water mark on *Landranger* by a continuous black line, on *Explorer* by a continuous blue line which is sometimes difficult to see against the background of rock drawing. The Admiralty plots HWMS as the lower limit of the buff tint, quite unlike any colour used by the OS. The great similarity between the two organisations' views of the high-water mark is covered by the note on the chart that "the topography is derived chiefly from Ordnance Survey maps", but the differences in datum result in a systematic difference of recorded heights.

Differences in spelling, caused by the OS' attempts to get the Gaelic spellings correct and the Admiralty's insistence on spell-as-you-speak, are remarked on where they could cause confusion. The Admiralty states[2] that its spellings are "in accordance with the principles and systems approved by the Permanent Committee on Names for British Official Use." It seems unlikely that this Committee includes a Gaelic scholar. In fact, it always surprises me that speakers of English seem to consider it somehow beneath them to attempt to spell correctly any names in the other two languages indigenous to these islands. A good example here is a rock drying 0.6m, so probably never appearing much above MLWS, for which the Admiralty uses the part-French-looking "Bo Vich il a Vhetur," which seems likely to be a corruption of "Bogha Mhi-chiall a'Bheithir," loosely translatable as Wild Animal Rock. The Admiralty provides many more names (usually in English translation) than does the OS, and these are used here to give some individuality to the features listed.

6. Unmapped rocks

So we need now to decide what we are going to look for, what islands and rocks we can reasonably ask to be added to *Landranger* and *Explorer*. Having regard to the differences between the four extracts considered above, our conclusions might be that anything *Explorer* doesn't show will almost certainly be below MLWS or well out to sea, while *Landranger* shows only the features larger on plan, as is appropriate to its smaller scale, but doesn't offer a defined boundary for its indications.

This means that we can reasonably provide a list of rocks drying above MLWS that are not shown on *Explorer*. By definition, drying rocks do not reach MHWS, and so they should appear as rock drawings *without* the blue line. Those which will appear above the local (Stornoway) Ordnance datum should be specially remarked, by showing in red their "OS height", which is the amount by which they exceed that datum. In some cases, the chart does not tabulate the local OS datum, and here we need to make an informed

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[2] *Nautical Publication NP5011, Symbols and Abbreviations used on Admiralty Paper Charts,* Taunton: The United Kingdom Hydrographic Office (2016), p.3, "*Names"*

estimate, or even remark only on the drying heights above local MSL. The limitations of *Landranger* make such a list less appropriate. But for both maps, we can look for genuine islands not shown on the map, reaching above MHWS on the chart. On *Explorer*, they will need the blue line; on *Landranger*, they may be too small to show. We do not consider that LR needs to show anything less than 100ft across on plan.

In the list below, therefore, we show for *Explorer*

- the drying height of all rocks shown to dry above MLWS, if unmarked already
- the drying height and the "OS height", that is the height above the local OS datum, for all rocks that dry to such a height whether marked on the existing map or not
- any features above MHWS ("islets") not already shown

and for *Landranger*

- any features above MHWS not already shown and larger than about 100 feet across on plan
- We show also the relevant maps and charts, with tabulated details of range of spring tides and the height of OS datum above LAT. For charts that do not give details about the OS datum, we show the method we use to work it out.

The chain of the Outer Hebrides, from Barra Head to the Butt of Lewis, is often familiarly known as the Long Island, because when viewing it from Skye or from the mainland the channels between the various islands cannot be distinguished: there is always some island or other in the line of sight. For the purposes of this list, we divide the Long Island into three groups, separated by the Sounds of Barra and Harris.

We start at Barra Head, the southern tip of the Outer Hebrides, and work north. Items are collected by major islands, proceeding clockwise around them.

Group A: The Southern Islands

BERNERAY TO THE SOUND OF BARRA

LR31 edition C1 2000, recent reprint 2009
EX452 revision A, 2002
Chart 2769 *Barra Head to Greian Head*, 2013, 1:30,000 (1mm = 98ft)
Tidal levels at Barra Head: MHWS 4.0m, MLWS 0.8m, therefore MSL 2.4m above LAT.
Difference between OS altitudes and chart altitudes not consistent:
therefore OS heights cannot be fixed and drying heights are given above local MSL

BERNERAY

Shelter Rock at NL 562807, dries 3.3m (0.9m above MSL)

Bird Rock at NL 552798, shown on Landranger as a single feature, on EX as two

MINGULAY
Nothing missing on LR or EX.

PABBAY
Outer Heisker (Theisgeir a-muigh) at NL 573868 shown on LR as single unit, on chart
and EX as 4 islets and 2 small rocks

LINGAY
Nothing missing on LR or EX.

SANDRAY
Cletta at NL 647900 shown on EX without blue line
Rock at NL 629921 very close to coast of Rubha Sheadair shown on EX *but not on LR or chart*
Loimbo Breaker at NL 627930, dries 2.2m: not shown on EX, does not reach MSL

FLODDAY
Islets at NL 6095 9200, 6095 9195, and 6175 9225, all more than 100 feet across, but not
shown on LR

VATERSAY
Islet at NL 649933 not shown on EX nor (too small?) on LR – called Sgeir a' Chiogaid
(probably a typo for a'Chlogaid, *of the pyramid*) on chart; this name applied to islet further
north at NL 650938 on EX
Islet at NL 650935 not shown on EX nor (too small?) on LR
Sgeirean Fiachlach at NL 677945 shown on chart and EX as 9 islets, on LR as 2

BARRA
Islet at NF 645005, 600 feet largest dimension, not shown on Landranger
Sgeir Liath at NF 651033, shown on chart and EX as 4 islets, on LR as a single unit

Chart 2770 *Sound of Barra*, 1:30,000, 2016 (1mm = 98ft)

Tidal levels at North Bay (NF 719039): MHWS 4.2m, MLWS 0.6m,
therefore MSL 2.4m above LAT
OS altitudes consistently 2m above chart: hence OS local datum is 2m below MHWS,
2.2m above LAT, 0.2m below local MSL

Tralisker at NF 726089, 1.2m above MHWS, no blue line: more than 100 feet across but
not clear on LR
Goose Rocks at NF 743081, dries 4m (OS height 1.8m)
Islet at NF756025, largest dimension 400 feet, not shown on Landranger
Bo nan Sgeiran Mòra at NF 740050, small islet, no blue line, too small for Landranger
Bo nan Sgeiran Beaga at NF 743050, dries 4.1m (OS height 1.9m)
Bo Migag at NF 735042, dries 2.4m (reaches MSL)
Rock at NF 726040, dries 2.4m (reaches MSL)
Islet at NF 732032, no blue line and not shown on Landranger
Rock at NF740003, dries 4.3m (OS height 2.1m)
Rock at NL 7315 9995, dries 3.5m (OS height 1.3m)
Deer Rock at NL 715999 , no blue line on EX
Rock at NL 714994, dries 3.3m (OS height 1.1m)

Group B: The Uists and Benbecula

SOUND OF BARRA TO SOUND OF HARRIS

This entire group of islands, from Eriskay in the south to Berneray in the north, are connected by causeways, and are therefore treated as a single group

SOUTH COAST OF SOUTH UIST AND ERISKAY

LR31 contd
EX452 contd
Chart 2770 *Sound of Barra* contd: OS local datum 2.2m above LAT

Hartamul at NF 834113: substantial island with lesser rock to E, not shown on EX
Calvay Rock at NF 8035 1330, dries 3.3m (OS height 1.1m)
Rock at NF 798095 dries 3m (OS height 0.8m)
Oashsgeir at NF 777116 dries 3m (OS height 0.8m)
Hasgeir Fiaray at NF 729134 , dries 2.7m (OS height 0.5m)

Outer Hasgeir Fiaray at NF 719137, dries 2.4m (OS height 0.2m)

WEST COAST

LR22 revision C1, 2000
EX453 revision A1, 2002, selected revision 2007
Chart 2722 *Skerryvore to Saint Kilda*, 1:200,000, 2015
Tidal levels at Balivanich (Benbecula): MHWS 4.1m, MLWS 0.5m, hence MSL 2.3m,
above LAT
OS altitudes consistently 2m above chart: hence OS local datum is 2m below MHWS,
2.1m above LAT, 0.1m below local MSL

There are no ports on the west coast of the Uists or Benbecula, and the causeways prevent passage of the sounds north and south of Benbecula by anything larger than a kayak, so a large-scale chart is unnecessary. Explorer therefore shows more details of islets above MHWS than the chart. We treat the Uists and Benbecula as a single unit, northward up the west coast and southward down the east. We take the causeways as limits of the coasts.

Ardivachar Rks at NF 722468 dries 3.2m, (OS height 1.1m), not shown on EX

EX454, revision A1, 2002, selected revision 2007

Sgeir an Galtun at NF 766612 dries 3m (OS height 0.9m), not shown on EX
Rock at NF 712657 dries 3.7m (OS height 1.6m), not shown on EX
Rock at NF 697674 also dries 3.7m, (OS height 1.6m), not shown on EX

HEISKER or MONACH ISLANDS

Tidal levels at Shillay referred to LAT: MHWS 4.2m, MLWS 0.4m, hence MSL 2.3m
OS altitudes consistently 2m above chart: hence OS local datum is 2m below MHWS,
2.2m above LAT, 0.1m below local MSL

West Dureberg at NF 577661 dries 1.2m, not shown on EX
Middle Dureberg at NF 613686 dries 2.7m (OS height 0.5m), not shown on EX
Charlotte Rocks at NF 654692 dries 1.4m, not shown on EX

NORTH UIST (North coast. Islands north and east of the Cope Passage are treated under
Harris-and-Lewis)
LR18, revision B1, 2002
EX454 contd
Chart 2841 *Loch Maddy to Loch Resort*, 1:50,000, 2011
Tidal levels at Bays Loch referred to LAT: MHWS 4.7m, MLWS 0.6m, hence MSL 2.7m

Gairgrada at NF 818800 dries 1.8m, not shown on EX
Meal Sgeir at NF 883823 islet about 300 feet across (OS height about 3m), not shown on EX or LR
Cat Rock at NF 933826 dries 1.2m, not shown on EX

Chart 2802 *Sound of Harris*, 1:21,000, 2011
Tidal levels at Loch Maddy referred to LAT: MHWS, 4.8m, MLWS 0.7m, hence MSL 2.8m
OS datum (Stornoway) 2.6m above LAT

Features SE from Berneray

The Reef, from NF 937811 TO 940807 six tiny heads, no blue lines on EX
Torkel Rock at NF 937798 dries 2.8m, (OS height 0.2m) just reaches MSL
Rock at NF 929784 dries 4.2m (OS height 1.6m)
Rock at NF 973784, dries 3.2m (OS height 0.6m)
Rock at 975794, dries 2.6m, just reaches OS datum
Sgeir a'Bhata Reothairt at NF 984782 dries 4.6m, (OS height 2m)

Features from Torogay to Opasay

Clach Mhòr Sheamsgeir at 57`41.2,7`08.8, NF 934780 tiny islet (OS height 3.2m), no blue line
Carroch Rock at NF 937774 dries 4.6m (OS height 2m)
Sgeir a' Ron Mhòir at NF951773, dries 3.1m (OS height 0.5m)
Yellow Rocks of Splears at NF 970775 dries 3.5m (OS height 0.9m)
Splears at NF 961774 dries 4.6m (OS height 2m)
Rock at NF 969773, dries 4m (OS height 1.4m)

Rock at NF 969777 dries 4.2m (OS height 1.6m)
Rock at NF977773, dries 3.2m (OS height 0.6m)
Sgeir a'Chuain (Rock of the Open Sea) at NF 983774, has tiny red "4" on EX, which is in
accordance with the chart height of 2m. We adopt this convention to show heights
between OS local datum and MHWS. This and Sight Rock (below) are the only red figures
on EX
Rock at NF 965763, dries 3.7m (OS height 1.1m)
Rock at NF 987762, dries 3.8m (OS height 1.2m)
Creag na Sealladh (Sight Rock) at NF 9905 7575, has tiny red "4" on EX

Features closer to the north coast of North Uist

Rock at NF 943753, dries 4.4m (OS height 1.8m)
Sgeir an Tarbh at NF 954753, dries3.9m (OS height 1.3m)
Sgeir Nighean an Righ at NF 968755, dries 4.6m (OS height 2m)
Rock at NF 970744, dries 4.4m (OS height 1.8m)
Angus Rock at NF 980735 dries 3.1m (OS height 0.5m)

NORTH UIST-BENBECULA-SOUTH UIST (East coasts)
The east coasts are much more indented than the west coasts and offer various harbours.
Large-scale charts are therefore available.
Chart 2825.1 *Loch Maddy*, 1:12,500, 2015
Tidal levels at Loch Maddy referred to LAT: MHWS 4.8m, MLWS 0.7m, hence MSL 2.8m.
OS local datum (Stornoway) is 2.6m above LAT at Loch Maddy

Nothing missing on LR or EX.

Chart 2825.2, *Loch Eport*, 1:15,000, 2015

Islet at NF 934640, no height available, no blue line
Bo Carrach at NF 925634, dries 2.7m, (OS height 0.1m)
Sgeir an Lolla at NF 908637, dries 4m (OS height 1.4m)
Islet at NF 902639, no height available, no blue line

Islet at NF 901641, no height available, no blue line
One Stone Rock at NF 8935 6340 dries 3m (OS height 0.4m)

LR22, revision C1 2000
EX453, 2002A1, selected revision 2007
Chart 2904 *Usinish to Eigneig Mhor*, 1:25,000, revision 2016
At a rough count, there are over 600 islands plotted on this chart, from nameless rocks a few feet across to Grimsay North Uist about four miles by two, and fewer than twenty of them are not shown on EX 453

From Eigneig Mor to Wiay

Bo Mòr at NF 892533 dries 3m (OS height 0.4m)
Centred on NF 880 500, the island of Màitheagh Riabhach is given its Gaelic name by EX to
its north-east, and the Anglicised version Maaey Riabhach to its south-west
At NF 880 499, EX omits two small blue lines
Keiravagh Islands at NF 871478 shown on LR as apparently a single island
Bo Iain Ghlais at NF 881477 dries 3m (OS height 0.4m)
At NF 849466 substantial island (about 500 feet across) and smaller island
to its E omitted from both EX and LR
Du' Sgeir an Tuath at NF 877447, (OS height 3.2m) no blue line on EX
Cleit Steisay at NF 848447, dries 4.3m (OS height 1.7m)
Rock at NF 834450 no height available, no blue line
Eilean na Bà Ruaidhe at NF 816453 shown on LR and the chart as a single unit,
on EX as four separate items
Islet at NF 820461 no blue line

Chart 2825.3, *Loch Carnan*, 1:12,500, 2015
On the chart, the name Loch Carnan refers to the outer part of Bagh nam Faoileann:
on the map it is applied to a much more restricted area centring on NF 828436
Tidal levels at Loch Carnan Pier (NF 831430): MHWS 4.5m, MLWS 0.6m, hence MSL
2.6m above LAT
OS local datum (Stornoway) 2.5m above LAT

Islets at NF 8285 4365, two small blue lines missing

Chart 2825.4, *Loch Skipport*, 1:12,500, 2015

Float Rock at 8495 3835, dries 2.3m (1.7m above MLWS)

Chart 1795, *The Little Minch Southern Part*, 1:100,000, 2017

From Usinish to Bolum Island: no changes required to EX or LR

Chart 2825.5, *Loch Eynort*, 1:12,500, 2015

Bolum island at NF 830282 shown on chart and EX as 2 islets, on LR as a single unit

Interestingly, at NF 812276, EX names the isthmus between the innermost head of the
Sloc Dubh and the sea, in an apparently unpopulated area, as "Hafn," a Welsh word
for *gap* but not a Gaelic word. It would be instructive to find out how many people,
in what professions, use this name.

Bo Carrach at NF 816263 dries 3.5m (OS height 1m)

Chart 1795, *The Little Minch Southern Part*, contd

From Loch Eynort to Loch Boisdale

Broad Rocks at 829 241, dries 3.7m, (OS height 1.2m, well below MHWS) shown on EX
with blue line

LR31, edition C1, 2000
Chart 2770.1, *Loch Boisdale*, 1:12,500, 2016
Tidal levela at Loch Boisdale: MHWS 4.1m, MLWS 0.5m, hence MSL 2.3m above LAT
OS local datum (Stornoway) 2.3m above LAT, same as local MSL

At NF 827200, no blue line for northerly rock, not shown on LR
Tripach at NF 827199, no blue line
Rock at NF 783181, 0.6m above MHWS (OS height 2.4m), no blue line, not shown on LR
Islet at NF 8275 1720, not shown on EX or LR
Clan Ewan Rock at NF 841161 dries 1.2m, not shown on EX

Group C: Harris and Lewis
NORTH OF THE SOUND OF HARRIS, including the distant islands

HARRIS (South-west coast. Islands south and west of the Cope Passage are treated under
North Uist)
Off-Lying Islands

LR18, edition B1, 2002
Chart 2802, *Sound of Harris*, 1:21,000, 2011
Tidal levels at Leverburgh, MHWS 4.6m, MLWS 0.6m above LAT, hence MSL 2.6m
Local Ordnance datum (Stornoway) 2.6m above LAT at Leverburgh, same as MSL
EX454, revision A1, 2002, selective revision 2007

Rock at NG 002777 dries 4m (OS height 1.4m)
Rock at NF 991786 dries 4.5m (OS height 1.9m)

EX455 A1, revised 2003, selected revision 2007

Sgeir Stevain at NG 016822 with smaller rock to E, no blue lines on EX, no HWM on LR
Rock at NG 012821 no blue line on EX (? too small for LR)
Knight's Rock at NG 005825 dries 3.7m (OS height 1.1m)
Group of 4 rocks at NF 991821 no blue lines on EX (all too small for LR)
Sgeir an Tarbh at NF 988824 dries 3.2m (OS height 0.6m)
Rock at NF 975847 no blue line
Sgeir nan Sollaig at NF 964852 no blue line
Sgeir Dhubh at NF 960854 no blue line

Rock at NF 966853 dries 3.1m (OS height 0.5m)

HARRIS: South-west Coast

Rock at NG 019847 dries 3.6m (OS height 1m)
Rock at NF 972912 dries 4m (OS height 1.4m)
Bretasker (outer rock) at NF 956935 not shown on LR

Chart 2841, *Loch Maddy to Loch Resort*, 1:50,000, 2011

TARANSAY
No changes to EX or LR

LR13, edition C1, 2002
EX456, revision A1, 2002, selective revision 2007
Tidal levels at West Loch Tarbert: MHWS 3.7m, MLWS 0.7m,
hence MSL 2.2m above LAT
No charted indication of OS local datum: EX altitudes consistently 2m higher than
chart, so OS datum can be taken as 2m below MHWS or 1.7m above LAT

Bona Ron at NA 970068 reaches 0.3m above MHWS, no blue line
Rock at NA 967065 dries 2.9m (OS height 1.2m)
Husinish Glorigs centered on NA 988098, shown as 6 islets on chart and LR, 10 on EX
Round Bo at NA964102, dries 2.3m (OS height 0.6m), not shown on EX
Obe Rocks at NA 943158 dries 3.5m (OS height 1.8m), not shown on EX
Bo Ban at NA 940183 dries 3.5m (OS height 1.8m), not shown on EX
Sgeir Chomnard at NA 891108 (Gasker inset) reaches 6m above MHWS, no blue line

A lighthouse reaching to 38m above MHWS stands on Gasker but is not symbolised on EX
Loch Resort marks the traditional boundary between Harris and Lewis (Inverness-shire
and Ross-and-Cromarty respectively)

LEWIS

Chart 2721 *Saint Kilda to Butt of Lewis*, 1:200,000, 2015
For the short stretch of coast from Mealasta Island to Eilean Molach, both EX and LR
give more details than the chart

LR13, contd
EX458, revision A1, 2002, selected revision 2007
Chart 2515 *Ard More Mangersta to Tiumpan*, 1:25,000, 2011
Tidal levels at Little Bernera: MHWS 4.3m, MLWS 0.5m, hence MSL 3.3m, above LAT

No data for difference between LAT and OS local datum: EX altitudes consistently 2m
higher than chart, so OS datum can be taken as 2m below MHWS or 2.3m above LAT

Sgeir Gallan at NB 048399 dries 3.4m (OS height 1.1m)
Iola Sgeir at NB 097375 dries 2.7m (OS height 0.4m)
Sgeir Collavig at NB 178341 dries 3.1m (OS height 0.8m)
Sgeir na h-Adaig at NB 137348 dries 3m (OS height 0.7m)
Bogha na Maighdean at NB 126366 dries 2.4m (OS height 0.1m)
Niughlaisgeir at NB 136381 dries 4m (OS height 1.7m)
Bogha Dubh at NB 128403 dries 2.5m (OS height 0.2m)
Sgeir na Galla at NB 111416 (Little Bernera inset) dries 3.1m (OS height 0.8m)

LR8, edition C1, 2002
EX460, revision A1, 2002, selected revision 2007
Tidal levels at Carloway: MHWS 4.1m, MLWS 0.7m, hence MSL 2.4m above LAT
Local Ordnance datum (Stornoway) 2.2m above LAT

Rock at NB 174439 dries 2.8m (OS height 0.6m)

Chart 1785 *North Minch Northern Part* 1:100,000, 2015
Tidal levels at Stornoway: MHWS 4.8m, MLWS 0.7m, hence MSL 2.8m above LAT
Ordnance local datum at Stornoway 2.7m above LAT

Dun Eorodail at NB 543 629: substantial islet, greatest dimension 200m, not shown on chart
Am Braga at NB 566613 dries 3.4m (OS height 0.7m)

EX459, revision A1, 2002, selected revision 2007

Islet at NB 443342, greatest dimension approx 300m, not shown on chart or LR
A'Chearc at NB 493289, dries 4.3m (OS height 1.6m)

Chart 2529 *Approaches to Stornoway* 1:25,000, 2009
LR14, edition C2, 2000
EX457 revision A1, 2002, selected revision 2007

Sgeir a'Chaolais at NB 417257 dries 3.7m (OS height 1m)
Rock at NB 406240 dries 2.6m (1.9m above MLWS), not shown on EX or LR
Plaideag at NB 385221 dries 2.9m (OS height 0.2m)
Sgeir nan Each at NB 375207 dries 4.2m (OS height 1.5m)
Sgeir an Tanga at NB 376206 dries 3.2m (OS height 0.5m)
The Brothers at NB 408221 dries 3.2m (OS height 0.5m)

Chart 1794 *North Minch Southern Part*, 1:100,000, 2018

Rock at NB 370102 dries 2.9m (OS height 0.2m)

EX456 cont

Aline Lodge on the west shore of Loch Seaforth marks the traditional boundary between
Lewis and Harris

EX455 A1, revised 2003, selected revision 2007 (contd)

Sgeir Inoe at NG 292919, dries 2.3m (1.6m above MLWS): not shown on Explorer but
described in a marginal note as “the small island of Sgeir In-ao” lying 5.5km off Rubh' an Eorna. Shown on LR in that position under that name

Chart 2905 *East Loch Tarbert* 1:12,500, 2012
Tidal levels at East Loch Tarbert: MHWS 5m, MLWS 0.8m, hence MSL 2.9m, above LAT
OS local datum (Stornoway) is 2.7m above LAT

Sgeir an Daimh at NG 243988 dries 3.5m (OS height 0.8m)
Sgeir Braigh Mor at NG 195954 dries 4m (OS height 1.3m)
Maclean Rock at NG 199963 dries 3.5m (OS height 0.8m)
Grasgeir a's Iar at NG 182971, greatest dimension about 500 feet, not shown on LR
Little Whiting Rock at NG 174983 dries 3m (OS height 0.3m)
Sgeir Ian Ruadh at NG 156978 1m above MHWS (OS height 3.3m), no blue line
Sgeir Bun a'Loch at NG 158969 1m above MHWS (OS height 3.3m), no blue line
Sgeir Ghobhlach at NG 178947, no blue line
Rock at NG 183951, height unknown, no blue line
Rock at NG 188933 dries 4.7m (OS height 2m)

Chart 1757 *The Little Minch Northern Part* 1:100,000, 2015

No changes to LR or EX

LR18, edition B1 2002

No changes to LR or EX

Outermost Isles

ST KILDA
LR18, edition B1 2002
EX460 cont
Chart 2524.6 *Saint Kilda*, 1:15,000, 2015
Tidal levels at Village Bay: MHWS 3.4m, MLWS 0.4m, hence MSL 1.9m, above LAT
Local OS datum 0.33m above LAT
Nothing missing on LR or EX

FLANNAN ISLES

LR13, edition C1, 2002
EX460 cont
Chart 2524.5 *Flannan Isles* 1:15,000, 2015
Nothing missing on LR or EX.

SULA SGEIR
LR8, edition C1, 2002
EX460 cont
Chart 2524.1 *Sula Sgeir* 1:15,000, 2015

Boghannan s'Iar at 5 HW 619311 dries 3.3m (OS height probably 3m)
Bogha Corr at HW 6125 3125, dries 1.7m (OS height probably 1.5m)
Two islets at HW 619307 not shown on Landranger

RONA
Chart 2524.2 *Rona* 1:20,000, 2015
Nothing missing on LR or EX