How to work out the tidal stream

John Goode looks at several ways of calculating the rate and set of a tidal stream – and touches on allowances that we may need to make in practice.

Whenever we set sail on the up, down and sideways-moving seas that surround our shores, it’s wise to be able to make full use of any source of tidal stream information that we may have at our disposal. Although presented in different formats, with varying degrees of sophistication and claimed accuracy, most sources available to yachtsmen use exactly the same core data – as provided by the Admiralty’s UK Hydrographic Office. In some cases this data can be quite basic, many decades old and obtained primarily for the benefit of larger, deep-draught shipping.

For times when we need to know more than just whether a weak or strong stream is with or against us, or when it will turn, it’s good seamanship practice to have a prepared means of extracting precise stream rates already to hand – or standby to be used if more detailed tidal chartwork is required.

As well as illustrating several classic ways of predicting the set (direction) and rate (speed) of a tidal stream, I’ve also touched on some of the limitations that we should be aware of in practice. That’s because, no matter how accurately we might work out the ‘predicted’ speed of a stream (whether it’s the realistic numbers from a printed atlas or charted tidal diamond, or that computed for us to a precision of one hundredth of a knot by an electronic chartplotter), it remains only a mathematical calculation – and one that can occasionally be subject to less than predictable influences.

While it isn’t possible to make precise allowances for all potential influences (such as storms surges, floodwater pouring out of estuaries or strong winds blowing continually from the same direction), we can sometimes – with the help of a dependable electronic log and depth sounder – check out the actual speed of the tide or find an elusive back eddy. Generally, though, in good weather most of the tidal streams that we encounter should be flowing at a speed that’s within 20 per cent of the predicted rate – no matter what source we used to obtain it.

In good weather we can expect the speed of a tidal stream to be within 20% of its predicted rate

Effect of heavy rain and storm force winds

Approaching the narrow entrance of a tidal estuary after a long period of heavy rainfall (as we’ve had this summer), be prepared for the tidal stream already faster stream to be considerably accelerated by floodwater pouring down from higher ground.

In the open sea around our shores, a strong wind blowing continually from the same direction as the tidal stream can increase its speed – and slow it down when it runs towards the blow. As a rough guide, a Force 6 blowing in the same direction for around 12 hours can increase/decrease the tidal stream speed by about ½ knot – and about ¼ knots if a Force 9 gale persists for a couple of days.

Harness the height of tide to beat a foul stream

While not all tidal eddies (such as the prominent and much used one off the Cherbourg peninsula) are recorded, there are numerous smaller counter-streams – or at least areas of slacker water – that we can often harness to make better progress against a foul tide.

Predictions, rainstorms and back eddies

Prediction sources

Whatever our preferred method of navigation, it’s always worth bearing in mind that the core tidal stream data used by most printed and electronic sources is exactly the same.

So too are the basic principles used for any ensuing chartwork – whether it’s applied to a paper chart or extracted after fuller and direction from a nautical almanac, or having it all computed for us by a chartplotter’s electronic programme. And don’t forget that a tidal ‘prediction’ from any source can occasionally be subject to less than predictable influence.

To yachtsmen use exactly the same core data – as provided by the Admiralty’s UK Hydrographic Office. In some cases this data can be quite basic, many decades old and obtained primarily for the benefit of larger, deep-draught shipping.

For times when we need to know more than just whether a weak or strong stream is with or against us, or when it will turn, it’s good seamanship practice to have a prepared means of extracting precise stream rates already to hand – or standby to be used if more detailed tidal chartwork is required.

As well as illustrating several classic ways of predicting the set (direction) and rate (speed) of a tidal stream, I’ve also touched on some of the limitations that we should be aware of in practice. That’s because, no matter how accurately we might work out the ‘predicted’ speed of a stream (whether it’s the realistic numbers from a printed atlas or charted tidal diamond, or that computed for us to a precision of one hundredth of a knot by an electronic chartplotter), it remains only a mathematical calculation – and one that can occasionally be subject to less than predictable influences.

While it isn’t possible to make precise allowances for all potential influences (such as storms surges, floodwater pouring out of estuaries or strong winds blowing continually from the same direction), we can sometimes – with the help of a dependable electronic log and depth sounder – check out the actual speed of the tide or find an elusive back eddy. Generally, though, in good weather most of the tidal streams that we encounter should be flowing at a speed that’s within 20 per cent of the predicted rate – no matter what source we used to obtain it.

In good weather we can expect the speed of a tidal stream to be within 20% of its predicted rate

Effect of heavy rain and storm force winds

Approaching the narrow entrance of a tidal estuary after a long period of heavy rainfall (as we’ve had this summer), be prepared for the tidal stream already faster stream to be considerably accelerated by floodwater pouring down from higher ground.

In the open sea around our shores, a strong wind blowing continually from the same direction as the tidal stream can increase its speed – and slow it down when it runs towards the blow. As a rough guide, a Force 6 blowing in the same direction for around 12 hours can increase/decrease the tidal stream speed by about ½ knot – and about ¼ knots if a Force 9 gale persists for a couple of days.

Harness the height of tide to beat a foul stream

While not all tidal eddies (such as the prominent and much used one-off the Cherbourg peninsula) are recorded, there are numerous smaller counter-streams – or at least areas of slacker water – that we can often harness to make better progress against a foul tide.

Predictions, rainstorms and back eddies

Prediction sources

Whatever our preferred method of navigation, it’s always worth bearing in mind that the core tidal stream data used by most printed and electronic sources is exactly the same.

So too are the basic principles used for any ensuing chartwork – whether it’s applied to a paper chart or extracted after fuller and direction from a nautical almanac, or having it all computed for us by a chartplotter’s electronic programme. And don’t forget that a tidal ‘prediction’ from any source can occasionally be subject to less than predictable influence.
Tidal streams at a glance

By far the easiest way to work out tidal stream rates – and the most dependable

For accuracy and simplicity, my preferred sources of tidal data are the Yachtsman’s Tidal Atlases – compiled specifically for small boat sailors by the late Michael Reeve-Fowkes and currently published by Adlard Coles.

Based solely on the time and height of High Water Cherbourg (extracted from our nautical almanac), the atlas’s pages are marked up the same way as any other tidal atlas – i.e. 6 hrs before and 6 hrs after the time of HW. Their ability to provide the height of tide without undue interpolation was illustrated in my earlier article (YM Summer 2012 issue). They are just as quick and easy to use for ‘instantly’ extracting the rate and set of a tidal stream.

In areas covered by the atlases (left), not only can the height of tide above Chart Datum for every port be extracted without interpolation – we can also determine its speed and direction in a format that’s immediately suited to practical tidal chartwork. See Quick course to steer, YM June ‘11.

1 Cherbourg high water

Get the time and height of HW Cherbourg on 1st October – here from Reeds Nautical Almanac.

Note: during the summer Cherbourg’s TIME ZONE –0100 conveniently equates to British Summer Time.

Mark up the Atlas’s stream rate conversion table. Pencil-in (the same on all 12 pages) the Cherbourg HW height of 6.5 metres.

2 Mark up the time boxes either side of HW Cherbourg. Fill in each page for the 6 hours before/after Cherbourg’s HW time of 1013.

Here, on the HW –1 page, we subtract one hour and write 1013; on the HW +1 page we add an hour and so on.

3 We can establish the stream’s rate anywhere on the atlas by comparing its ‘mean rate’ (shown alongside each arrow) with the Stream Rate Conversion Table. Here, simply by casting an eye over the table the ‘mean’ rate of 1.4 knots immediately converts to a predicted Rate of 2.0 knots at 1013 hrs (1 hr before HW Cherbourg).

‘It is worth spending a few minutes holding station by an outer mark’

Hold station to gauge rate and set

Before entering a complex pilotage situation where accurate allowance for cross-tide is critical, it’s worth spending a few minutes holding station by an outer mark.

By stemming the stream while noting the reciprocal of our heading and, provided it’s accurate (see YM June ’12 issue) the speed shown on our electronic log, we can get a fairly reliable indication of the actual speed and direction of the stream we’ll encounter when we get under way again.
Admiralty tidal stream atlases

How to make full use of the most comprehensive source of tidal data

1. **Look up standard port time of HW**
   - From the Almanac, get the time of HW at the atlas’s reference port. Here, it’s 1112 UT (GMT) at Dover on 16 June.

2. **Mark up the tidal stream atlas**
   - Mark up the pages of the atlas by filling in the time boxes for 6 hrs before and 6 hrs after Dover’s HW time of 1112 hrs. On the page of the atlas shown (right), at 0812 hrs (3 hours before HW Dover) the highlighted stream Rate indicates a speed of 2.4 knots at neaps and 4.8 knots at springs.
   - If, as here, we’re between neap and spring tides it’s usually sufficient to make a quick estimation of the stream’s Rate simply by looking at the numbers.

3. **Computations of rates**
   - When it’s likely that more tidal stream accuracy (between neaps and springs) will be required during the day ahead, its worth going one step further by taking just a few minutes to mark up the Computation of Rates table – printed on the atlas’s inside front cover – before setting sail. This requires going back to the Almanac.
   - Tidal Diamond Reference Ports: The table is based on the time of High Water at its allocated standard port.
   - Note that the chart in the example below, has 10 tidal diamonds – far fewer reference points than you’d get from a dedicated tidal atlas.

Charted tidal diamonds

How to establish basic rate and set using the chart and an almanac

1. **Get time of High Water at the standard port**
   - From the Almanac, get the time of HW at the atlas’s reference port. Here it’s 1730 UT (GMT) at Plymouth on 1 June.

2. **Mark up the tidal diamonds table**
   - Using the chart and an almanac, mark up the tidal diamonds table – inside the front cover of the relevant tidal atlas, pictured right – as shown at the bottom of the opposite page.

3. **Computation of rates requires stream atlas**
   - Although not as comprehensive as a dedicated tidal atlas, limited stream information can be obtained at the strategic positions marked on a chart by lettered Tidal Diamonds.
   - These relate to a box-out table (usually printed on the face of the chart, but sometimes you'll find it on the back) that gives the predicted direction, and neap and spring rates, at the diamond's geographical position. The table is based on the time of High Water at its allocated standard port.
   - The table can be marked up by pencilling on the chart alongside the boxes the times that indicate 6 hrs before and 6 hrs after Plymouth’s High Water time of 1730.
   - Here, at Tidal Diamond ‘E’ to the south of Portland Bill, at 1430 (3 hrs before HW Plymouth) the direction of tide is 228° True – with a stream rate of 4.8 kts at springs and 2.4 kts at neaps.

Thanks to Southern Sailing School, Southampton. Tel: 01489 575511. Website: www.southern.co.uk

John Goode’s series of booklets and DVDs on essential navigation and seamanship are available through his website www.marinepublications.co.uk or by calling 01633 411090 (24 hr answerphone).

Books and DVDs can be ordered from John Goodes website. www.southern.co.uk