

Appendix, No. 2.

MR. TELFORD'S REPORT to the Right Honourable the Lords Commissioners of His Majesty's Treasury, respecting the *Great Roads*, from *Holyhead* through *North Wales*.

IN obedience to Your Lordships Instructions, dated the 4th May 1810, no time was lost in commencing surveys in North Wales. The project being extensive, it was necessary to precede the actual detailed surveys by careful perambulation, and various trial surveys. The most important points in general Lines of Communication through mountainous countries appear to be, 1st. The direction and shape of the Vallies. 2dly. The comparative elevations of the Passes in the Ridges which separate these Vallies. And 3dly. The crossing large Rivers, particularly, in this case, the arm of the sea which divides Anglesea from Caernarfon, and also the tide way of the Conway River.

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Having (with these general points in view) examined and attentively considered the various lines proposed, or of which the country is susceptible, between Holyhead and Shrewsbury, and also between Bangor Ferry and Chester, and having determined the principal points which were to regulate the surveys, I, in order as much as possible to guard against prejudices respecting particular lines, employed persons unknown in Wales, and accustomed to make Road surveys in similar countries in Scotland; with the same view I avoided communicating with Land Owners or others interested in the track through which the surveys were carried, considering in general surveys of this nature, that it is better to judge from the shape and distribution of the country alone.

In order that a correct judgment may be formed of the state of the present Roads, I have caused accurate surveys and sections to be made and laid down on the same Maps, and to the same scales with the new lines; this will shew their comparative distances and ratio of inclination.

Having laid down the lines of Road from the actual surveys, the adjacent country has been filled up from the very excellent Map of Mr. Evans; this was necessary to shew the relative position of the principal Towns, Vallies, and country Roads.

HOLYHEAD to SHREWSBURY.

To preserve the order laid down in the Instructions, I shall proceed first with the line between Holyhead and Shrewsbury.

The general direction of this line is chiefly determined by the point of crossing the Menai, and circumstances connected with the valley of the Dee.

The Menai can certainly be crossed with most advantage in the vicinity of the present Ferry, and the valley of the Dee must be followed to near the great Aqueduct below Llangollen: this creates a very considerable bend to the N. E., but proceeding in a more direct line, is precluded by the unbroken ridge which forms the S. E. side of this valley. Much pains was in vain bestowed to obtain a line from near the Druid Inn, across the country towards Oswestry. But the pass at the Tannat summit is 1,160, another pass a little to the West of Corwen, at the Ceiriog summit is 1,246, and that leading to the Ceiriog at the Glynn is 996 feet all above the level of Corwen Bridge, and the lowest of them is about 500 feet

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above the level of Kyrniogu. The Tannat valley, besides being entangled with this very elevated summit, is nearly as far to the S. W. as Llangollen is to the N. E. of a direct line; and the deep and confined valley of the Ceiriog, by creating two high summits, is an effectual bar to leaving the valley N. E. of Corwen, I therefore consider that the general line of communication must be continued in the same vallies through which the present Road passes.

But though continued in the same vallies, so ill conducted and imperfect is the present Road, that scarcely any part can be made use of. I have therefore, in choosing a new line, paid very little regard to it.

I shall now proceed in detail with the separate districts; into which, for sake of distinctness, I have divided this line, beginning at Holyhead.

From HOLYHEAD to the MENAI.

From the Eagle Inn at Holyhead to the Western shore of the Menai at Bangor Ferry, the distance by the present Road is 24 miles 810 yards. From the streams in this Island running North and South, the Road crosses the vallies nearly at right angles, and frequently with rates of ascent and descent of 1 in 9½, 12, 15, 16, being inconveniently steep for Wheel Carriages; besides the greater vallies, the face of the country is almost wholly broken into small hills, over which the Road is carried in continual succession; it has also been carried nearly three miles to the North of a direct line, and bending towards the highest part of the Island. To attempt improving the present Road, so as to bring it to the stipulated breadth and rate of inclination, would amount to a total change, and must unavoidably lengthen it very considerably. To go more North, would be departing still further from a direct line, and, unless carried several miles, would get upon still higher ground. It is therefore to the southward, that the new one is chosen; this not only enables it to be carried more direct, but to pass the general summit at 160 feet lower level, by crossing Lady Stanley's Sands; the distance between Holyhead and the Menai is made 2 miles 1,556 yards less than by the present Road; and if even continued by the Four-mile Bridge, the saving in distance would still be 1 mile 1,008 yards.

In the direction here proposed a very excellent Road may be laid out, the greatest inclination not exceeding 1 in 30, and that adopted only in a very small proportion of the Road, in order to preserve a proper direction, and avoid unnecessarily increasing the length of the line, but the average inclinations are not 1 in 50.

The Estimates of the expense are formed upon the principle of having the Road 40 feet in width, of which 18 feet in the middle to be made with a bed of stones 15 inches in depth on an average, properly laid and broken, with the necessary Bridges, Cross Drains, Side Drains and Fencing, including the value of the land to be occupied by the Road, Side Drains and Fences, all executed in the most perfect manner. This sort of Road, besides the middle or winter Carriage Road, leaves a summer Road on each side, which, if proper regulations were adopted, would prevent inconveniency from Carriages meeting.

From Holyhead, to and across Lady Stanley's Sands, to the junction of line by Four-mile Bridge:		£.	£.
Road-making, including cutting and embanking	-	23,267	
Bridges and Drains	-	340	
Breast and retaining walls, fencing land, and damages	-	2,444	
			26,051
From D ^o , by Four-mile Bridge:			
Road-making, including cutting and embanking	-	7,355	
Bridges and Drains	-	509	
Breast and retaining walls, fencing land, &c.	-	3,903	
		11,833	
Carried forward	-	£.	26,051

Brought forward - - -	£.	26,051	
From junction of Lines to W. Side of Maldraeth Embankment:			
Road-making, including cutting and embanking - - -	13,932		
Bridges and Drains - - - - -	417		
Breast and retaining walls, fencing land, &c. - - -	7,780		
			22,129
Across Maldraeth Valley:			
Road-making, embanking, &c. - - - - -	1,841		
Bridges and drains - - - - -	1,230		
Land, &c. - - - - -	600		
			3,671
From D° to West Bank of Menai, opposite Swilly:			
Road-making, cutting and embanking - - - - -	6,741		
Bridges and Drains - - - - -	602		
Breast and retaining walls, fencing land, &c. - - -	3,920		
			11,263
	£.	63,114	
If carried by Four-mile Bridge - - - deduct -		14,218	
	£.	48,896	
	Distance.	Expense.	
	Miles. Yards.		
From Holyhead to the Menai, across the Sand - - -	21. 1,914	£. 63,114	
From - D° - to - D°, by Four-mile Bridge - - -	22. 1,562	£. 48,896	
Add, if the Road is continued to Ynys-y-Moch - - -		£. 4,500	

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The crossing the Menai having always been considered the chief obstacle in this important line of communication, I repeatedly examined it. I caused correct surveys and sections to be made, and perused the several Reports which have been made respecting it.

As a general explanation of the nature of the tides in the Menai, I shall insert an extract from a Report made in April 1783, by Mr. John Golborne, who seems to have very attentively considered the subject. "On April the second, being the day after new moon, the wind at S.W. and moderate weather, the tide flowed 19 feet 4 inches at the Swilly rocks, the current ran with great velocity towards Beaumaris for three hours and a half, when it changed its course, and ran towards Caernarfon; it continued flowing for an hour and a half, and then became stationary for half an hour at high water, but still continued its course towards Caernarfon. During the ebb its velocity increased for an hour and a half, and then abated; at forty minutes after two there was very little current, and at three o'clock it again changed its course and ran towards Beaumaris with a strong current, and continued falling till 20 minutes after five, when it again began to flow from Caernarfon. I shall endeavour to account for this irregularity in the tide's motion, which is very singular. It is to be considered that the tide coming out of the great Western Ocean, makes high water, at the full and change of the moon, at nine o'clock on the Bar of Caernarfon, and at half-past ten at Beaumaris; the first of flood then arriving an hour and a half sooner at the Bar of Caernarfon than it does at Beaumaris, pushes up the Straights of Menai with great violence, and meets the tide near Beaumaris which has flowed round the Island of Anglesea. It might indeed, have been expected to have arrived there sooner, as it had not one-fourth of the space to move over, and it most undoubtedly would have done so, was not its motion greatly

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“ greatly impeded by great obstructions in passing over numerous sand banks
“ and shoals lying between the Bar and Caernarfon, and in the mouth of the
“ Straights of the Menai. The Swilly Rocks too are no small impediment, over
“ which it runs with great impetuosity until the tide of ebb begins to make at
“ the Bar of Caernarfon; it suddenly changes its course, and runs the opposite
“ way with great violence, and the current becomes much increased by being
“ joined by the tide of flood flowing in at Beaumaris for an hour and a half,
“ causes a most violent ebb which runs with great violence through the Swilly.
“ At length the ebb at Beaumaris coming on, the other consequently slackens,
“ and the current again changes its course near Lord Paget's house, and runs
“ for two hours towards Beaumaris before the flood comes again up the Swilly.
“ From the observations which I have made on the tides, it appears that they
“ flow five hours and ebb seven at the Swilly rocks, that very high tides have
“ risen seven yards, and that the Swilly rocks are very dangerous to pass for four
“ hours and a half in spring tides.” To these judicious remarks I shall only add,
that from my own observations, and those made by Mr. Morrison, the Surveyor
whom I employed, it appears that the spring tides, in July 1810, rose 21 feet
6 inches, and that the greatest velocity during those tides, taken between
Ynys-y-moch and the Swilly, was from 4 to 5½ miles per hour. The annexed
Map and Sections will shew the relative situation of the shores, and the channel
between them. The duty assigned me being to consider and report respecting
a Bridge across the Menai, I shall confine myself to this object. Admitting the
importance of the communication to justify acting on a large scale, I not only
consider the constructing a Bridge practicable, but that two situations are
remarkably favourable: it is scarcely necessary to observe, that one of these situa-
tions is at the Swilly rocks, and the other at Ynys-y-moch; these two being so
evidently the best, the only question that can arise is, to which of them the
preference ought to be given.

From the Appendix to the Second Report of the Committee on the Holyhead
Roads and Harbour, it appears that a considerable number of small coasting
Vessels, viz. from 16 to 100 tons, navigate the Menai, and there have been a few
from 100 to 150 tons. By statements from the principal Shipbuilders in the
River, made in the year 1800, to the Committee for improving the Port of London,
it also appears that Vessels of 150 tons, when they have all an end, are only 88
feet in height above the water line; and further, that even Ships of 300 tons,
with their top-gallant masts struck, are nearly the same height. These in the
Menai may be considered as extreme cases, and if provided for, ought, as to
navigation, to satisfy every reasonable person; it may indeed rather be a question,
whether the height should not be limited to Vessels under 100 tons, by which the
expense of a Bridge would be considerably diminished.

In the Plans I have formed, provision is made for admitting Vessels of 150
tons to pass with all an end; that is, in one Design preserving 90 feet, and in the
other 100 feet between the line of high-water and the lower side or soffit of the
arch. The first of the Designs is adapted for passing across the three rocks,
named the Swilly, Benlass, and Ynys-Well-Dog, which by their shape and position
are singularly suitable: to embrace the situation most perfectly, I have divided
the space into three openings of 260 feet, and two of 100 feet each, making piers
each thirty feet in thickness; over the three large openings, the arches are made
of cast iron; over the smaller spaces, in order to add weight and stability to the
piers, semicircular arches of stones are introduced; but over these, as well as the
large openings, the Spandrels, Roadway and Railing, are constructed of cast iron.
In this way the Navigation is not impeded, because the piers standing near to
the outer edges, are guards for preventing Vessels striking upon the rocks, while
the whole structure presents very little obstruction to the wind. From the ex-
tremity of the abutments, after building rubble walls above the level of the tide-
way, I propose carrying Embankments, until the Roadway reaches the natural
ground. The annexed Drawing will sufficiently explain the nature of the
design. I propose the Bridge to be 32 feet in breadth, and, from minute calcu-
lations made from detailed Drawings, I find the expense of erecting the whole in
a perfect manner amounts to £. 158,698.

The other Design is for the narrower Streight, called Ynys-y-Moch; here the
situation is particularly favourable for constructing a Bridge of one arch, and
making

making that 500 feet span, leaves the Navigation as free as at present. In this I have made the height 100 feet in the clear at high-water spring-tides, and I propose this Bridge to be 40 feet in breadth; estimating from Drawings, as already described, I find the expense to be £.127,331. or £.31,367. less than the former. From leaving the whole Channel unimpeded, it is certainly the most perfect scheme of passing the Menai, and it would, in my opinion, be attended with the least inconvenience and risk in the execution.

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In order to render this evident, I have made a Drawing to shew in what manner the centering or frame for an arch of this magnitude may be constructed; hitherto the centering has been made by placing supports and working from below; but in the case of the Menai, from the nature of the bottom of the Channel, the depth at low water, and the great rise and rapidity of the tides, this would be very difficult, if not impracticable. I therefore propose changing the mode, and working entirely from above; that is to say, instead of supporting, I mean to suspend the centering. By inspecting the Drawing, the general principle of this will be readily conceived.

I propose, in the first place, to build the masonry of the abutments as far back as the lines AB, CD, and in the particular manner shewn in the Section.

Having carried up the masonry to the level of the Roadway, I propose, upon the top of each abutment, to construct as many frames as there are to be ribs in the centers, and of at least an equal breadth with the top of each rib. These frames to be about fifty feet high above the top of the masonry, and to be rendered perfectly firm and secure. That this can be done, is so evident, I avoid entering into details respecting the mode. These frames are for the purpose of receiving strong blocks, or rollers and chains, and to be acted upon by windlasses or other powers.

I next proceed to construct the centering itself; it is proposed to be made of deal baulk, and to consist of four separate ribs, each rib consisting of a continuation of timber frames, five feet in width across the top and bottom, and varying in depth from 25 feet, near the abutment, to 7 feet 6 inches at the middle or crown. Next to the face of the abutment, one set of frames about 50 feet in length can, by means of temporary scaffolding and iron chain bars, be readily constructed and fixed upon the masonry offsets of the abutment, and to horizontal iron ties laid into the masonry for this purpose. A set of these frames (four in number) having been fixed against the face of each abutment, they are to be secured together by cross and diagonal braces; and there being spaces of only 6 feet 8 inches left between the ribs (of which these frames are the commencement) they are to be covered with planking, and the whole converted into a platform 50 feet by 40. By the nature of the framing, and from its being secured by horizontal and suspending bars, I presume every person accustomed to practical operations will admit that these platforms may be rendered perfectly firm and secure.

The second portion of the centering frames having been previously prepared and fitted together in the carpenter's yard, are brought in separate pieces, through passages purposely left open in the masonry, to the before-mentioned platform; they are here put together, and each frame raised by the suspending chain bars and other means, so that the end which is to be joined to the frame already fixed, shall rest upon a small movable carriage: it is then to be pushed forward, perhaps upon an iron Railroad, until the strong iron forks which are fixed upon its edge, shall fall upon a round iron bar which forms the outer edge of the first or abutment frames: when this has been done, strong iron bolts are put through eyes in the forks, and the aforesaid second portion of frame-work is suffered to descend to its intended position by means of the suspending chain bars, until it closes with the end of the previously fixed frame like a rule joint. Admitting the first frames were firmly fixed, and that the hinge part of this joint is sufficiently strong, and the joint itself about 20 feet deep, I conceive that even without the aid of the suspending bars, that this second portion of the centering would be supported; but we will for a moment suppose that it is to be wholly suspended.—It is known by experiments, that a bar of good malleable iron, one inch square, will suspend 80,000lbs. and that the powers

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of suspension are as the sections; consequently a bar of $1\frac{1}{2}$ inch square will suspend 180,000 lbs. but the whole weight of this portion of rib, including the weight of the suspending bar, is only about 30,000 lbs. or one-sixth of the weight that might be safely suspended; and as I propose two suspending chain bars to each portion of rib, if they had the whole to support they would only be exerting about $\frac{1}{12}$ th of their power; and considering the proportion of the weight which rests upon the abutments, they are equal also to support all the iron-work of the Bridge, and be still far within their power.

Having thus provided for the second portions of the centering a degree of security far beyond what can be required, similar operations are carried on from each abutment until the parts are joined in the middle and form a complete centering; and being then braced together, and covered with planking where necessary, they become one general platform or wooden bridge on which to lay the iron-work.

It is, I presume, needless to observe, that upon such a centering or platform the iron-work, which it is understood has been previously fitted, can be put together with the utmost correctness and facility; the communications from the shores to the centering will be through the before-mentioned passages left in the masonry.

The form of the iron-work of the main ribs will be seen by the Drawings to compose a system of triangles, preserving the principal points of bearing in the direction of the radius. It is proposed in the breadth of the bridge (i. e. 40 feet) to have 9 ribs, each cast in 23 pieces, and these connected by a cross-grated plate, nearly in the same manner as in the great Aqueduct of Pontcysylte over the valley of the Dee near Llangollen; the fixation of the several ribs in a vertical plane appearing (after the abutments) to be the most important object in iron Bridges, I propose to accomplish this by covering the several parts, as they are progressively fixed, with grated or reticulated and flanced plates across the top of the ribs. This would keep the tops of the Ribs immovable, and convert the whole breadth of the Bridge into one frame; besides thus securing the top, I propose also having cross braces near the bottom of the ribs.

The main ribs being thus fixed, covered and connected together, the great feature of the Bridge is completed; and as, from accurate experiments made and communicated to me by my friend the late William Reynolds of Coalbrook Dale, it requires 448,000 lbs. to crush a cube of $\frac{1}{4}$ inch of cast iron of the quality called gun metal, it is clear, that while the ribs are kept in their true position, the strength provided is more than ample.

When advanced thus far, I propose (though not to remove) yet to ease the timber centering, by having the feet of the centering ribs (which are supported by off-sets in the masonry of the front of the abutment) placed upon proper wedges; the rest of the centering to be eased at the same time by means of the chain bars. Thus, the hitherto dangerous operation of striking the centering, will be rendered gradual, and perfectly safe: insomuch, that this new mode of suspending the centering instead of supporting it from below, may perhaps hereafter be adopted as an improvement in constructing iron bridges, even in places not circumstanced as are the Menai Straits. Although the span of the arch is unusually great, yet by using iron as a material, the weight upon the center, when compared with large stone arches, is very small; taking the mere arch stones of the center arch of Blackfriars bridge at $156 \times 43 \times 5$ equal to 33,540 cubic feet of stone, it amounts to 2,236 tons, whereas the whole of the iron-work in the main ribs, cross plates and ties, and grated covering plates, that is to say, all that is lying on the centering at the time it is to be eased, weighs only 1,791 tons; it is true, that from the flatness of the iron arch, if left unguarded, a great proportion of this weight would rest upon the centering; but this is counterbalanced by the operation of the iron ties in the abutments, and wholly commanded by the suspending chain bars.

When the main iron ribs have been completed, the next step is to proceed with the iron supporters of the Roadway; and these, instead of being constructed in the form of circles, or that of perpendicular pillars, as hitherto, are here a series of triangles, thus including the true line of bearing. These triangles are, of course,

course, preserved in a vertical plane by cross ties and braces: iron bearers are supported by these triangles, and upon the bearers are laid the covering plates under the Roadway, which instead of being solid, are (in order to lessen the weight) proposed to be reticulated.

If I have, throughout this very succinct description, made myself understood, it will, I think, be admitted, that the constructing a single arch across the Menai, is not only a very practicable, but a very simple operation; and that it is rendered so, chiefly by adopting the mode of working from each abutment, without at all interfering with the tideway.

In the Swilly Bridge, although the arches are smaller, yet being placed on piers situate on rocks surrounded by a rapid tide, and springing at a great height, the inconvenience of carrying materials and working is greatly increased; and supposing the Bridge part constructed, an enormous expense is still to be incurred before the Roadway can be carried over the flat ground on the Anglesea shore. Therefore, whether economy, facility of performance, magnificence, or durability be consulted, the Bridge of one arch is, in my opinion, infinitely preferable; and it is not less so, if considered in what regards the navigation.

From the MENAI to the TOLL-BAR.

Having crossed the Menai, the present Road ascends at the rate of 1 in 11, and descends at the same rate towards the town of Bangor, from whence it proceeds on the Chester Road with inclinations of 1 in 17, 14, and even 9, to Llandegau; it then turns at an acute angle up the valley of the Ogwen, and frequently confined between the steep bank of that stream and the slate Railway to the Toll Bar, a distance of near six miles, rising sometimes 1 in 18 and $15\frac{1}{2}$; its breadths between Llandegau and the Toll Bar, are 18 and 20 feet.

Under these circumstances, and considering that the general direction is very circuitous, I have laid out a line from the intended Bridges over the Menai, which points towards the Toll Bar; and this has been conducted so as no inclination shall exceed 1 in 30, generally much less, and the distance is reduced to 5 miles 748 yards.

EXPENSE:	
Road-making, cutting, banking	£. 6,730
Bridges and Drains	666
Breast and retaining walls, fencing land, and damages	3,831
	<u>£. 11,227</u>

From the Toll Bar the present Road proceeds for a short distance nearly parallel with the Rail Road, it then descends and crosses the River Ogwen, and proceeds with inclinations of 1 in 17, 15, and 13, along the eastern bank of the river to Tyn-maes.

To Tyn-maes.

Instead of losing level by descending to the Ogwen, I have chosen a line gradually ascending, the steepest parts of which are only 1 in 40 and 50; this line is carried along the western bank of the Ogwen to near Tyn-maes, where the stream is crossed by one arch upon rock abutments. The distance is 3 miles 638 yards, being an increase of distance of about 400 yards.

EXPENSE:	
Road-making, cutting and banking	£. 4,853
Bridges and Drains	1,038
Breast and retaining walls, fences, lands, &c.	2,688
	<u>£. 8,579</u>

From Tyn-maes to a short distance east of Lake Ogwen, the present Road passes along the face of a steep and rugged hill in some parts nearly level, in others with ascents of 1 in 17, 15, and even 13; the breadth is only 21, 18 and 15, feet, and it is much exposed from loose stones falling down from the upper parts of the mountain.

To the east end of Lake Ogwen.

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To render this part of the Road safe and of easy ascent, I propose to reduce the whole to one inclination, by which it will be rendered 1 in 36. In order to obtain thirty feet in breadth, it will be necessary to take the upper side of the present Road, which has been cut out of the solid, for the foundation of a breast wall to build this up to a proper height, and on the upper side to cut a small part out of the natural slope of the hill, which must of course be secured by a retaining wall. It will also be necessary to build a parapet wall upon the breast wall, along the whole of the lower side of the Road. By these means, a very perfect and commodious Road would be obtained. In constructing the breastworks, retaining-walls, parapets, and filling up the Roadway, a great proportion of the loose stones would be employed, and the rest should be thrown along the lower side of the new Road; when these fragments, which now encumber the face of the mountain, have been cleared away, many ages will not again supply an equal quantity; at the top of this ascent, a rocky point, which at present causes a sharp bend, must be partly cut down, and there must be a new Bridge built over the Ogwen. With some alterations, the line may be continued along the South side of the Lake Ogwen. This distance is 3 miles 1,045 yards, being nearly the same length as the present Road.

Expense of this Division, including Bridges and Drains, breast walls, parapets, &c. &c. - - - - - £.18,436

To the Bridge of
Llugwy.

From the east end of Lake Ogwen the Road is carried on the South side of the valley, ascending and descending alternately at the rate of 1 in 19, 17, 12, and 11½, until it passes near Capel Ceriog, and from thence along the North side of the Llugwy to a Bridge which crosses that stream at a rocky pass.

Besides this division, as far as Capel Ceriog, being on the wrong side of the valley with regard to exposure, the surface is very irregular, ascending and descending alternately, and the Road partakes fully of the nature of the ground; I have therefore laid out the new line on the other side of the valley, always gradually descending, and so as no part has more than 1 in 38 and 52. The distance is just equal to the present line, being 11 yards short of 5 miles.

EXPENSE:

Road-making, cutting, banking, &c.	- - - - -	£.6,819	
Bridges and Drains	- - - - -	- 1,300	
Retaining walls, land, &c.	- - - - -	- 1,359	£.
			<u>9,478</u>

To the River Con-
way.

From the last-mentioned Bridge the present Road descends through very rough ground at 1 in 26, and then passes along a flat part of the valley to near the great water-fall, from whence to Bettws-y-coed, and even to the River Conway, the inclinations are sometimes 1 in 20, 15, and 14.

I was very desirous to have carried the line down the other side of this valley, but was deterred chiefly by the very lofty and perpendicular rocks adjacent to the water-fall, and also because a line might be laid out along the same side as the present, with the greatest inclination only 1 in 34, but generally 1 in 72 and 95. Between Bettws-y-coed and the present Bridge over the Conway, some irregular ground intervenes; partly to avoid this, but chiefly to obtain a command of the difficult ground which falls in the next division, I have crossed the River Conway, about a mile below the present Bridge; the length of the present division is 11 yards short of 5 miles.

EXPENSE:

Road-making, cutting, banking, &c.	- - - - -	£.6,152	
Bridges and Drains	- - - - -	- 4,680	
Parapets	- - - - -	- 1,250	
Retaining and breast walls, fences, land, &c.	- - - - -	- 2,678	£.
			<u>14,760</u>

From

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To
Rhydllanfair.

From the proposed Bridge over the Conway, to the Cross Road at Rhydllanfair, the present Road is very irregular, and, in some instances, as steep as 1 in 9½. By gaining the Eastern bank about a mile below the present Bridge, a command of the ground is obtained, which has enabled me to lay out a line, the steepest part of which is 1 in 30, and the rest 1 in 60; the distance is 3 miles 308 yards; and this, with the last division, when compared with the present Road from the same extreme points, is longer by about 200 yards; but, from the very worst, may be converted into one of the best parts of the Road.

EXPENSE:

Road-making	- - - - -	£.2,794	
Bridges and Drains	- - - - -	298	
Breast and retaining walls, parapets	- - - - -	6,147	
Fences, land, damages, &c.	- - - - -	819	£.
		<u>10,058</u>	

From Rhydllanfair, to the crossing of the Conway at the Toll Bar, the Road has already in some parts been considerably improved; but to render it perfect, much still remains to be done: there are instances of the inclinations being near 1 in 20, and the breadths 20, 18, and 15 feet only; immediately after crossing the Conway, in the middle of this division, a deviation is necessary. The proposed improvements will obtain the full width; and reduce the ascents to 1 in 36 where steepest; the distance is 2 miles 396 yards, which is about 50 yards more than the present Road.

EXPENSE:

Road-making, cutting, banking	- - - - -	£.2,421	
Bridges and Drains	- - - - -	158	
Retaining and breast-walls, fences, land, damages, &c.	- - - - -	1,972	£.
		<u>4,551</u>	

From the Conway at the Toll Bar, to the Inn at Kyrniogu Maur, the present Road is very irregular; it ascends and descends alternately, and sometimes at the rate of 1 in 22 and 20; I therefore propose to pass to the opposite, or northern side of the valley, and continue gradually, but always ascending to the Inn, the greatest rise being 1 in 35, and that only for a small portion of the distance; the rest being 1 in 50, 100, 258. The length of this division is 3 miles 550 yards, being 66 yards less than by the present Road.

EXPENSE:

Road-making, cutting, banking	- - - - -	£.4,214	
Bridges and Drains	- - - - -	815	
Breast and retaining walls, fences, land, damages, &c.	- - - - -	1,886	£.
		<u>6,915</u>	

After passing Kyrniogu, the present Road reaches its greatest summit between the Dee and the Conway, viz. 874 feet above high-water mark spring tides, at Bangor Ferry. The Road proceeds rising and falling alternately, making a bend to the N. E. over a considerable hill at Cerrig-y-Druiddion; then, after falling down to the Gairw, and crossing and re-crossing it, passes on to Tynant. Besides these irregular and unnecessary bendings, the ascents and descents are sometimes 1 in 17 and 14.

To avoid these, it will be necessary to make several variations, particularly down the valley, to the southward of Cerrig-y-Druiddion; also, by keeping afterwards along the North side of the stream, to the eastward of that place. With these variations, and in some instances cutting and banking, an excellent Road may be made, with the greatest descent only 1 in 30, but generally 1 in 40, 50, 60, 90. The distance from Kyrniogu is 7 miles 143 yards, being about 66 yards shorter than the present Road.

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Mr. Telford's Report to Lords of Treasury, 22 April 1811.

EXPENSE:	
Road-making, cutting, banking	£. 7,655
Bridges and Drains	1,232
Retaining and breast-walls, fences, land, &c.	2,858
	<u>£. 11,745</u>

To junction with old Road.

At Tynant, considerable exertions have already been made in cutting the Road out of rock which is in some instances 20 feet in height, and a very high breast-wall has also been built; but this Road is only from 15 to 20 feet in breadth, and must therefore have at least one-half more added to it; the breast-wall and parapet must also be constructed in a substantial manner with lime mortar.

But, after leaving this Pass, the Road falls at the rate of 1 in 22½ to the Gairw, and after crossing it, ascends 1 in 17, and shortly after again descends at 1 in 15½.

In order to avoid these irregularities, I have continued the new line down the North side of the stream, descending regularly at 1 in 35 and 40, and crossing before the Gairw falls into the Alwen, have joined the present Road at the bottom of the last-mentioned steep descent. The distance from Tynant, by this new line, is 2 miles 902 yards, being about 303 yards more than the present Road.

EXPENSE:

Road-making, cutting, banking	£. 4,274
Bridges and Drains	1,310
Breast and retaining-walls, parapets, fences, land, &c.	2,745
	<u>£. 8,279</u>

To Chester Branch Road.

From the before-mentioned junction with the present Road, the line is continued nearly all the way along it, passing the Druid Inn, and across the Alwen; near Rug House, it reaches the point where the proposed branch to Chester turns off, being a distance of 2 miles 902 yards, although some parts of the present Road has inclinations of 1 in 18½, 19, and 20. Yet the proposed line will have none more than 1 in 44, which is effected chiefly by cutting down heights, filling up hollows, and making the Road all 40 feet in breadth.

EXPENSE:

Road-making, cutting and banking	£. 2,701
Bridges and Drains	495
Retaining-walls, fences, land, &c.	1,028
	<u>£. 4,224</u>

To opposite Llan-santfraid.

From the point where the Chester Branch turns off, the present Road proceeds across the Dee at Corwen Bridge, passes through the Town of Corwen, and along South side and nearly parallel with the River to the bottom of a hill West of the Toll Bar, opposite Llan-santfraid and near the 8 mile-stone from Llangollen, where an extensive variation must commence. The changes in this division are the cutting down heights, filling up hollows, making the Road the full width, securing the upper side by retaining-walls, making some cross drains and fencing; some small houses at the western entrance into Corwen should also be removed. The distance is 3 miles 1,022 yards.

EXPENSE:

Road-making, cutting, banking	£. 4,558
Bridge and Drains	1,540
Retaining walls, fences, land, &c.	1,955
	<u>£. 7,948</u>

To Llandisilio.

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From the bottom of the before-mentioned hill West of the Toll Bar, to the small woollen manufactory opposite the Canal Weir at Llandisilio, the present Road passes over a continual succession of steep hills alternately rising and falling at the rates of 1 in 14, 16, 17, 18, 19. The Road is also much too narrow.

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Report to
Lords of Treasury,
22 April 1811.

To
Llandisilio.

Aware that going parallel with the declivity of the River would make a Road comparatively level, that is to say, 1 in 400 or 500, I had surveys carried down both sides, but found the hills project and recede so much as to lengthen the line $2\frac{1}{4}$ miles; this appeared to be too much, if a line could be laid out, the greater proportion level and none more than 1 in 30; this has been accomplished by the line laid down in the Map and Section, by rising for $\frac{3}{4}$ ths of a mile 1 in 44, to clear the Glendower hill, and from thence to continue on a perfect level for $4\frac{1}{4}$ miles, pass the summit 90 feet lower than the present Road, and then to descend at 1 in 30 to the small woollen manufactory. In the course of this improvement there are two very considerable pieces of cutting, and the whole distance, in whatever line the Road is made, ought to be protected by a retaining-wall. The distance is 6 miles 847 yards, being 858 yards longer than the present line.

EXPENSE:

Road-making, cutting, banking	- - - - -	£. 14,571	
Bridges and Drains	- - - - -	3,466	
Retaining walls, fences, land, &c.	- - - - -	5,672	£.
			<u>23,709</u>

From the woollen manufactory the present Road passes over some rising ground which should be avoided, because the descent from it is at 1 in 16; it next proceeds to Llangollen, which it passes through, making two turnings, both at right angles, in very narrow streets; these may be avoided by continuing a direct line on the South side of the church, crossing the Brook a little higher than the present Bridge, and joining the old Road a little way East of the Toll Bar. After passing Llangollen, the present Road, until after it has passed opposite to the great Aqueduct, is not very objectionable on account of the rate of inclination, being only in one instance so much as 1 in 29; but it is all too narrow. By the foregoing alterations, the new line will in no place be more than 1 in 40; generally 1 in 50 and 60. The distance is 5 miles 1,399 yards, being 31 yards shorter than the present Road.

To opposite Pont-cysyllte Aqueduct.

EXPENSE:

Road-making, cutting, banking	- - - - -	£. 5,099	
Bridges and Drains	- - - - -	845	
Retaining walls, fences, land, &c. &c.	- - - - -	3,985	£.
			<u>9,929</u>

From opposite the GREAT AQUEDUCT of PONT-CYSSYLTE, to the top of the South Bank of CHIRK VALLEY.

The present Road passes in a circuitous manner, and over such hilly ground, that the rates of ascents and descents are frequently 1 in 18, 17, 15, and even 12. There are circumstances which render it difficult to lay out a good line in this division; Chirk Castle, its parks and woods, occupy the skirts of the hill above the village, and those of Lord Dungannon the banks, immediately below it. The river Ceriog continues deep, with many bold banks, far into the country; and the Ellesmere Canal has taken possession of some of the most favourable ground along the base of the hill, and also a considerable portion of the Ceriog banks: under these circumstances, it was not until after sundry trials (which are shewn by dotted lines on the Map) that I laid out the proposed line. (This, instead of following the present Road to the Turnpike Gate, and then turning at an acute angle,

RECAPITULATION.

Mr. Telford's Report to Lords of Treasury; 22 April 1811.

DIVISIONS.	Length of present Road.		Length of proposed Road.		EXPENSE. £.
	Miles.	Yards.	Miles.	Yards.	
From Holyhead to Ynys-y-Moch on the Menai - - - - }	24.	810.	21.	1,014.	67,614
Crossing the Menai - - - - }	0.	726.	0.	1,100.	127,331
From D° to near the Toll Bar - - - - }	5.	1,633.	5.	748.	11,227
— D° to Tynmaes - - - - }	3.	242.	3.	638.	8,579
— D° to East end of Lake Ogwen - - - - }	3.	1,045.	3.	1,045.	18,436
— D° to Bridge at the Rocky Pass upon the Llugwy - - - - }	4.	1,639.	4.	1,749.	9,478
— D° to crossing the Conway - - - - }	-	-	4.	1,749.	14,760
— D° to Road to Rhydlanfair - - - - }	8.	77.	3.	308.	10,058
— D° to Toll Bar upon the Conway, - - - - }	2.	341.	2.	396.	4,551
— D° to Kyrniogu-Maur - - - - }	3.	616.	3.	550.	6,915
— D° to Ty'nant - - - - }	7.	209.	7.	143.	11,745
— D° to joining the Old Road - - - - }	2.	594.	2.	902.	8,279
— D° to where the Chester Branch turns off - - - - }	2.	902.	2.	902.	4,224
— D° to near 8-mile-stone East of Corwen - - - - }	3.	1,012.	3.	1,012.	7,048
— D° to Woollen Manufactory opposite the Canal Weir at Llandisilio - - - - }	5.	1,749.	6.	847.	23,709
— D° to opposite great Aqueduct of Pontcysylltè - - - - }	5.	1,430.	5.	1,399.	9,929
— D° to South Bank of Chirk Valley - - - - }	3.	1,243.	3.	389.	28,656
— D° to the Queen's Head - - - - }	8.	1,628.	7.	748.	8,440
— D° to Shrewsbury - - - - }	13.	1,283.	13.	1,283.	20,477
	109.	1,389.	105.	1,082.	394,480

From BANGOR FERRY to CHESTER.

The Road from Bangor to Chester is at present even more incommodious than the Shrewsbury line; the ascents and descents are steeper; they are very frequent, and sometimes continued for a great distance; these, and the inconvenience and risque of Conway Ferry, form intolerable obstacles in this communication.

In the country which occupies the space between Bangor and Chester, the principal streams run from the S. E. to N. W. and of course form a succession of vallies in that direction. Of these vallies the chief are the Conway and the Clwyd; the rugged chain of mountains which form the western side of the Conway valley, are only broken by the secondary valley which is occupied by the

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Mr. Telford's
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Lords of Treasury,
22 April 1811.

the Shrewsbury line; the eastern side of the Conway valley is also very high ground, and there are a number of less extensive vallies between the Conway and the Clwyd. The eastern side of the Vale of Clwyd is likewise composed of a lofty ridge, unbroken until it has passed opposite the Town of Denbigh; here a small valley enters, but it very soon turns in a circuitous direction to towards Mold, and there is high land between it and the valley of the Dee: I am therefore satisfied, after having repeatedly and carefully examined various parts of the country, that it is either along the shore, or by the top of the vales of the Conway and Clwyd, that the most advantageous lines of communication with Chester are to be formed. Under this conviction, I have caused correct surveys to be made in both these directions, and shall now proceed to discuss each separately and in detail, beginning with the Shore Road.

From BANGOR FERRY to CONWAY.

The present Road ascends from the Ferry-house, at the rate of 1 in 11, and descends towards Bangor at the same rate; from Bangor it proceeds by inclinations sufficiently easy until it reaches the Brook Cegin, into which it descends at 1 in 13, and ascends from it at 1 in 10½; it next descends into the Ogwen at 1 in 8½, and ascends from it at 1 in 16 and 10; from thence it proceeds by a succession of small irregularities, by Aber, to Penmaen-maur; here it ascends chiefly at 1 in 16, to 189 feet above the level of the Sea, and then descends at 1 in 15; from thence it continues passing over a number of irregularities 1 in 28, 22, 17, 16, and 11, to the Hill of Sychnant, which it ascends at 1 in 8, continued to 543 feet above the level of the Sea; from this height it descends at 1 in 17, 15, 12, and 9, to the Town of Conway.

To render this division as perfect as it is capable of, the line should be continued along the Shrewsbury line to the top of the first bill, descend at 1 in 35 to the Town of Bangor, and continue along the present Road to near the Penrhyn Arms. The most perfect line would then be along the shore; but as that would pass between Penryn Castle and the Sea, and understanding it would on that account be much objected to, I have caused a line to be surveyed to the South of the present Road, crossing the Cegin and the Ogwen considerably above the present Bridges, with the greatest inclinations not more than 1 in 33 and 66. After ascending from the valley of the Ogwen, the line descends towards Aber, at the rate of 1 in 132, and then continues very nearly level to the Marth, West of the Town of Conway, where it passes over a small ridge of land, at 1 in 33. In this mode, it is evident that, in order to avoid Penmaen-Maur and Sychnant, the Road is formed along their bases, a little above high-water mark, partly by removing fragments and cutting rock, and partly by building breast-works; this appears perfectly practicable, and can be only objectionable on account of the expense. Distance from the Shrewsbury new line to Conway 17 miles, 427 yards; being 1 mile 274 yards longer than the present line.

EXPENSE:

Road-making, cutting, banking	- - - -	£. 24,496
Bridges and Drains	- - - -	6,424
Breast-walls and parapets	- - - -	13,916
Retaining walls, fences, land, &c.	- - - -	7,844
		<u>52,680</u>

Proposed Bridge.

The Ferry at Conway, from the nature of the quicksands, the flatness of the Eastern shore, and other circumstances, is more inconvenient and dangerous than that at Bangor, accordingly accidents are more frequent. Spring tides rise about 20 feet, and flow up to near Llanrwt, and as there is an extensive space immediately above the Ferry, consequently a considerable portion of tidal water is required. Besides the rise of the tide, there is about 16 feet left in the Channel next Conway at low water, and nearly the same on the Eastern side of the rocky island.

Conway Ferry.

Here, in order to form a safe and commodious passage without materially interfering with the navigation of the River, I propose making one arch of cast iron, 200 feet span, over the Channel next the Town: Abutments for this may be built upon rock

F. A. Davis 22.
Sons, Printers.
Litho. Franck

rock at low-water mark; behind the Eastern abutment I propose to cut away the rock somewhat under the level of low water, to form a passage for Vessels suitable for this River; and over this space I propose placing a Drawbridge. In order to obtain stones conveniently to form an embankment, but chiefly for creating a free passage for tidal water, which, when formed, cannot on account of being rock be changed by the current, I propose to cut away all the small rocky island, except as much as will form an abutment and wing-walls to the left of three arches of 50 feet span each; with these stones, and others which may be had from the adjacent banks, I mean to construct an embankment across the Sands, to the Eastern Shore. This I conceive to be the safest and most economical mode of effecting a passage, having due regard to the navigation of the River. From my Estimates, the Expense of this amounts to £.44,178. Distance, 744 yards.

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After crossing the Conway, the present Road ascends a small hill at 1 in 19, passes to the South side of a track of low marshy land, which separates the Orme's Head from the main land; it then with a very quick bend turns parallel to this marsh, and continues with a succession of irregularities to ascend at 1 in 22, to a pass which separates another lesser point of land at Llandrilloyn; it afterwards goes in a tolerably regular manner for a short distance; it then ascends at 1 in 15, and immediately descends at 1 in 20 and 11 into a deep dingle, where, after crossing the Colwyn only 28 feet above the level of the Sea, it ascends at 1 in 7, 11, and 15, until it has reached the summit of Penmun Rhos at 360 feet above the level of the Sea; from this elevation it immediately descends at 1 in 31, 10, and 14½, to Llandulas, which is only 19 feet above the Sea; from this point it again ascends at 1 in 10½, and passes afterwards by sundry small irregularities, but without any considerable obstacle, to Abergelle.

From this description, and inspecting the Section, it will be evident that this communication can only be effectually improved by a total change; accordingly, after passing the Ferry House on the eastern shore of the Conway, and cutting about 10 feet from the summit of the before-mentioned small hill, instead of crossing to the south side, I continue the line along the north side to near the eastern end of the marsh land, and nearly in a direct and level line to the bottom of the pass at Llandrilloyn; it ascends this pass at 1 in 80 and 100; afterwards, partly level and partly 1 in 132, it reaches the Colwyn, at a point from whence the Hill of Penman Rhos is ascended at 1 in 33, and descended at 1 in 66. I was very desirous of having passed this promontory on a level from the point of crossing the Colwyn, and even to have crossed this stream nearer to the shore, but was deterred from doing so, not by the great height of the perpendicular rocks which compose the head, because being lime-stone the expense would have been partly defrayed by the sale of stone, but because on the eastern side of the head, from the sea dissolving and washing away the marly soil, and the water from the upper grounds getting behind it, the surface of the hill, for about a mile in length, and a quarter of a mile in breadth, is continually slipping down from the face of the Rocks which compose the nucleus of the Mountain: on this account it becomes absolutely necessary to keep upon the solid part of the hill; but the new line is at the summit of the hill, kept about 140 feet under the level of the present Road, and about half that under a line which has of late been injudiciously laid out and partly executed. After passing this hill, the proposed line proceeds to Abergelle, either upon a level or at only 1 in 252. The length of this division is 11 miles and 33 yards, being 374 yards less than the present Road.

EXPENSE:

Road-making, cutting, banking	- - - -	£. 17,722
Breast-walls, parapets	- - - -	915
Bridges and Cross Drains	- - - -	2,503
Retaining-walls, fences, land, damages, &c.	- - - -	7,326
		<u>£. 28,466</u>

From Abergelle to Holywell, the present Road passes by St. Asaph; but To Holywell. instead of keeping between the upland and flat ground, it bends southward, and ascends at 1 in 29, 20, 16, 9, 13, 15 and 24, to the height of 396 feet above the

Ordered by the HOUSE OF COMMONS to be Printed, 30 May, 1811.

Thos. Telford, Engineer.
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the Sea, from which it descends at similar rates to St. Asaph, which is only 46 feet; from St. Asaph it immediately passes over a hill, rising at 1 in 14, and falling 1 in 8, to the level of 18 feet above the Sea; from this very low point it ascends at 1 in 18, 11, and 10, to the height of 726 feet, from which it descends at 1 in 22 and 12, and afterwards ascends and descends alternately at 1 in 17, 19, and 12, to Holywell, which, in its lowest part, is 344 feet above the Sea.

It is needless to observe, that this division is very imperfect; between Abergelle and St. Asaph might be improved by carrying a line along the base of the Uplands, but between St. Asaph and Holywell, the eastern ridge of the Clwydian hills continues very high and bold, until it has passed opposite to St. Asaph, and as far as Rhyddlan; so that, without traversing upon the face of these hills in a very awkward manner, and which would greatly lengthen the line, the stipulated rate of ascent cannot be obtained; but there is no occasion to do this, because, by proceeding from Abergelle to Rhyddlan by a direct line, which has already been very judiciously laid out and partly made, and from thence, passing the Northern extremity of the before-mentioned ridge, there is a valley which ascends very gradually by the South side of Newmarket to a summit 93 feet lower than the present Road, and which is so situated, as to admit of a very gradual and easy descent to Holywell. From Abergelle to Rhyddlan the Road is quite level; from the Bridge to the village, it may be made 1 in 30; from thence proceeds at 1 in 264, 132, and 199, to the bottom of the before-mentioned valley, which it ascends only for a very short distance at 1 in 33, and then 1 in 62, 40, 60, and 100, and descends from the summit at the rate of 1 in 66, to the Town of Holywell; here some old houses should be removed, and a passage opened in a direct line to the main street. The length of this division is 16 miles 896 yards, being 535 yards shorter than the present Road.

EXPENSE:

Road-making, cutting, banking	- - - -	£. 20,900	
Bridges and Drains	- - - -	549	
Breast and retaining-walls, parapets, fencing land, houses, &c.	- - - -	9,304	£.
			<u>30,753</u>

To Chester.

From Holywell to Chester, the present Road is quite as imperfect as in the last division; it ascends at 1 in 20, 12, 10, 14, 11 and 24, up the Halkin Mountain, to 700 feet above the level of the Sea, and descends by similar rates to Northop, which is 334. It then proceeds, passing some deep ravines, and ascending and descending alternately, sometimes at 1 in 18½, 12½, and 13, to Hawarden, from thence descends sometimes 1 in 12½ and 13½ to the flat land adjacent to the River Dee, upon which it continues towards Chester; when it passes over some gently rising ground to the southern suburb, called Handbridge, down which it descends to an old inconvenient Bridge.

But the valley of the Dee reaching from Holywell to Chester, and the latter place standing near the level of the tideway, there appears no good reason for ascending 340 feet above the former place; I have therefore, after leaving Holywell by a little deep cutting, descended at the rate of 1 in 66, excepting for a short distance in passing a dingle a little way east of the town, where the inclinations are 1 in 33, but from thence to near the Town of Flint the descent is regularly at the rate of 1 in 100. Immediately South of that place, in passing a dingle, it is 1 in 50, and then for a small distance level; afterwards it proceeds descending at 1 in 100 to the shore of the River Dee at Oakenholt Mill, and keeps close along the shore to Connah's Quay; it then passes along a tolerable Road in a straight direction to the Manor-house of Saltney, all nearly level, but instead of bending in a circuitous manner along a formed Road, it proceeds directly on to the present Road from Hawarden, which from thence to Chester, with some repairs, may be made an excellent Road. The length of this division is 18 miles 473 yards, being about three quarters of a mile longer than the present Road.

EXPENSE:

Road-making, cutting, banking	- - - -	£. 21,930	
Bridges and Drains	- - - -	5,221	
Breast and retaining-walls, fences, land and damages	- - - -	9,324	£.
			<u>36,475</u>

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[Appendix,

Mr. Telford's Report to Lords of Treasury, 22 April, 1811.

RECAPITULATION.

DIVISIONS.	Length of Old Line.		Length of New Line.		EXPENSE.
	Miles.	Yards.	Miles.	Yards.	
From Bangor Ferry to Conway - - - -	16.	153.	17.	427.	£. 52,680
Crossing the River Conway - - - -	0.	744.	0.	744.	44,178
Conway to Abergelle - - - -	11.	407.	11.	33.	28,466
Abergelle to Holywell - - - -	16.	1,431.	16.	896.	30,753
Holywell to Chester - - - -	17.	869.	18.	473.	36,475
Totals - - - -	62.	84.	63.	813.	192,552

BRANCH from near CORWEN to CHESTER.

Although, at the expense stated in the last section of my Report, an excellent Road may be made from Bangor to Chester, yet this expense being considerable, it became my duty to examine the district of country which forms the head of the Vale of Clwyd, and particularly that part alluded to by Mr. Fletcher in his evidence, as stated in the Second Report from the Committee on the Holyhead Roads and Harbour; aware of that gentleman's local knowledge, and his disposition to communicate information, I benefited by his explanations and advice in the Chester line.

To pass this upper part of the country, it has been proposed to leave the Shrewsbury line, at or near to Cerig-y-Druiddion, in one way to proceed by Ruthin and Mold, and by another to cross the Alwen valley, fall into the head of the Clwyd, skirt the top of the vale ascending to near Llandegle, and afterwards to pass down the Nant-y-Frith valley to Cargwile. Neither of those lines are in my opinion advisable, they cross, or are entangled in the deepest vallies which intersect this part of the country, and they of course pass a succession of high summits; to reduce the frequent and long continued ascents and descents to the stipulated rate of inclination, the line must be greatly extended by means of repeated traverses.

But an excellent line may be obtained by proceeding along the Shrewsbury line past the Druid Inn, and leaving it a little way to the eastward of Rug House. This line passes, partly along a country Road through a district comparatively smooth, to the Raven Inn near Llandegle, and having crossed the Road from Ruthin to Wrexham, it passes considerably to the North of the rugged valley of Nant-y-frith, descending to near Pout Bloiddyn, crossing the river Allen a little to the South of Hart's Heath, and passing the ridge which forms the North bank of the Allen, it descends in nearly a direct line to the Chester Road, East of Hawarden, where the Mold Road also joins it; from this point to Chester the direction of the Road is now good.

From the Shrewsbury Road to the Raven Inn, being a distance of 10 miles 968 yards, the shape of the ground is very favourable for road-making, and accordingly the inclinations are remarkably easy, being only in three instances, and these for very short distances, so much as 1 in 30, but in the others only 1 in 40, 50, 60, 77, 85, 95, and so on to perfectly level; in this way it ascends to 432 feet above the point where it leaves the Shrewsbury Road; it then descends at 1 in 91, to the Raven Inn, which is 342 feet above the before-mentioned point, or nearly on a level with the Inn at Kyrniogu.

EXPENSE:	
Road-making, cutting, banking - - - -	£. 13,509
Bridges and Drains - - - -	3,722
Retaining walls, fences, land - - - -	6,866
	£. 24,097

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From Telford's
Report to
Lords of Treasury,
22 April 1811.

To Point Bloiddyn.

From the Raven Inn the line ascends for a short distance at 1 in 30, afterwards 1 in 66, 54, and $35\frac{1}{2}$, to the general summit of this part of the country, which is 220 above that near Kyrniogu; from this point it descends at 1 in 110, 94, 33, 38, 40, 306, 127, and 30, to Point Bloiddyn. Although the inclinations are here very easy, yet in some instances in this division there will be considerable id-cutting with some rock, also breast and retaining walls; the distance is 9 miles 748 yards.

EXPENSE:

Road-making, cutting, banking	-	-	-	-	£. 11,842
Bridges and Drains	-	-	-	-	3,438
Retaining-walls, fences, land	-	-	-	-	7,407
					£. 22,687

To the Chester
Road.

After crossing the Allan the line continues to descend for a short distance at 1 in 40; it then ascends at 1 in 70, 30, and 53, to the top of the before-mentioned ridge, being about 80 feet above the valley; from thence it descends at 1 in 46, 50, 200, 74, and 54, to the present Chester Road, the distance being 5 miles 396 yards.

EXPENSE:

Road-making, cutting, banking	-	-	-	-	£. 6,869
Bridges and Drains	-	-	-	-	1,276
Retaining-walls, fences, land	-	-	-	-	4,474
					£. 12,619

RECAPITULATION.

DIVISIONS.	Distance.		Expense.
	Miles.	Yards.	£.
From the Shrewsbury Road to the Raven Inn	10.	968.	24,097
From the Raven Inn to Pont Bloiddyn	9.	748.	22,687
From D ^o to the present Chester Road	5.	396.	12,619
From D ^o to Chester Bridge	4.	836.	2,000
Totals	29.	1,188.	61,403

From these Statements, it appears that a very good Road may be made to Chester in this direction, at about one-third of the expense of that along the shore, but the distance would be increased about $9\frac{1}{2}$ miles above that of the improved shore line.

Besides a great saving in point of expense, there would, by adopting this Branch, be the further advantage of making upwards of 43 miles East of the Menai, and of 64 from Holyhead, common to the Shrewsbury and Chester lines, which would be the means of supporting the repairs of the Road, and also an establishment of good Inns.

GENERAL RECAPITULATION.

LINES.	Distance.		Expense.
	Miles.	Yards.	£.
Holyhead to Shrewsbury	105.	1,082.	394,480.
Menai, Shore Road to Chester	63.	813.	192,552.
From near Coryen to Chester	29.	1,188.	61,403.

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CONCLUSION.

FROM the foregoing Statements and the annexed Sections* it will appear, that although passing through a mountainous country, the communications may, from being inconvenient and dangerous, be rendered perfectly commodious and safe.

In a Road forming so extensive and general a thoroughfare, it is presumed that when taken up by the Public, the most advisable, and in the end the most economical Plan is, to lay it out as perfectly, and construct it as substantially in the first instance, as the shape of the country and the nature of the works are capable of. It is upon these principles my Estimates are formed, and although, by prudent arrangement and management during the performance of the works, some retrenchments may possibly be made, yet I cannot advise in general statements, that the Expenses (which have all been founded on detailed data) should be taken at less than what I have stated.

Although the laying out the lines of Roads in the best directions was the sole object I had in view, yet I think it will appear that in no instance is any Gentleman's seat more incommoded by the proposed than by the present lines; and it so happens, that very few new inns or stage houses are required, from Holyhead to the Menai, being by the improved line only about $21\frac{1}{2}$ miles; no house to sleep at being wanted, it will only be necessary to provide some good stables, and two or three small rooms, which I understand there will be no difficulty in establishing. If a Bridge is constructed, without which the communication will ever be very imperfect, a new inn, or something like the last-mentioned accommodation, will be required, and the latter will, in fact, be all that is absolutely necessary; because when the Menai forms no more obstruction than any equal portion of Road, the distance between Holyhead and Capel Ceriog, reduced to $38\frac{1}{2}$ miles, would, upon an improved Road, be a very easy journey; but were an inn required, the Owners of the adjacent property would be led by their own interest to provide one. After Capel Ceriog, Kyrniogu, Corwen, and Llangollen would, as at present, be stages; it is only in case the Road by Whittington is adopted, that a house will be wanted at the Queen's-Head, and the property at that place is fortunately in the hands of Owners who have it sufficiently in their power to accommodate the Public. On the Shore Road to Chester, it is only required to adopt Rhyddlan instead of St. Asaph, for all the rest would remain as at present.

If the Branch from near Corwen to Chester be adopted, it appears that some better accommodations at the Raven Inn, near Llandegle, will be sufficient; because, at this junction with the Shrewsbury Road, the Druid Inn is at present tolerably commodious.

Though superfluous for those accustomed to inspect Canal and Road Sections, yet it may here be right to state, that in order to render the irregularities of the surface of the ground perceptible, it was necessary, in the Sections of these Roads, to make the heights to a scale 13 times the size of that for the lengths, and therefore the whole outline becomes to that degree caricatured; but both the present and proposed lines are laid down to the same scales, and may therefore be correctly compared; and the ratio of the inclinations being also marked in figures*, it is presumed the whole is rendered perfectly distinct. When it is considered that correct and minute Surveys have been taken and laid down, and Sections made of 370 miles of Road, besides 68 miles of regular trial Surveys, and much laborious perambulation performed, it will, it is trusted, be allowed that no time has been lost in this important service, which also unavoidably includes numerous detailed Drawings and Calculations, in order to arrive at the results stated in the General Estimates of the Expense.

THO^S TELFORD.

London, 22d April 1811.

Mr. Telford's
Report to
Lords of Treasury,
22 April 1811.

* Annexed to the
MS. Report.

* On the Sections
mentioned above.