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Liverpool's Lost Railway Heritage

Angela Connelly and Michael Hebbert

MARC Discussion Paper

March 2011

Manchester Architecture Research Centre, University of Manchester

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Background

This discussion paper is the result of a short research project undertaken by MARC in February 2011. Liverpool's lost railway heritage had come up in one of our regular trawls amongst local governments and agencies in North West England for live topics suitable for project work or dissertations. John Hinchliffe, World Heritage Officer of Liverpool City Council, spoke of neglected pre-1850 railway heritage, some of it still unlisted, including tunnels that lead up from the north and south docks to Edge Hill on the escarpment behind the city centre. He asked if we could provide a description and assessment of this extraordinary heritage, and a summary of the views of the principal stakeholders.

The topic was fascinating but beyond the scope of a student project or dissertation. Happily, an experienced MARC researcher had a month on her hands between submitting her PhD thesis and undergoing her oral examination. Angela Connelly's PhD, funded by the Arts and Humanities Research Council in collaboration with the Methodist Church, is a study of the design and use of Methodist Central Halls, involving archival work, interviews, and architectural documentation in six cities - including Liverpool. So Dr Connelly (as she now is) was well positioned to undertake the study.

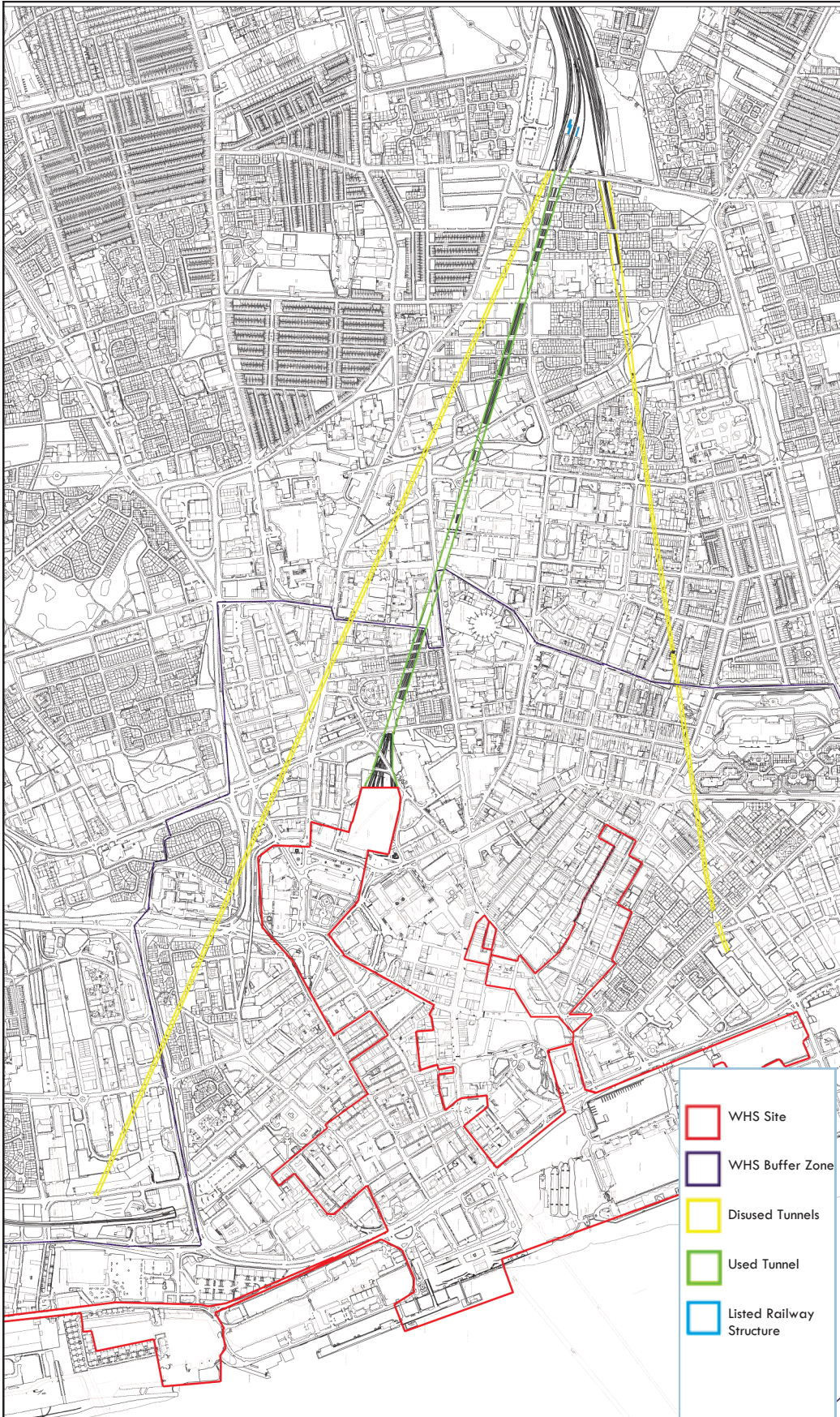
This mini-research project has been completed by the University of Manchester for Liverpool City Council on a *pro bono* basis. We hope that it will contribute to the recognition, conservation and ultimate re-use of this heritage from the earliest railway era.

Michael Hebbert

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Map 1: Liverpool Maritime Mercantile World heritage Site and buffer zone (with relationship to the early railway tunnels).

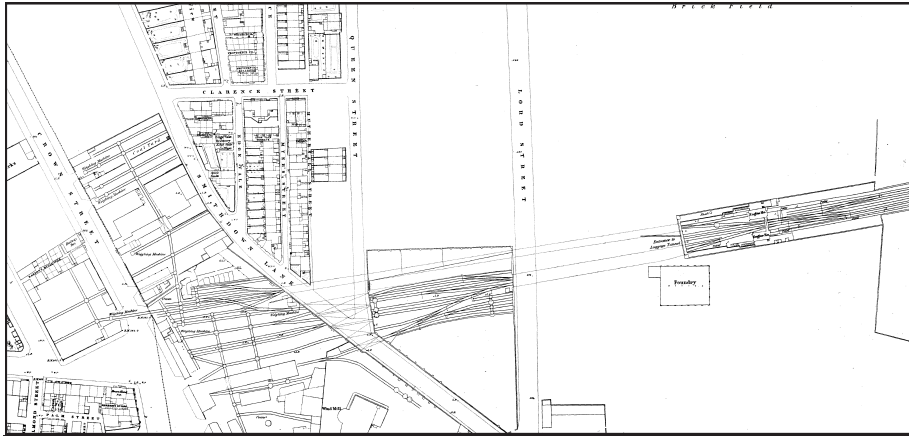
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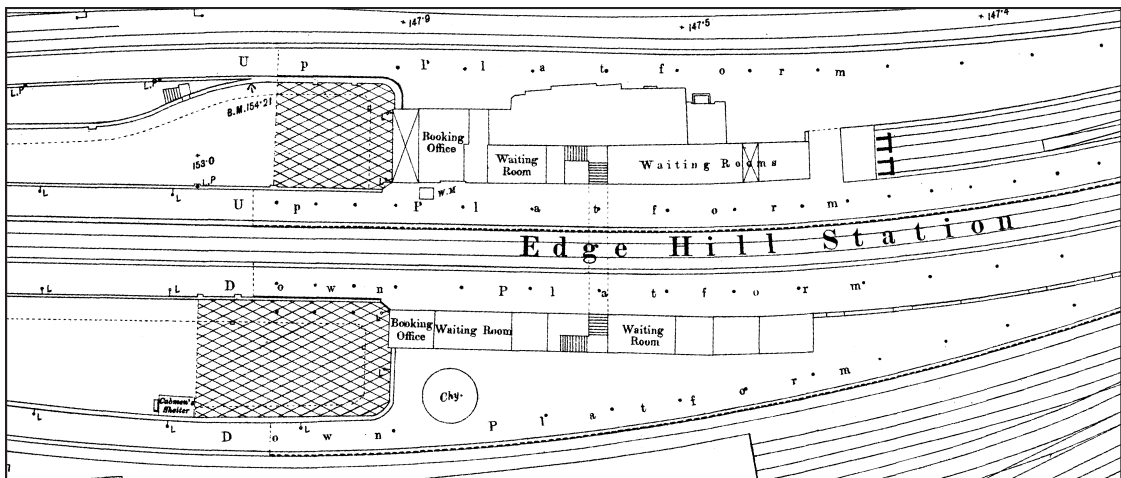




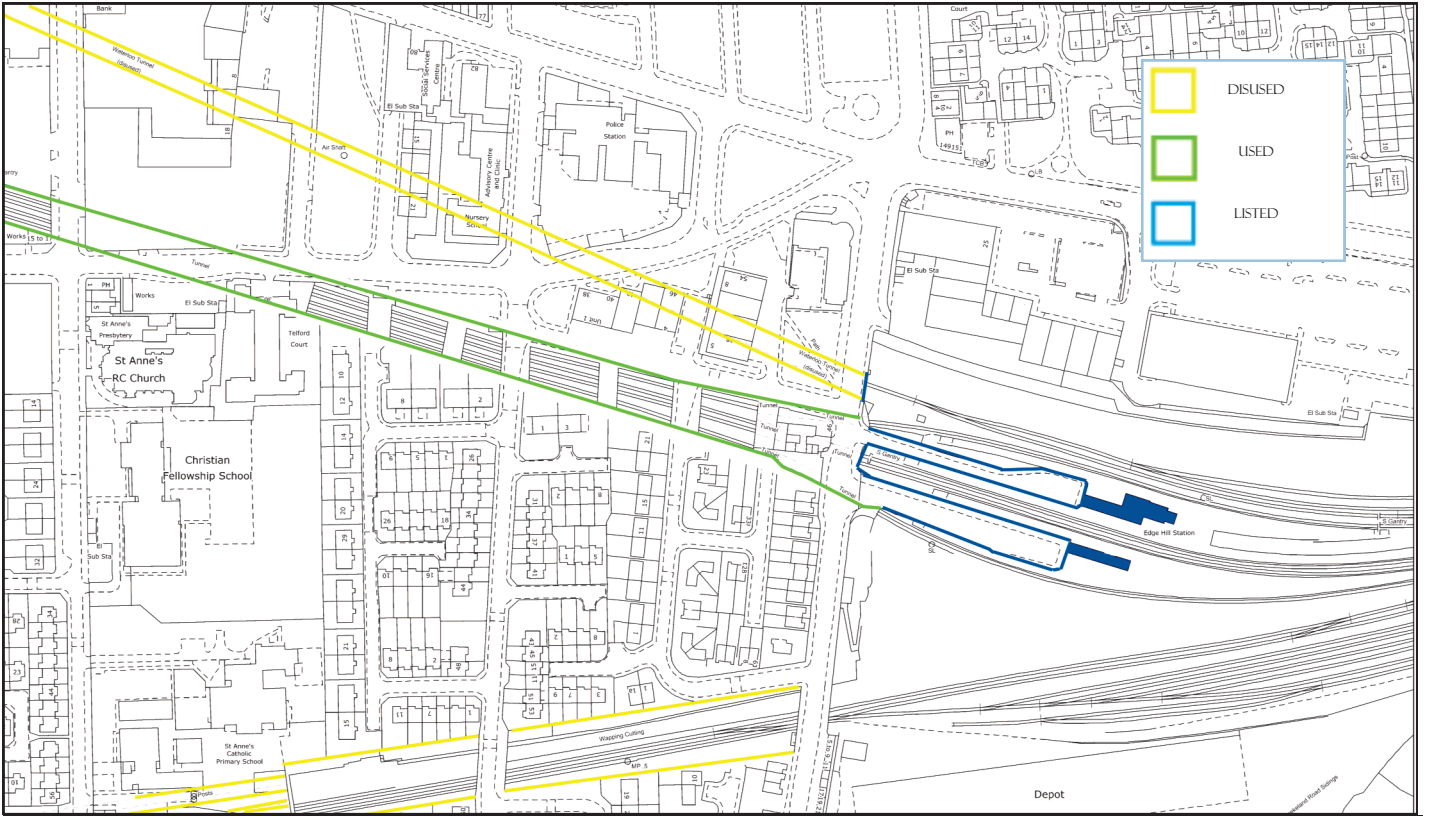
<p>Map 2 Edge Hill Station (1836) and associated workshops</p>	<p>Reproduced from the Town Plan, 1849 © Crown copyright/ database right 2011. An Ordnance Survey/EDINA supplied service.</p>	<p>Scale 1: 1056</p> <p>↑</p> <p>North</p>
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<p>Map 3</p> <p>Detail of the crown street coal yard and engine houses</p>	<p>Reproduced from the Town Plan, 1849 © Crown copyright/ database right 2011. An ordnance survey/EDINA supplied service.</p>	<p>Scale 1: 1056</p> <p>↑ North</p>
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<p>Map 4</p> <p>Detailed map showing Edge Hill station accommodation</p>	<p>Reproduced from the Town Plan, 1849 © Crown copyright/ database right 2011. An ordnance survey/EDINA supplied service.</p>	<p>Not to scale</p> <p>↗ North</p>
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Map 5
Edge Hill station today

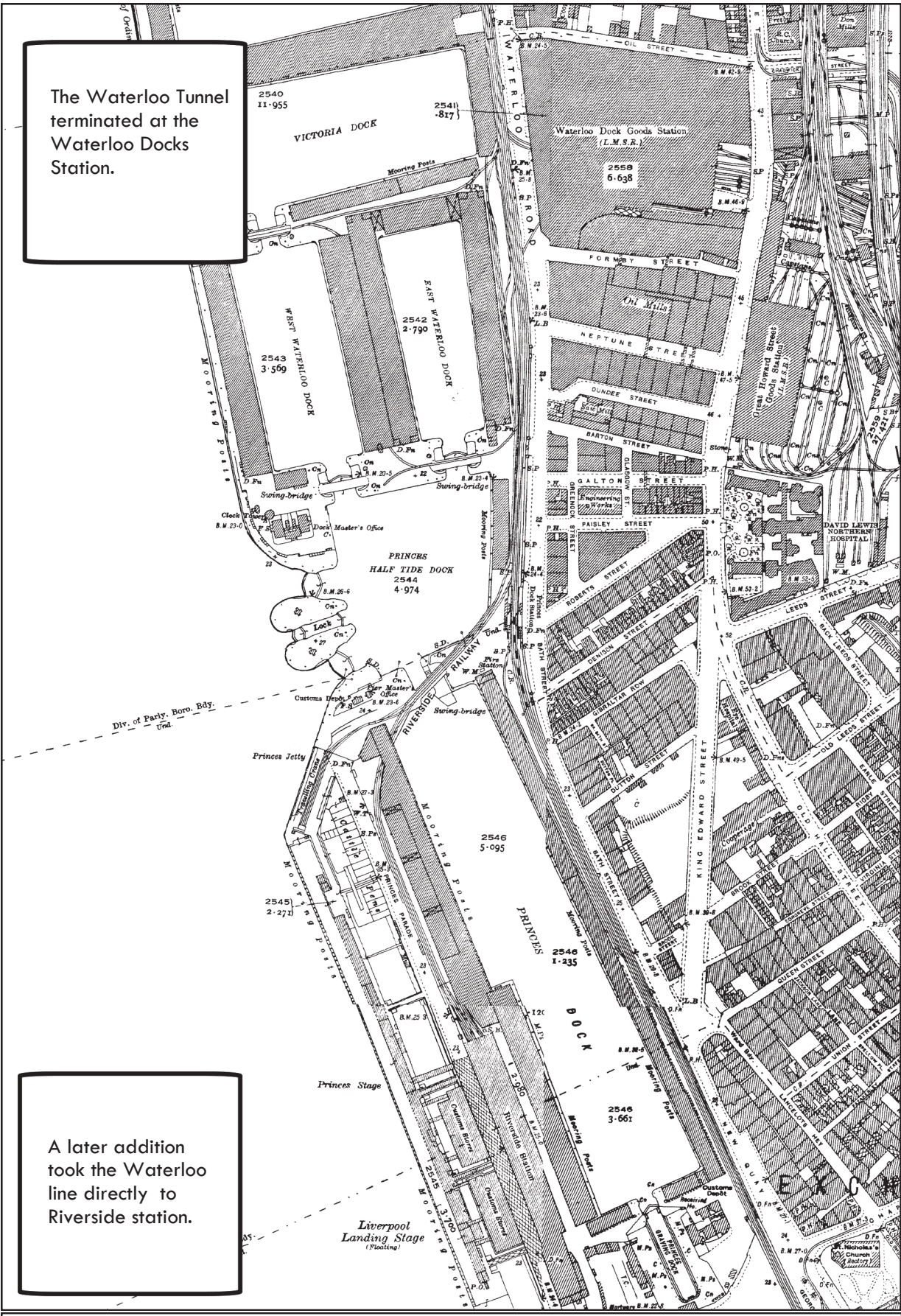
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The Waterloo Tunnel terminated at the Waterloo Docks Station.

A later addition took the Waterloo line directly to Riverside station.



Map 6

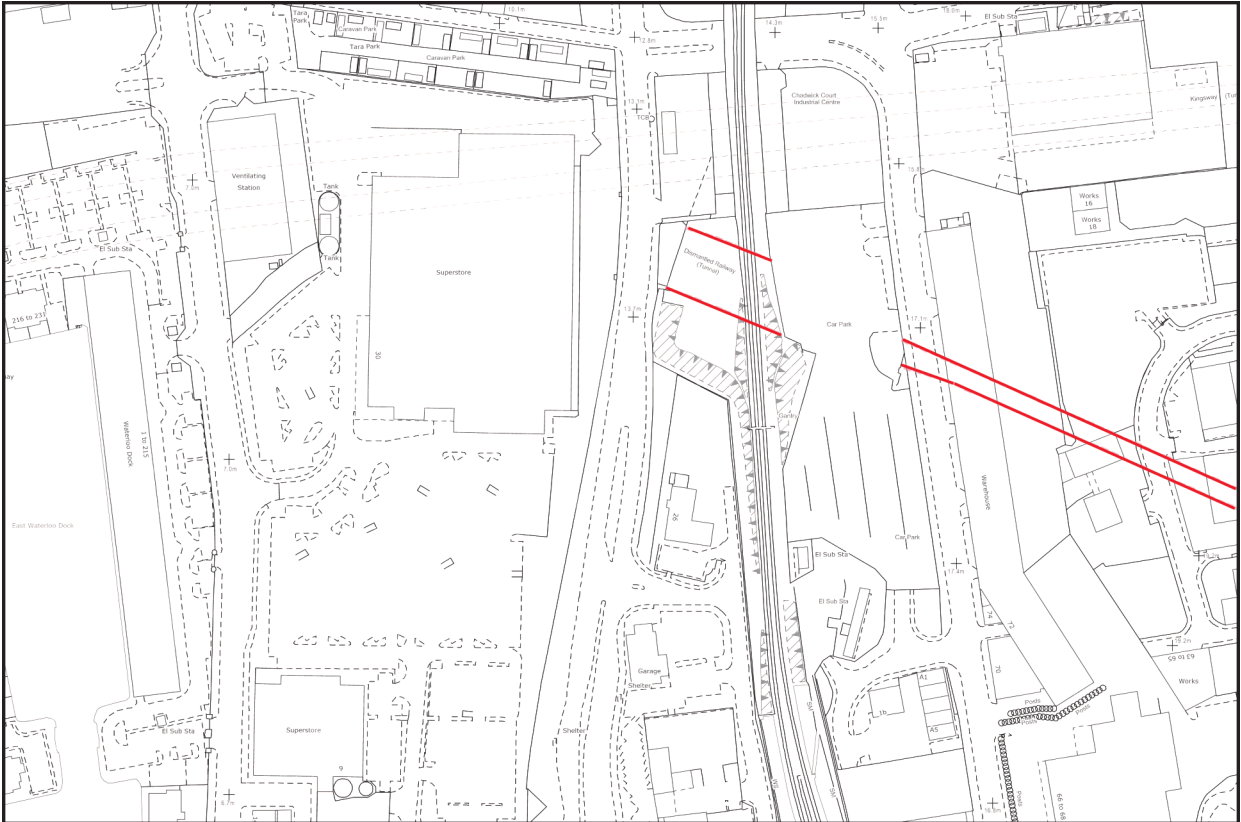
The western end of the Waterloo tunnel and its link to Riverside Station.

Reproduced from National Grid, Second Revision, 1928 © Crown copyright/ database right 2011. An Ordnance Survey/EDINA supplied service.

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North

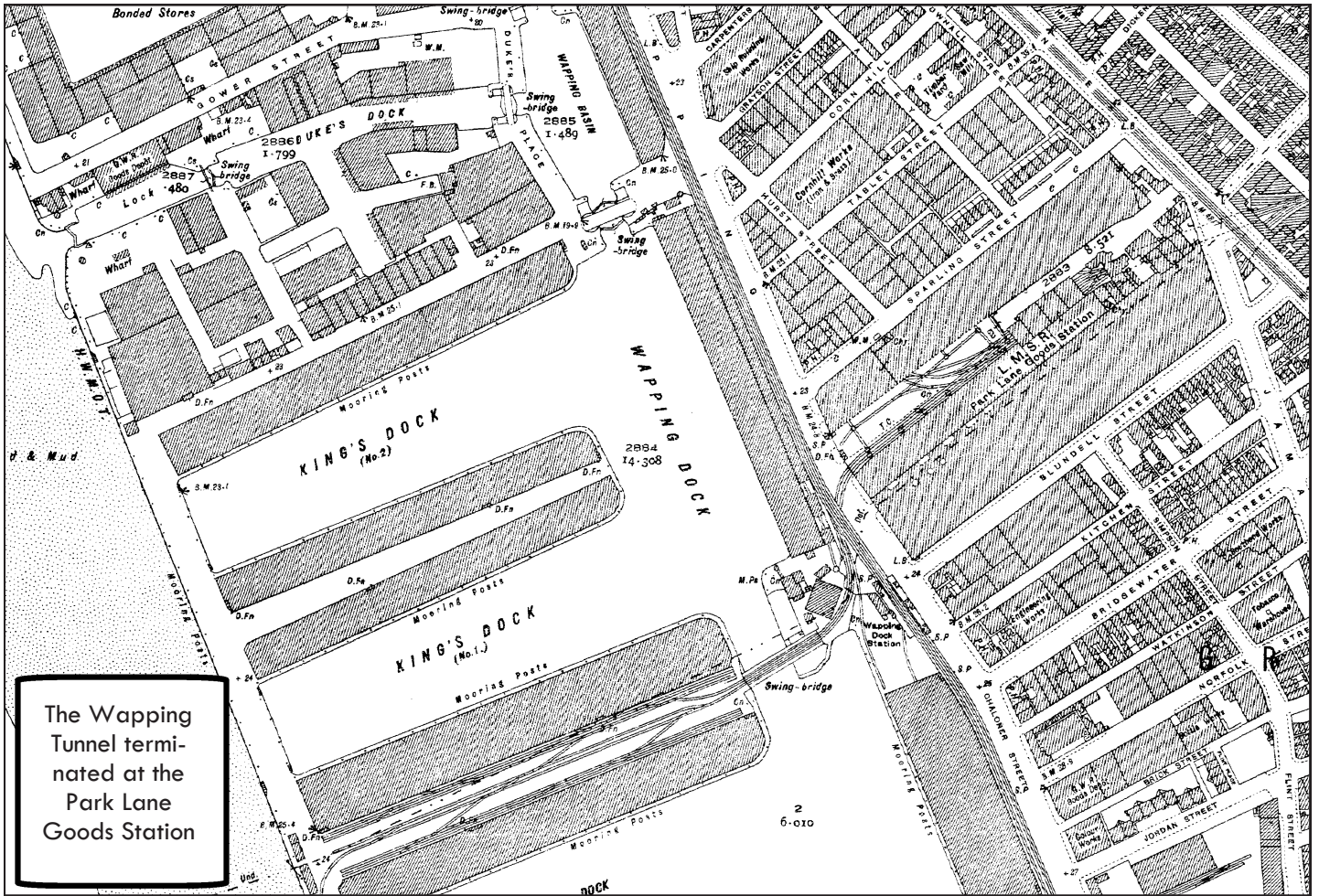


Map 7
The western end of the Waterloo tunnel

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Scale 1: 2500





The Wapping Tunnel terminated at the Park Lane Goods Station

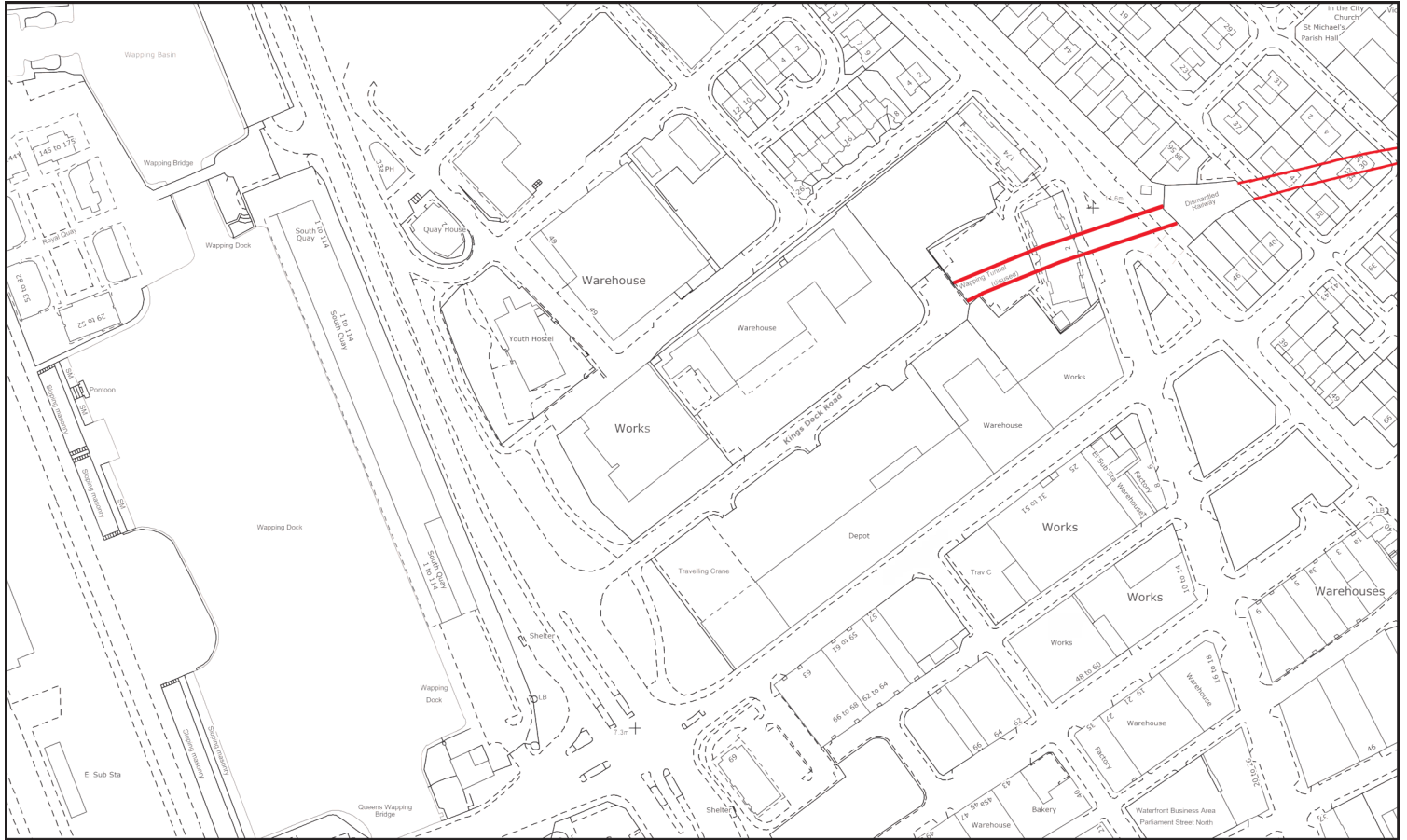
Map 8

The western end of the Wapping tunnel

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Scale 1 : 2500





Map 9

The western end of the Wapping tunnel

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2. Introduction

This report contains the results of an exploratory investigation into Liverpool's railway heritage with a focus on the earliest structures dating from 1830 on the Liverpool to Manchester Railway (L & MR). It summarises the views of key stakeholders, contains a description of lost and remaining heritage as well documenting its existence in major archives. It concludes by giving recommendations that will serve as a benchmark for future feasibility studies.

The trigger for this report was *The Birth of the Railway Age*, a bid prepared by Steve Davies, Director of the National Railway Museum in York, with the support of Sir Neil Cossons, for a serial nomination to be included on the 2011 UK Tentative List of Potential Sites for World Heritage Nomination (NRM, 2010). *Birth of the Railway Age* included structures from the Stockton and Darlington Railway (1825) and Liverpool Road Station in Manchester (1830) - but Liverpool's early heritage was excluded.

Though the bid did not succeed, Liverpool's omission has prompted the city take a fresh look at the status and potential of its railway heritage. It is undoubtedly neglected by comparison with other structures along the L & MR line. The nine-arched Sankey Viaduct over Sankey Brook in Warrington is Grade I listed as the earliest major railway viaduct in the world. Other bridges and stations enjoy protected status particularly around St Helen's, Newton-le-Willows and Huyton. The Manchester terminus of the L & MR was derelict and faced demolition in the late 1970s but is now incorporated - as the oldest railway station in the world - into the Museum of Science and Industry, the city's most popular tourist attractions. In March 2010, English Heritage awarded Grade II listing to Bourne's Tunnel near Rainhill. This colliery rail track predated the L & MR and cut across its route. The chief engineer, George Stephenson, proposed that the L & MR go over it to form a tunnel. It is listed as one of the earliest railway tunnels for its architectural value and, significantly, for its group value with the other L & MR structures nearby.

Much of Liverpool's 1830 railway heritage remains in use, testifying to the rigorous quality of the original engineering. Equally, this means that historical integrity needs to be balanced against improvements to meet contemporary requirements. Before considering the sites in detail, it is worth noting three major issues that affect it.

Firstly, the line between Manchester and Edge Hill is about to be electrified and long overdue. It will bring significant economic benefits to the North West. Network Rail, the transport infrastructure company, is currently pressing ahead with detailed studies of the route between Manchester and Liverpool to support the electrification of the line, scheduled for completion in 2016. Jo Kaye, Network Rail's route director, explained that 'we have looked at all the tunnels and road and pedestrian bridges...some will need work to be carried out before the overhead power lines can be put in place. Having done all the background work we are now at a stage where we are ready to start on the ground'. Electrification could easily be viewed as a challenge to heritage conservation. But opportunities may also present themselves by increasing accessibility to these sites.

Secondly, there is a renewed interest in the potential of Liverpool's forgotten railway tunnels run underneath the site of which two are disused (see pages 19—23). Their reuse as a rapid transit system, was first mooted soon after they closed almost 40 years ago (Merseytravel, 1972). Work started on the line but was abandoned due to lack of funding. But the idea continues to resurface and is gaining currency within Liverpool City Council particularly since funding was pulled from a proposed overground light rail development in 2005.

Thirdly, our report describes a giant triangle that links the maritime mercantile city with pioneering railway heritage [Map One]. This pattern has significant potential for the reconditioning and reuse of historic structures. The economic situation at the present time remains difficult with heritage funds and human resources directed towards the opening of the Museum of Liverpool in late 2011. However, this does not preclude the creative soliciting of funds from charitable and private sources for a longer term vision.

The Liverpool and Manchester Railway

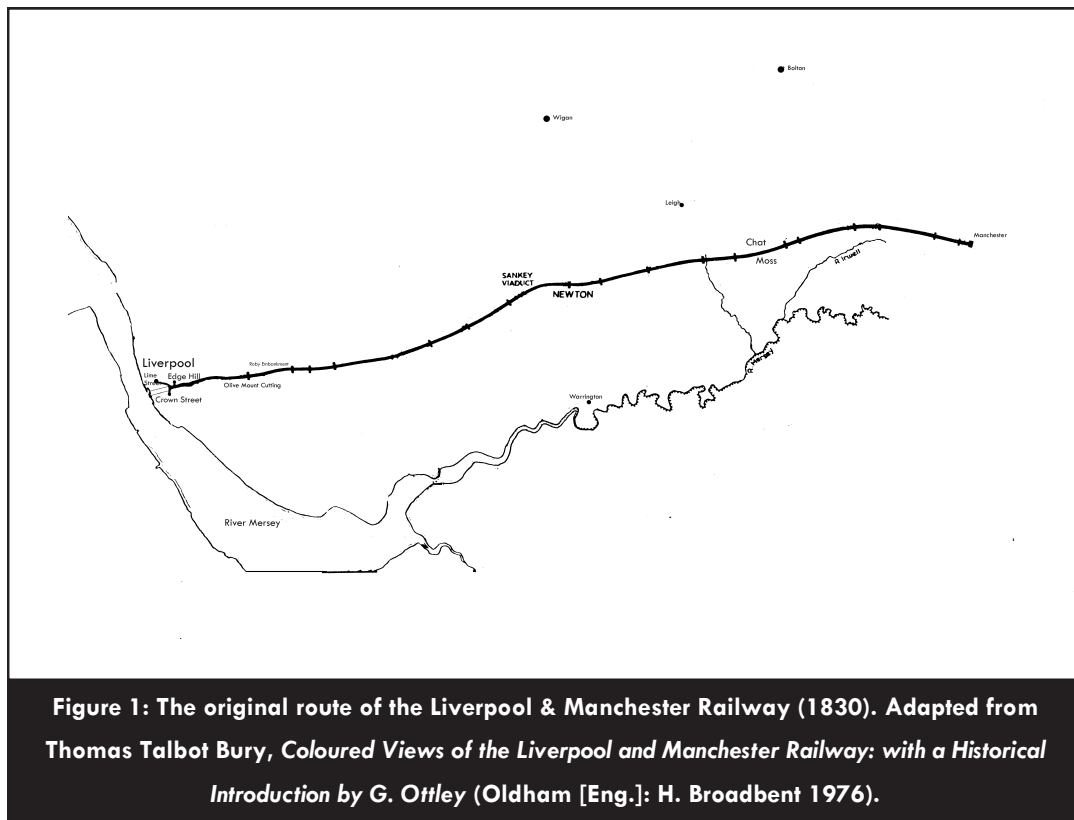
For transport historians, such as Jack Simmons, Terry Gourvish and Mark Cassons, the 'Railway Age' began not with the lines at Oystermouth (1807) or even Stockton & Darlington (1825) but on the 15 September 1830. This date marks the official opening of the Liverpool & Manchester Railway (L & MR). The 31 miles of wrought iron railway between Liverpool and Manchester was the world's first interurban railway connection that dispensed with horse-drawn carriages to use fully mechanised power on a double track line.

It was the result of an endeavour proposed by William James with the support of a corn merchant, Joseph Sandars, and his fellow Quaker business contacts. Equally vociferous in their condemnation of the monopoly of canal companies as they were in their opposition to slavery, they proposed a direct means of communication between the Manchester and Liverpool. Raw cotton needed to be delivered to Manchester from the port at Liverpool and then the finished goods returned there for export. With the assistance of interested Manchester parties, they reached a mutual agreement to provide the funds and campaign for the proposal.

George Stephenson, the self-trained engineer who made his mark on smaller-scale colliery lines in the north east of Britain, initially surveyed the line and proposed that it entered Liverpool from the north. However, vigorous opposition from wealthy landowners and the canal companies was not helped by Stephenson's poor defence of the survey to a parliamentary select committee. His deficiencies, regarding solving the problem of taking the route over boggy Chat Moss and driving a tunnel underneath Liverpool, became apparent. Summing up the proceedings, the case for the defence was plainly stated by Mr Alderson who said that 'I beg to claim here the support of every individual...when I say that this is the most absurd scheme that ever entered into the head of man to conceive' (House of Commons, 1825: 461).

Undeterred, the Liverpool and Manchester Railway Company gave gravitas to their next parliamentary

petition by employing the eminent civil engineers, John and George Rennie, to resurvey the line. With the assistance of a young Charles Vignoles, they proposed an alternative accession point into central Liverpool (Figure 1). Approaching from Edge Hill in the east, a tunnel would link the railway office located there to the King's Dock (although now called 'the Wapping Tunnel' the Wapping Dock was not built until 1855). The canal companies were placated by the offer shares in the developing company. In 1826, Parliament gave its ascent. The first works to be executed included what were to be the major feats of engineering: the Wapping Tunnel and the route over Chat Moss.



Despite his earlier setback, the directors of the Liverpool & Manchester Railway Company maintained their faith and reappointed George Stephenson as the chief engineer. The question of how the railway would be run was unresolved. The debates centred upon whether or not the railway would be run by locomotive power or a system of stationary engines to haul the carriages along the route. Stephenson argued strongly for the former – having already experimented with locomotives in his earlier work on the Stockton and Darlington line (1825). The directors of the company were sufficiently enlightened enough to promote engineering innovation by organising a locomotive competition with a prize of £500. It took place at Rainhill near St Helen's and 'the Rainhill Trials' have become the historical benchmark. George's son Robert succeeded with the 'Rocket'. It was then decided that the line would experiment with fully mechanised steam traction. Under the terms of the 1826 Act, the untested locomotives could not enter Liverpool. A stationary engine and rope haulage system was used. This, in part, explains the location of the original terminus on the outskirts of the city at Crown Street in Edge Hill. The cars could be uncoupled from the locomotives to

descend by gravity through a tunnel to the goods yard (later replaced by the Park Lane Goods Station) located at the docks. Meanwhile, first class passengers were ferried between the company's office in Dale Street and Edge Hill by road.

The stationary engines were located in a cutting and disguised by an ornamental Moorish Arch. Further to the west this led to three tunnel portals. In the middle was the 'Wapping' tunnel to the docks (although now called the Wapping tunnel, the Wapping Dock was not constructed until 1855). The northern tunnel, at 266 metres, provided a direct link for passengers to Crown Street. The third tunnel was initially an opening that formed a shed (Holt, 1986: 17). It was later made into a tunnel on a curved incline over the Wapping tunnel to connect to join the Crown Street tunnel. The 1849 town plan also describes an 'entrance to a luggage tunnel' without specifying its exact designation (See Figure 2).

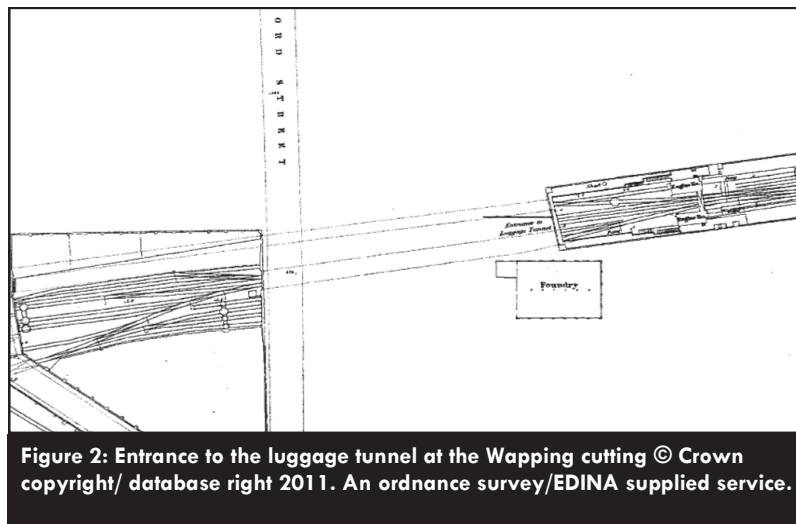


Figure 2: Entrance to the luggage tunnel at the Wapping cutting © Crown copyright/ database right 2011. An ordnance survey/EDINA supplied service.

In the intervening years between the initial proposal and the opening of the line, the aspirations of for the L & MR evolved. Realising the potential profit to be made from the transportation of passengers (which the Stockton and Darlington Railway had carried as a by-product), plans were made to provide specifically for this. Each of the termini had waiting rooms and booking offices and passenger services operated at regular timetables. This precedent eventually led to the standardisation of time throughout the UK (Zerubavel, 1982; Esbester, 2009).

From its innovative use of steam locomotives, specific facilities provided for public convenience and a reserved track, the L & MR was the prototype modern railway. Its success and difficulties were watched and learned from. Within eight years, the total length of railways in the British Isles increased from 97 to 742. Passenger journeys totalled 5.4 million (Mitchell, 1962: 541; 544). The L & MR was a success and the construction of railways was generally accepted as a key communication route.

It soon became apparent that Crown Street terminus was neither convenient nor suitably equipped enough to handle both passenger and freight transport. In 1836, a new terminus opened at Lime Street, closer to

Liverpool's civic life. However, the steep gradient into the city meant that stationary engines needed to remain at Edge Hill. A new station was created some 300 yards to the north east of the original Crown Street site from which a tunnel, designed by the engineer William MacKenzie, was driven through to Lime Street. It was later opened out into a series of cuttings in 1881, two years after the first locomotives used the tunnel to make the line fully motive. Stationary engines continued to work both goods lines through Waterloo and Wapping, to 1895 and 1896 respectively, after the rope broke in the Waterloo tunnel.

The railway was complicit in the continuing development of Liverpool's port. As the docks expanded northwards, a third tunnel was driven from Edge Hill to service the Waterloo Docks and terminated at the Waterloo Goods Station. Heading out from Edge Hill, it is known as the Victoria tunnel. At Byrom Street, a cutting links it to the Waterloo tunnel for the remaining section. Its total length is 2,475m long. By this time, Edge Hill station became a pivotal junction. It served later branch lines and would form a crucial part in the railway history of Britain as a hub for freight traffic. Its tracks were continually added to and new facilities established to service and recondition carriages. The question is: what remains of it now?

3. The Sites

3.1 The Railway Office, Crown Street (1830)

Ordnance Survey Reference: SJ 364 897



Figure 3: Site of the former Crown Street railway station.

In 1830, Crown Street and its associated railway office were afforded finer architectural treatment than the stopping places further along the route. Thomas Talbot Bury's lithograph print shows the railway shed, booking office and waiting rooms. The buildings are on a linear plan, parallel to the railway, and provided a clear demarcation between rail and road traffic. It was sufficiently comparable to the terminus at

Manchester and with a Grecian frontage and built in sandstone (Fitzgerald, 1980: 57 – 58). It is from these two structures that the railway station, as a distinctive building type, would evolve: Isambard Kingdom Brunel adopted the L & MR station plans for the stations on his lines (Biddle, 1973: 107). Only the Manchester example at Liverpool Road remains.

Originally passengers booked their tickets in Dale Street and were then conveyed by horse-drawn carriage up the steep gradient towards Edge Hill. When Lime Street and Edge Hill Stations were opened in 1836, the Crown Street site was converted to use as a goods yard and coal depot. It fell out of use in 1967 and has subsequently been landscaped over. Today, there is a complex of student housing that preserves the memory of this heritage in the names of the immediate streets and buildings: Stephenson House, the Sidings and the Railyard. A portion of the façade from the former coal depot has been incorporated into the railings protecting the site (Figure 3).

3.2 The 'Moorish' Arch and the Edge Hill Engines Station [See Map 3]

Ordnance Survey Reference: SJ 367 898

While the original station building has been erased from the landscape, fragments remain of the engine houses and Moorish Arch located in a 12 metre deep cutting, known as the 'Wapping' or 'Chatsworth Street' cutting. Coming from the Manchester end, it formed the opening portal into Liverpool. The monumental architectural style was deliberate and provided a gateway into the maritime city with an international outlook. It was designed by the Liverpool architect John Foster to impress passengers before they disembarked at Crown Street. The elaborate arch spanned the external elevations of two engine sheds.

Moving from here towards Liverpool was the entrance point to three tunnels, surmounted with walls and an ornamental parapet. Above this, two one hundred feet chimneys ventilated further engine houses located there. The parapet has since been filled in and the chimneys demolished although the base of one remains (Figure 4).

Other boiler houses, workshops and engine sheds were carved directly into the sandstone cutting at various dates. Originally, the engines were worked from steam generated in the boilers and conveyed through pipes laid in a tunnel excavated in the rock. This was fuel intensive and expensive. Eventually, another boiler house was built next to the 1836 Edge Hill Station with two pairs of stationary non-condensing engines, constructed by Mather and Dixon of Liverpool, under the direction of civil engineer, John Grantham. The steam cylinders had side levers like marine engines but with the connecting rods reversed to convey power down towards the machinery. This was placed in vaults cut out of the sandstone upon which beam pedestals were fixed. Once the Victoria Tunnel opened (1849), a new set of boilers was constructed on the south side of the station to supply steam for the Wapping Tunnel engines. A victim of L & MR's success, the Moorish Arch

was demolished in the late 1830s. Until recently, the cutting was used for goods and occasional shunting (now superseded by the newly opened Olive Mount Chord).

The North Western Society for Industrial Archaeology and History carried out excavation work between 1976 and 1980. The slides and papers relating to these are located, though uncatalogued, at the National Museums of Liverpool. Paul Rees and his colleagues discovered that the original arch had fallen into the cellars and the rope haulage system was partially submerged. The remains of the steps down into the cutting could be seen. Further excavation work of the left hand side boiler house revealed the existence of an underground communication tunnel linking the two engine houses. They concluded that the system was devised by Stephenson to meet the requirements of the line and site and should be considered as an engineering feat 'whose importance was only overshadowed by the success of the Rocket' (Rees, 1980: 169).

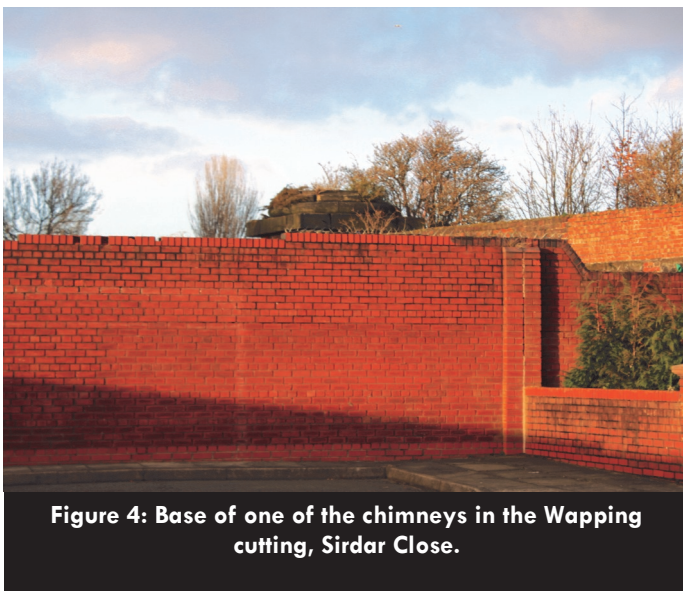


Figure 4: Base of one of the chimneys in the Wapping cutting, Sirdar Close.

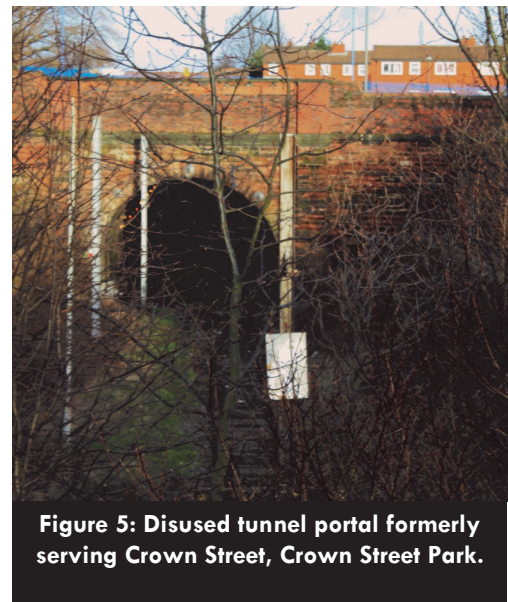


Figure 5: Disused tunnel portal formerly serving Crown Street, Crown Street Park.

After the excavations finished in 1980, parts of the cutting containing the winding gear were filled with sand to protect them. The large winding wheel connected to the rope haulage system at Lime Street was removed. One of the rope support wheels was removed from the Chatsworth Street site along with an expansion joint from a steam pipe on Edge Hill Station. These are stored at National Museums of Liverpool. The National Railway Museum in York also holds a return pulley wheel and bearing block from the rope haulage system, a steel seal die, pieces of fish-belly rail with four chairs and two sections of the multi-stranded wire rope, one from the Wapping Tunnel and the other from the Victoria Tunnel.

3.3. The Wapping Tunnel [See Maps 8 and 9]

Ordnance Survey Reference (east portal): SJ 347 894

The entrance to the 'great tunnel' at the dock end, as described by the civil engineer Joseph Kirwan in 1831,

was marked by a tower and approached through a cutting. It contained space for four lines of rails. Slender cast-iron pillars provided support for an 'elegant pile' of warehouses for expensive items. For the return journey, wooden turntables rotated the carriages around and onto the other side of the double line of track in the main tunnel. This tunnel measures 6.7 metres wide by 4.9 metres high and was surmounted by a semi-circular arch (L & MRC, 1826). Artificial brickwork was introduced where the natural rock could not support the mass.



Figure 6: The western portal of the Wapping tunnel, King's Dock Street.

2, 076 metres was tunnelled through sandstone, shale and clay. Some of the shale was so wet that great ingenuity was required to support the roof until the masonry lining was built (Rolt, 1962). Ventilation shafts were located at Crown Street, Blackburne Place, Rathbone Street, Myrtle Street and White Street. The latter two have since been demolished. It was first opened was to the directors of the L & MR in July 1830, three months before the inaugural journeys and so, the shaft at Blackburn Place was used to take tourists down to view the tunnel which was gas lit. Street names, corresponding to those passed overground, were indicated on the walls. For James Scott Walker, writing in 1832, the combination of lighting with whitewashed walls produced an effect that 'was grand and beautiful...and the whole vista appeared like a succession of superb arches, formed through massy parallel walls, the intervening spaces being left in comparative darkness' (Walker, 1832: 20).

Today, the tunnel portal at the Wapping end is plain and unmarked, presumably because it terminated at the warehouse where architectural finery was not required. Last used in 1965, its portal is located in the eastern perimeter wall of an industrial park and is blocked up by bricks with debris (Figure 6). The Park Lane Goods Station has been demolished. Around 20 m to the right hand side are two further tunnel portals. These were a much later addition of a spur. Unofficial reports indicate that the last section of the tunnel is flooded. This is around a mile from Edge Hill, located near a cut provided for the Cheshire Lines Committee/Merseyrail Northern Line to pass through in 1977 (28 Days Later, 2010). The tunnel has two owners. Network Rail owns the initial section leading out from Edge Hill and the Chatsworth Cutting. The rest was sold to the Liverpool Corporation in 1967.

Located 300 m from the Wapping Dock, the tunnel is within the buffer zone of the existing World Heritage Site. The surrounding area remains undeveloped but the remaining structures include some fine warehousing and it is close to tourist attractions at the Docks. No part of it is listed although it is mentioned in the nomination for inscription for Liverpool as a world heritage site.

3.4. Olive Mount Cutting

Ordnance Survey Reference: SJ 393 907

This cutting was constructed as part of the original line. At seventy foot deep, it required 480,000 cubic yards of sandstone to be blasted out to make a cutting of 2 miles long. It was the first extensive stone cutting on any railway. The high quality excavated sandstone was then used to build the Roby embankment and the Sankey Viaduct with the excess sold off for profit. Its constrained proportions – narrow yet deep – created a spectacular new landscape on the entry into Liverpool. The cutting, along with the tunnel underneath Liverpool, attracted geologists to examine the newly exposed rock faces (Freeman, 1999). It has since been widened but retains a sense of the drama evocatively depicted in the Thomas Talbot Bury prints.

3.5 The Waterloo/ Victoria Tunnel (1849) [See Maps 6 and 7]

Victoria Tunnel Portal: Grade II

Ordnance Survey References: (East) SJ 338 914; (West) SJ 371 899

The chief engineer was Edward Woods, who also worked on part of the Wapping Tunnel and its ventilation shaft at Blackburne Place. He was appointed to construct a new tunnel to run between Edge Hill station and the Waterloo Dock. Opened in 1849, it consists of two tunnels at a total length of 2,475 m long, falling at a gradient of 1 in 60. The eastern end, running from Edge Hill, is known as Victoria tunnel (Figure 7). The western end, terminating at the Waterloo Docks, took on the name of Waterloo and terminated at the Waterloo



Figure 7: The Victoria tunnel portal on the right with one to Lime Street on the left, Edge Hill Station.



Figure 8: Ventilation shaft for the Victoria tunnel, Archbishop Blanch High School, Minshull Street.



Figure 9: Ventiation shaft for the Victoria tunnel, Helena Street.



Figure 10: Ventilation shaft for the Victoria tunnel, Shenstone Street.

Goods Station. An open cutting at Byrom Street links both tunnels.

The tunnel was last used in 1971. It is owned by Network Rail. There is no scheduled maintenance on the tunnel because it is disused. The three ventilation shafts serving the tunnel, located between the Royal Infirmary and Edge Hill Station, are in different styles and probably constructed by different companies. While the portal to the Victoria Tunnel at Edge Hill is Grade II listed, further investigation is needed to locate the Waterloo tunnel portal. The site is obscured with foliage and hoardings. It should be located under a railway arch on Great Howard Street that is marked with a plaque containing a Liver bird and inscribed with the year, 1849. This carried a different railway line over the Waterloo branch (see p. 28).

In 1895, it was extended over the Mersey Docks and Harbour Board's railway to the now demolished Riverside Station. This was used for ocean liner traffic until 1971. The railway played a principal role in the mass trans-atlantic movement of people from mainland Europe via Hull to the embarkation point at Liverpool and on towards the United States of America

3.6 Edge Hill Station [See Maps 2 and 4]

Ordnance Survey Reference: SJ 371 899

North and South Buildings are Grade II; the Engine House is Grade II*; The Hydraulic Tower and both carriage ramps are Grade II. Original portal to Lime Street is Grade II.*

As described above, Lime Street became the terminus in 1836 and a new station was built at Edge Hill connected to Lime Street by William MacKenzie's tunnel (see page 25). Edge Hill remained important because stationary engines were required to convey the carriages to Lime Street and the docks. David Singleton believes that it 'was one of the first purpose built railway stations other than a terminal in the country' built in stone and characteristic of the rest of the structures erected along the L & MR (Singleton, 1980). Still in use, it is one of the oldest working railway stations in the world. It cannot claim this outright because the Tudor style buildings at Earlestown, near Newton-le-Willows, cannot be accurately dated.

The station buildings are classical and constructed in red sandstone with hipped slate roofs and heavy rustication to the ground floor. They share a strong family resemblance to similar structures along the line, particularly Liverpool Road station in Manchester. Map 4 details the plan from 1849. Both station buildings contained a booking office and two waiting rooms to segregate different classes of passenger. Two elegant sandstone carriage ramps slope down to the buildings. These are listed together with the original entrance to the Lime Street Tunnel. The Tunnel Hotel was formerly located at the top end and opened to serve the passenger traffic. It has long since gone and one solitary construction remains. It appears to be an early



Figure 11: Edge Hill station (1836), north side buildings.



Figure 12: Edge Hill station (1836), south side buildings.

Victorian building and is now an antiques shop. L-shaped on plan, it appears on the Ordnance Survey maps after 1860 adjacent to 'the Tunnel Hotel'. Local knowledge suggests that it was formerly the stabling yards for horses belonging to the railway clientele.

In order to keep pace with technological change, more facilities were built on site. Map 2 shows the development by 1849 with engineering and foundry workshops to service the locomotives. In 1873, the London and North Western Rail (LNWR) congestion from goods traffic was causing problems. They relieved it by creating the innovative 'gridiron' sidings for which the hydraulic plant house and adjoining accumulator tower (1882) were built adjacent to the north side station buildings. The sidings were laid out at a gradient so wagons could be prepared and fuel replenished from stationary tank engines as they descended. The Engine House is listed at Grade II* as due recognition of the contribution of the gridiron to Britain's industrial history.

Little used for passenger traffic, the late twentieth century saw the associated buildings fall into a state of disrepair. The arts group Metal, raised funds from Merseytravel, Kensington Regeneration, the Railway Heritage Trust and others to refurbish the derelict buildings on platforms 1 and 2. Between 2007 and 2008, Liverpool architects, Shed KM refurbished the listed engine room, accumulator tower and boiler space and stripped these back to reveal their original features. It is now in use daily for artists and exhibitions.

3.7 Lime Street Station and Lime Street Chambers (formerly the North Western Hotel)

Ordnance Survey Reference: SJ 352 905

Both Grade II Listed

It was quickly realised that the Crown Street terminus was poorly located for public convenience. By 1832, a terminus located on Lime Street in the city centre was proposed. A new tunnel was driven from Edge Hill towards Lime Street (1832—1837). The contractor was William MacKenzie who followed up his training on the canals, with the profitable contract for the L & MR tunnel between Edge Hill and Lime Street. He became one of the most successful engineering contractors of the period with prestigious contracts in Britain, France, Spain and Belgium. At a gradient of 1 in 97 and a length of 2076m, the tunnel was opened out as a cutting in 1881. It was worked by rope haulage until 1879.

The earliest building at Lime Street was erected by 1836 on the site of a former cattle market. This offered the opportunity to create a suitably dramatic point of arrival in Liverpool and the Town Council contributed £2,000 towards the construction of its two storey classical façade designed John Foster Jnr. It forms part of



Figure 13: Entrance to Lime Street Station.



Figure 14: Lime Street Chambers (1867) by Alfred Waterhouse

the Liverpool forum along with other cultural and civic buildings on William Brown Street. This station was replaced in 1849 by a new station on Lord Nelson Street by Sir William Tite. It included the first innovative iron segmental-arched vault train shed by Richard Turner, built the year after he completed the Palm House at Kew, which marked the turning point in train shed design. The rear wall of the 1849 station still exists along the back edge of platform one.

The present station comprises two parallel sheds each covered by a wide curved iron and glass roof. The north shed was begun in 1867 to replace earlier sheds (1836, 1851) and, at the time, was the widest in the world with a span of 200 feet. The engineer was William Baker. An almost identical south shed was completed in 1879 designed by Francis Stevenson and E. W. Ives.

In 2005, the complex underwent a £2.6 million refurbishment that preserved the architectural heritage while updating the facilities to meet modern requirements. A collaboration between the major rail companies and Liverpool City Council, the arch signifying the approach was refurbished to much praise (Figure 13). Lime Street Station is located in the existing World Heritage Site.

The former North Western Hotel forms the façade to the railway shed at Lime Street (Figure 14). It was one of Alfred Waterhouse's earlier commissions and opened in 1867. French renaissance in style it contains a grand entrance hall and buffet. It has since been converted to student halls of residence opened in 1997 for Liverpool John Moores University.

3.8 Connected Sites of Interest

There are a number of related places of interest within or nearby the existing world heritage site. The following section draws heavily on the *Pevsner Architectural Guide for Liverpool* (Sharples, 2004).

Ventilation Tunnels and Chimneys

The 1865 ordnance survey map shows five shafts to the Wapping Tunnel of which three remain (see p. 20). Six shafts served the Waterloo/ Victoria Tunnel with three still in evidence (see p. 22). Other ventilation structures were required because of a growing wish to allow locomotives to go through the Lime Street tunnel. The delays caused by heavy traffic, particularly around the holiday season, made this an imperative. However, the waste from coal-powered locomotives needed to be extracted. The opening out of the tunnel into a series of cuttings was considered but initially believed to be too expensive to purchase the additional land and to deal with the public health implications. In 1871, a ventilation chimney, known as Ramsbottom's Chimney after its designer, the engineer John Ramsbottom, was built on Smithdown lane adjacent to the Crown Street Goods Yard. It outlived its use when the tunnel was eventually opened out in 1882. Its foundations can still be seen at Smithdown Lane next to the Lime Street Cutting.

The Overhead Tunnel Portal, Brunswick Docks and Dingle Underground Station

Liverpool continued to be at the forefront in innovative developments in transport, motivated out of the need to achieve the efficient movement of people and goods to service the dock and to maintain its maritime mercantile pre-eminence. In 1882, the Mersey Docks and Harbour Board received an Act of Parliament to allow them to build a double-line railway structure that ran for over 5 miles, with stopping places, along the docks. Promoters eventually adopted an electrified and elevated system: the first of its kind and engineered by Donald Fox.

Colloquially known as 'the Dockers' Umbrella', it was mostly elevated except for a tunnel between the Herculaneum Dock and Dingle. In 1932, the company offered first and third class tickets for round trips to tourist passengers which proved to be popular. It was used until 1956 when the cost of refurbishment outweighed its significant daily use. The tunnel portal at the Herculaneum Dock remains (Figure 15) Dingle Station is intact underground. Stanchions have been embedded in the dock wall close to the Wapping warehouse and to the north of Pier Head. These are visible only inside the dock estates side of the wall.

34 Rodney Street

The birth place of Henry Booth, the first secretary and treasurer of the L & MR (Grade II Listed).

MacKenzie's Tomb:

At the Scottish church of St Andrew on Rodney Street, William MacKenzie's burial place is marked by a distinctive pyramid tomb.

Statue of William Huskisson, Duke's Terrace, Liverpool (Grade II)

The Railway Viaduct and Arch

This viaduct was constructed in 1847 by what would eventually become the Lancashire and Yorkshire Railway Company (L & YR). It stretched for over a mile and originally had 117 arches. Its first terminus was enlarged at Great Howard Street which later became the L & YR's goods warehouse. This was located close to the Waterloo Goods Station belonging to the L & NWR at the end of the Victoria/ Waterloo tunnel. To take the L & YR line over this, an arch with a span of one hundred feet was constructed (Figure 16). It can be viewed from Great Howard Street. The viaduct has been partially reused for Meseyrail outer loop line.

Railway Warehouses

Located in the city centre, warehouses belonging to a number of different railway companies have been listed. On Victoria Street, the goods depot for the London and North Western Railway Company (into which the L & MR was amalgamated in 1845), was constructed in 1888 to serve Exchange Station in Tithebarne Street. Flemish renaissance in style, it was converted in 1923 to a fruit exchange. It is now grade II listed. Close by, the concave façade of the former Midland Railway goods warehouse gently curves around Crosshall Street. It was sympathetically converted into the Conservation Centre for the National Museums of Liverpool in 1995.



Figure 15: Portal to the Dingle tunnel section of the former Overhead Railway.



Figure 16: Railway bridge built by the L & YR to span the Waterloo tunnel (1849), Great Howard Street.

4. Comparison with Early Railway Heritage Elsewhere

The Stockton and Darlington Railway (1825)

The Stockton and Darlington railway was completed by George Stephenson. It is where Stephenson conducted many of his initial experiments with infrastructure and locomotive engineering. It brought him to the attention of national networks; but it was a small-scale colliery line. It carried passengers but not in a commercial sense and made use of horse-drawn carriages. Although important in the formation of Stephenson's ideas, it was the L & MR that provided the breakthrough and gave rise to the railway network as we know it today.

Liverpool Road Station, Manchester (1830)

The oldest railway station in the world is located in Manchester as the counterpart to the Crown Street terminus discussed on page 13. It is virtually unchanged. The original coach offices (passenger station), warehouse and intervening viaduct survive but it is no longer in working use as a rail station. Instead, it was sold to Manchester City Council for a nominal sum and has since enjoyed a high profile and popular restoration as the Museum of Science and Industry (MOSI) that has partly acted as a catalyst to the regeneration of former industrial wasteland in the part of the city known as Castlefield.

The Great Western Railway (1838)

The Great Western Railway (GWR) places its heritage value on the genius of Isambard Kingdom Brunel and the integrity of the site owing to its management by one railway company. Built on a broad gauge that was never standardised, it contains many interesting engineering features including the Box Tunnel in Wiltshire stretching for two miles and with characteristic Brunel motifs at the elaborate portals. However, the GWR's evolution only makes sense when the sites on the S & D and L & MR are taken into consideration. It is from these that Brunel would have taken as a starting point – particularly in his development of a different size of gauge.

The Semmering Pass, Austria (1848 – 1854)

The Semmering Pass in Austria is 41 km of railway that traversed the mountainous Alps and was regarded as a civil engineering triumph with a high standard of tunnels, viaducts and stations. It remains in working use. Inscripted as a World Heritage Site in 1998, its inclusion was justified as an 'outstanding technological solution to a major physical problem in the construction of early railways'. Tourists came to view the natural landscape that it opened up and made accessible. While the South Lancashire plain may not be quite as beautiful as mountainous Austria, the L & MR predated the Semmering Railway and equally made new features in the landscape that were lauded by contemporaries – particular through the Olive Mount Cutting and the Wapping tunnel. The Rainhill trials also provided a model for the operators of the Semmering railway who established their own locomotive competition to meet the technical challenges of the site.

5. Documentation

The Liverpool and Manchester Railway (L & MR) is well documented in images and writing. A brief survey of the main repositories is detailed below. An accompanying database describes the catalogued items.

Liverpool Records Office (LRO)

The fact that it was the Liverpool merchants who spearheaded the proposed railway plan is reflected in the large volume of documentation held by LRO. The collected papers of the initial proposer, William James, include his 'oculine survey of investigation. Fourteen letters written by George Stephenson are also held at this repository. Records relating to meetings chaired by Henry Booth are filed under 'Liverpool & Manchester Railway Company'. These record the debates surrounding the establishment of the railway as the Company pressed its case to Parliament. One document, dated 9 July 1825, considered William Huskisson's suggestion that profits from the shares should be limited. The Company felt that this proposal was contrary to the spirit of free trade.

In his extensive coverage of the location of railway archives and drawings, Mark Casson notes that 'few people make use of plans' (Casson, 2007: 36) The Liverpool collection does not appear in LRO's current printed or online lists. However, many drawings are not catalogued. A booklet compiled to commemorate the centenary anniversary of the L & MR indicates that the local collection should include Stephenson's original 1825 plan (which approached the city from the North via Bootle) and an original copy of the survey carried out by Charles Vignoles and the Rennies, dated 1826. Copies of engineering plans and drawings deposited by British Rail are not yet catalogued. Other unindexed accessions include Edge Hill Station Plans 1864 – 70 (4 Plans, Accession Number 3296).

Photographic evidence is plentiful. Recent accessions include the photographs of Keith Rose of the Waterloo Tunnel with various locomotives which seem to be dated c. 1980. A set of photographs taken by Henry Ainscough provides views of Edge Hill from the 1970s. In addition, one unnamed photographer records a 310 ft. high chimney stack that was demolished in 1938.

There is also much secondary literature in the local history collection as well as a folio of material relating to the centenary celebrations, held in Liverpool, with a facsimile of one of the original tickets. Some original material was destroyed because of a fire at an exhibition in Belgium to which it had been loaned.

Lancashire Records Office

The biggest collection of plans is held at the Lancashire Records Office. They are located here because of the power of the County of Lancaster Quarter Sessions to control the levying and rates applied to highways. Key amongst the 'Deposited Railway Plans' include railway lines and proposed branches; architectural drawings of railway buildings; and plans and sections of tunnels and bridges from the initial proposal in 1822 through to 1845.

The Institute of Civil Engineers

The Institute of Civil Engineers provides a useful resource on the technical details of the Liverpool tunnels, ventilation and stationary engine systems. In addition to written papers in the Institute's *Proceedings*, ICE's archives are best accessed through the names of men. Thomas Telford was commissioned to perform surveys of the line and his collection includes traced drawings (usually in poor condition) as well as letters from him to Henry Booth. William McKenzie's papers include drawings relating to the Waterloo/ Victoria Tunnel. Finally, filed under 'Engineering Drawings' are surveys, plans and sections that formed the basis to publications printed in the ICE's *Proceedings* (before 1837, *Collected Conversations*).

The National Railway Museum

An excellent collection of prints, photographs and memorabilia relating to the Liverpool and Manchester Railway through its amalgamation as the London and North Western Railway exists at the NRM and Science in Society. These include the photographs taken by the Anglican Bishop, Eric Treacy, during his tenure at St Mary's Church in Edge Hill. In addition, the collection of the prominent Victorian photographer, James Mudd, also contains images of the Liverpool Railways.

Public Records Office, Kew (PRO)

Records of the L & MR can be viewed PRO in Kew as part of their general railway collection. These include 'Liverpool and Manchester railway: branch railway and tunnel to Waterloo Road, Liverpool' (1844). The history of the Post Office's use of the railway, first tried on the L & MR Line with great success is also documented in their records. Statistics of railway accidents, of which William Huskisson was the first, are also held at PRO.

Manchester

The University of Manchester publishes the *Journal of Transport History* and has an excellent collection of academic literature relating to transport history in the United Kingdom. Additionally, the collected papers of Michael Robbins and E. Kenneth Brown are worthy of mention. These include a framed map of the railroad between Liverpool and Manchester (1825) and the proceedings accompanying the first petition to Parliament in 1825. At MOSI, most of the material relates generally to the L & MR with a focus on the Manchester operations although their collection includes newspaper cuttings, ticket stubs and other memorabilia.

L & NWR Society Archives and Study Centre

At Kenilworth in Warwickshire, the society of the London and North Western Railway Company has a large number relevant of documents, drawings and artefacts relating to Liverpool's railways between 1825 until nationalisation in 1948. This includes letters written by Charles Vignoles. One letter from Robert Stephenson to Henry Booth details the shipment of stationary steam engine parts for tunnel.

Online Sources of Information

Goldsmith's University (London) and Kress Library of Economics (New York) have collaborated in the digitisation of original archived material relating to the 'Making of the Modern World'. Including items documenting the development and reception of the L & MR. Any individual who is fortunate enough to have a subscription can gain easy access to items such including the 1826 broadside for *the specification for excavating the tunnel at Liverpool* (1826) [Figure 20]; James Scott Walker's, *An accurate description of the Liverpool and Manchester Railway* (1832) and Henry Booth's *An account of the Liverpool and Manchester Railway* (1831).

6. Stakeholder Aspirations for Liverpool's Lost Railway Heritage

Liverpool City Council

John Hinchliffe, the World Heritage Officer at Liverpool City Council, considers that Liverpool's contribution to the birth of the railway age is of international significance. The development of the railway system was integral to the continued expansion and operation of the port. Lime Street Station is within Liverpool – Maritime Mercantile City World Heritage Site (inscribed 2004) and some other components of the railway heritage (including parts of the Wapping and Waterloo Tunnels) are within the Buffer Zone. The surviving evidence of Liverpool's railway heritage bears witness to the outstanding universal value of the world heritage site and has strong thematic connections to it.

Mr Hinchliffe considers that a long-term comprehensive strategy should be developed to identify, protect, conserve, promote and improve understanding of Liverpool's railway heritage. The protection could be partially achieved by extending the buffer zone of the existing World Heritage Site. National recognition of its significance and its statutory protection could also be achieved by inclusion of those structures which are not currently listed, such as the cuttings and tunnels, on the statutory list of buildings of architectural or historic interest.

Mr Hinchliffe supports the investigation of the potential of the historic tunnels and cuttings as leisure resources and means of public transport between Edge Hill Station and the waterfront, as this would be consistent with Objective 6.1 of the Management Plan for Liverpool – Maritime Mercantile City World Heritage Site, which is to:

Manage transport into and across the site in a sustainable manner that aids the conservation of the character and significance of the site and the Buffer Zone.

Bringing the tunnels back into use in a way that protects and promotes the heritage whilst strengthening transport connections in the city, would be an ideal outcome.

Network Rail and Northern Rail

Network Rail owns the majority of the site. While they were unavailable for official comment, their emphasis on corporate social responsibility should mean that they will be open to dialogue particularly where sites are

disused. As a precedent both Network and Northern Rail agreed to lease Edge Hill station to the arts group 'Metal' in return for a 'peppercorn rent' that allowed Network Rail to retain the right of ownership over the buildings yet to see them refurbished and brought back into use.

Merseytravel/ Edge Hill Station Working Group

Local journalists Larry Neild and Peter Elson, along with Fred O'Brien, a former plaque maker and heritage enthusiast spearheaded the establishment of the 'Edge Hill Station Working Group'. They seek international recognition of the importance of Edge Hill by creating a bold and imaginative celebration of the railway age. Over the years, many ideas have been articulated but with little achieved. They see the working group as the catalyst that will garner the support of strategic decision makers. They have aspirations for a permanent railway exhibition and have solicited the verbal support of the National Railway Museum (York) and MOSI (Manchester).

Cllr Mark Dowd, chair of Merseytravel, has been instrumental in supporting this working group to explore the potentials of the site. It includes representatives from all political parties as well as the rail companies and local enthusiasts. Cllr Dowd believes that Edge Hill holds wide potential and says that 'it deserves due recognition for its significance'. He wants 'improved facilities and marketing of the site in order to attract tourists'. If sympathetically done, it could draw upon the surrounding heritage to the benefit of a deprived area. While the working group is in its early stages, he is keen to maintain the momentum and bring their ideas to fruition. Cllr Dowd also commented that it should not interfere with the proposed electrification of the line between Liverpool in Manchester, which, in any case is unlikely to be realised much before 2018. At the very least, funds are in place to commission a plaque for Edge Hill Station.

Metal

The community arts group, Metal, provide residential space for artists. Originally they operated out of a ticket office in West Hampstead. Ian Brownbill, their Liverpool director, thought that Edge Hill station similarly had the potential to become a creative space for the local community. Jenny Porter, project manager for Metal, said that their ambition is to continue to 'bring the spaces back into creative life that reflects on the history of creativity and innovation that the beginning of the railways and Stephenson's engineering prowess represents.' Having already completed refurbishment work, they have planning permission secured for further development of the site. They hope to create more of a presence on the approach to the station with the creation of a permanent memorial to the contribution made by Irish migrant workers to the excavation and building of the Liverpool to Manchester Railway. Currently, they have heritage lottery funding for an oral history project that will form the basis for a permanent station exhibition. At the very least Jenny said that Metal is working to 'raise Edge Hill's profile. If it's in people's minds then that is a good thing and can be the start of something'. With long experience in collaborative working, Metal hope that they can be a key part of ensuring recognition for Edge Hill's significance.

Friends of Williamson Tunnels/ Joseph Williamson Society

A group of Liverpool residents are dedicated to capturing the disappearing and neglected industrial heritage of the city, particularly around Edge Hill. To date, their work has focused on the Williamson Tunnels. They have taken responsibility for excavating the area and have established the 'Friends of Williamson Tunnels Heritage Centre' located at Smithdown Lane. However, they have been taking images and collating data relating to Liverpool's industrial heritage for the past thirty years.

David Head, Norma White and Jeff Jones all expressed a wish that unlisted structures should be protected to guard against further dereliction particularly the cuttings and tunnels. They hope for due recognition of the significance of the site and express the wish that, at some point, it can be excavated and brought back into use either for travel purposes or as a heritage trail. They are open to sharing their knowledge with any interested parties and hope that their years of accumulated research can help to realise Edge Hill's heritage potential.

Others

Not included in this report are the interests of other stakeholders, such as landowners around the tunnels towards the docks, and Edge Hill residents. In addition the museum sector, particularly that in Liverpool as well as NRM and MOSI would have to be considered if plans for a heritage centre were realized. Liverpool's railway heritage also has the potential to attract more tourism to the city and complement existing heritage attractions. National Museums of Liverpool should therefore be included as a stakeholder in any future project.

7. Conclusion

The first railway tunnel was the 'Terrenoir' between Roanne and Andrezieux in France but used horse-drawn carriages. In 1824, work began on the construction of the Thames Tunnel in London by Marc Brunel but engineering problems and lack of finance delayed its final opening until the 1843 and although designed to accommodate horse-drawn rail carriages, it did not do (Beaver, 1972: 47). With some confidence, it can be said that the Wapping Tunnel was the first railway tunnel to be driven under a city that accommodated railway traffic that was not drawn by horse.

The massive contribution made by George and his son, Robert Stephenson, such as the remnants of the stationary engine house at the Wapping Cutting, may be considered as works of creative genius. Equally, scholarship increasingly highlights that technological innovation is a collaborative process. All of the tunnels were worked upon by civil engineers of renown: Joseph Locke, Charles Vignoles, William MacKenzie and Edward Brown, amongst others, who made their names on the L & MR and were soon in demand building the rest of Britain's railway network and throughout the world. That the L & MR remains in use 180 years after opening demonstrates the sound economic and technical base upon which it was proposed and built.

As Walker eloquently wrote of the Olive Mount cutting in 1832 : 'the spectator marvels that it is the work of

human industry, and is lost in the calculation of the millions of blows with the pick-axe, the amount of human toil, and sinew, and skill, that must have been exerted to remove so prodigious a mass of matter' (Walker, 1832: 33 – 34). As well as the great engineers, the site tells the story of the courage of thousands of railway navvies employed on the line who had learned their trade by building canals. Extremely well-paid, they wandered from one project to another, living in shanty towns that were slung together for their benefit and moved to new employment opportunities (Coleman, 1968). They left little to history other than their work.

The station buildings at Edge Hill are largely unchanged but the surrounding site evolved to ensure that the Liverpool's transport and communications infrastructure was world-class. The maritime mercantile city of Liverpool was open to technological innovation to maintain an edge over international competitors. If one brings in the remains of the grid iron sidings at Edge Hill, the Overhead Railway and the Mersey Rail tunnel, the continuing history of the railway throughout the Twentieth century, can be traced through changes in the lines, tracks and facilities.

FELIX MENDELSSOHN TAKES A TRIP DOWN THE WAPPING TUNNEL
(1829)

Fresh from the visit to Scotland that provided him with the inspiration for *Die Hebriden* (die Fingalshöhle) and left him 'cheerful and invigorated', a young Felix Mendelssohn-Bartholdy found himself at a loose end in Manchester. He walked along the newly laid railway tracks and found himself at the mouths of two tunnels in Liverpool which he found to be 'a bit intimidating' (Elvers, 1986: 92). Mendelssohn managed to persuade the watchman to take him on a trip to the Docks before the tunnel officially opened to the public. Mendelssohn describes an exhilarating experience, travelling at a speed of fifteen miles per hour, through the open air and in complete darkness. 'It was' he wrote to his father 'a bit rough on my stomach' (Elvers, 1986: 93).

The social, economic and cultural changes brought about by the L & MR were equally ground breaking. The tunnels, cuttings and embankments, particularly around Liverpool, changed the natural landscape and opened up an underground world to a larger proportion of the general public than the canals did. The commissioned art work, published by Rudolf Ackerman, was an early public relations exercise and widely consumed by the general public. This had significant ramifications to the way that Victorians viewed and imagined their world (Freeman, 1999).

It was also the battle over the lands of the Earls of Sefton and Derby on the outskirts of Liverpool that brought into view the 'vandalism' of the railways and 'raised for the first time a broad issue that we can recognize very well today: the conflicting claims of material advantage and of the protection of the environment – an environment especially vulnerable in an island so small containing so large a population' (Simmons, 1991: 173). Certainly, recognition of the struggle to build the L & MR, particularly

around Liverpool, may help to contextualise contemporary debates.

Economically, the railway company, the L & MR was funded as a public joint-stock organisation. Its massive returns on investment and professional managers provided the benchmark for capitalist business organisations (Gourvish, 1988). It also saw the balance of power shift from the London-controlled stock-exchange to the provinces: it is of no coincidence that joint-stock banking came to Liverpool in 1831 (Sharples, 2004: 19). Liverpool merchants supplied half of the total cost for the London & Birmingham railway (Reed, 1969).

The remaining railway heritage at Liverpool consists of both fully operational structures and fragmentary remains of the earliest sites. Their group value bears a remarkable and underappreciated witness to the 'birth of the railway age'. The original L & MR line with its cuttings and tunnels at the Liverpool approach form a complementary counterpart to the bridges and viaducts leading into Manchester. Any consideration of 'the Birth of the Railway Age' may find it expedient not to include a fully working railway. But as the Semmering Pass in Austria and, indeed, Liverpool: Maritime Mercantile City demonstrate, working status and development are not incompatible with heritage designation. A future bid for World Heritage Status may reconsider the serial nomination under the UNESCO rubric 'to encourage less well represented sites to be provided with additional assistance with nomination and post-inscription management' (IUCN, 2005). Liverpool already has experience of such management.

8. Recommendations

Seek statutory listing of the Wapping Tunnel, The Wapping Cutting, the Victoria/ Waterloo Tunnel and the Olive Mount Cutting.

Secure the support of Network Rail and Northern Rail for the partial heritage use of Edge Hill railway station, mark its significance with a plaque, and explore feasibility of a permanent exhibition at the site with the possible collaboration of the National Railway Museum.

Archive the considerable photographic and documentary evidence accumulated by Metal, Friends of Williamson Tunnel and others. This could be done as a collaborative project with National Museums of Liverpool to highlight their underappreciated railway collection.

Ensure any future serial bid for World Heritage, along the lines of *The Birth of the Railway Age*, includes Liverpool's early heritage with Stockton & Darlington; Liverpool Road, Manchester; and the Great Western Railway.

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