



RAILWAYS FOR CHANGE—Essex in the Industrial Age

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Resource: INDUSTRIOUS EAST SITES

Authentic and historically important industrial heritage sites in the east of England have been grouped together in a network to encourage educational and cultural tourism. Visit the website at www.industriouseast.org.uk

Source: Essex Record Office (ERO)

The Essex Record Office houses the historical archive collection for Essex. This includes maps, original letters, deeds to properties and a wealth of information on Essex in the industrial period. The ERO can be searched online but personal visits are necessary to view the documents themselves.

<http://seax.essexcc.gov.uk/login.asp>

Source: The Essex Historic Environment Record (HER)

Once known as the County Sites and Monuments Record, or SMR, the HER is a database of every recorded feature in the landscape. The Historic Environment Record is used as a resource for planning and for research, and is maintained by at County Hall by the County Council.

Unlocking Essex's Past is a searchable website giving direct access to the range of HER resources including database entries, images and media resources.

<http://unlockingessex.essexcc.gov.uk/>



Former GER Steam Locomotive B12 4-6-0 is now on the Poppy Line, an Industrious East site.

Introduction: Exploring the impact of the railways on the Essex landscape

Although the impact of the Industrial revolution had been felt in a minor way in Essex towns during the late eighteenth and early nineteenth century, the main impact occurred with the construction of main line railways from 1837 to 1869. Chelmsford, Colchester, Maldon, Braintree, Harwich and other key centres of industrial activity were linked direct to London and the midlands. Heavy raw materials could be brought straight to the factory gate and the factory products in turn could be sent by rail to anywhere in the world.



Above: The railway revolution brought sweeping changes to the Chelmsford landscape—more on page 5

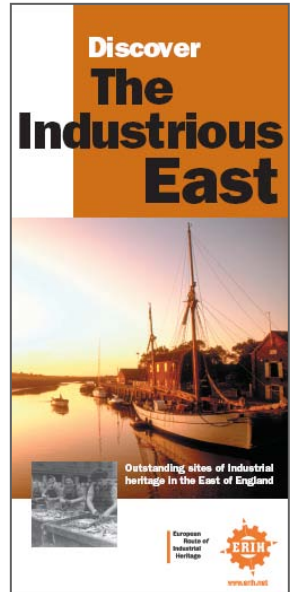
Eastern England's main line railways are historically very important. They are amongst the oldest group of main line railways in existence. The Great Eastern Railway from east London to Colchester and the Great Northern Railway from north London to Peterborough were designed by the famous railway pioneer Sir Robert Stephenson. Its structures and station buildings are only a few years younger than

Brunel's Great Western Railway now proposed as a World Heritage Site. These main lines were finished by 1850 and were amongst the first 6,000 miles of steam railway track to be laid anywhere in the world.

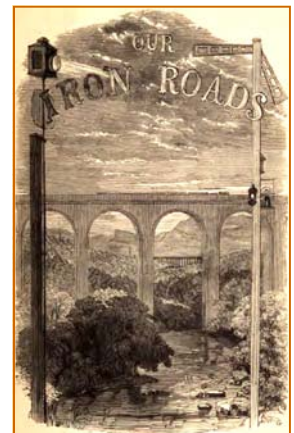
In this study we will be looking closely at the impact of the railways on two distinct Essex towns, Braintree and the county town of Chelmsford. The towns in both cases benefited economically from the railways which boosted the success of engineering companies that became world-famous. In our second lesson plan we see how the development of the Chelmer and Blackwater Navigation had a major impact on Chelmsford, enabling heavy cargoes such as coal timber and cast iron to be shipped direct to the town at affordable prices. In this lesson plan, our attention is focussed on the north side of the town away from the Navigation where a new industrial area developed in the nineteenth century alongside the Eastern Counties (later Great Eastern) Railway.

Many towns in eastern England welcomed the railways, those that did grew in a spectacular fashion. Several towns, such as Parkeston Quay (Essex) and Melton Constable (Norfolk) were built by the railways and have remained largely unchanged to this day. Others, such as Southend-On-Sea and Clacton have become centres of the leisure industry. Chelmsford, Luton, Peterborough and Norwich saw further phases of growth as engineering centres linked to the fortunes of individual companies using the railways to access world markets. Raw materials, parts and finished products were despatched by rail. The expansion of Braintree's industry was entirely geared to the railway distribution system. In this lesson plan we will look at how industrial development took early advantage of improved transportation links for both supply and distribution.

By 1851, the year of the Great Exhibition, the general public had discovered railway travel and passenger revenues rose dramatically with the large numbers attending the exhibition. Books such as "Our Iron Roads", 1852, (Illustrated centre right) supported the interest in railway travel and the demand for books to read on the journey. Start this lesson plan with a close look at the [ESSEX RAILWAYS TIMELINE](#)



The Industrious East Regional Route of Industrial Heritage combines 30 tourism attractions with other sites in the east of England. Visit the website at www.industriouseast.org.uk



ABOUT THIS LESSON PLAN

When most people think of the Industrial Revolution it conjures up images of factory chimneys, back-to-back houses and appalling working conditions.

However, away from the industrial heartlands of the Midlands and North new technologies brought changes to the local economies which had a profound effect on peoples lives.

This lesson plan looks at how transport and power together transformed the lives of the people of Essex during the Industrial Revolution. The railways changed the nature of employment and enabled many people to work in London for the first time.

RAILWAYS FOR CHANGE—Essex in the Industrial Age

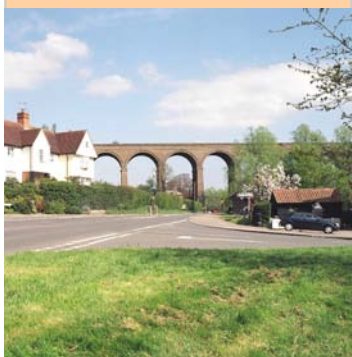
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Essex Branch Lines



1869 saw the completion of the last major branch line in Essex between Braintree and Bishops Stortford. Closed by British Rail, the route of the line carries a long distance footpath called the Fitch Way.



The famous Chappel Viaduct, on the Sudbury—Marks Tey branch line which opened in 1849. The line to Sudbury has never been “electrified” and the viaduct, unlike other railway structures in Essex and elsewhere, is free of electrical infrastructure such as masts and cables, retaining its original steam-age profile.

Year	LOCAL AND REGIONAL DEVELOPMENTS	NATIONAL DEVELOPMENTS
1836	4th July - Parliamentary Approval for Eastern Counties Railway; survey of line by Stephenson & Locke. Proposed line runs to Norwich and Yarmouth (Total of 115 miles)	
1837	March—Construction of ECR begins from Mile End with John Braithwaite as engineer. Gauge set at 5 feet against the national standard of 4 feet 8 and a half inches.	
1838	Development of new London terminal at Bishopsgate and Goods Yard at Spitalfields.	
1839	20th June—First section of ECR opens between Mile End and Romford, Essex	
1840	ECR completed between Shoreditch (London) and Brentwood, Essex.	National postal service (Penny Post) begins.
1843	29th March—Line opens to Colchester, Essex. Construction of temporary timber stations en route including Chelmsford. Sir Samuel Peto constructs Italianate Victoria Hotel at Colchester, which later fails. ECR runs out of funds after completing just 52 miles.	
1844	Robert Stephenson advises change of gauge to national standard. Work is completed in two months from September to October 1844.Parliament approves the Eastern Union Railway (EUR) to be built from Colchester to Ipswich. (17 miles). Line is designed by Joseph Locke.	Railway Act passed, requiring each company to run one passenger train a day along the length of the line at the cheap rate of one penny (1d) a mile. Eventually these “Parliamentary trains” led to early morning trains to London and the development of commuting.
1846	June— EUR opens to Ipswich. Line is built by Peter Bruff.	
1847	Construction begins of the Maldon to Braintree Railway, initially with lines in each direction.	
1848	2nd October—Braintree’s first station opens. It is made of timber (see image on page 6).	George Hudson, the notorious “Railway King” and chairman of the ECR, is made bankrupt.
1850	Peto’s Victoria Hotel in Colchester fails to attract business and is converted into an Asylum for the Insane.	
1851		Thousands of Essex people use the railways to visit the the Great Exhibition in Hyde Park.
1852		Telegraph lines (on telegraph poles) are installed along side main line railways.
1854	EUR branch to Harwich opens. Maldon-Braintree line reduced to a single line to supply steel for the Crimean War	Crimean War begins. Sir Samuel Peto is contracted to build a railway for the siege of Sebastopol in Crimea.
1856	Chelmsford Station is completely rebuilt with new station buildings on the elevated platforms. Main entrance survived until the rebuilding of 1987.	
1862	ECR and EUR are taken over by the new Great Eastern Railway.	
1864	The GER buys land for a new London terminus at Liverpool Street. New station finally opens in 1874.	
1869	Bishops Stortford to Braintree Line opens. New brick station is constructed at Braintree alongside new line. Old station becomes goods depot. and later a coal yard.	
1878	GER opens new locomotive, carriage and wagon works at Stratford. Eventually becomes largest in Britain.	
1883	Opening of Parkeston Quay named after the Chairman, C.H.Parkes. GER start steamship services to Holland.	
1923	The GER is grouped with other lines to form the new London and North Eastern Railway (LNER).	Grouping sees emergence of the Big Five railway companies— the LNER, LMS, GWR, SR and LNWR.
1948	Eastern Region of British Railways take over responsibility for railways in Essex.	Railways are nationalised. British Railways is formed. (eventually abbreviated to British Rail).
1952	1st March—Passenger services cease on the Bishops Stortford—Braintree Line	
1963	Witham-Braintree line recommended for closure. Eventually saved by popular support.	Lord Beeching publishes his report on the future of the railways proposing huge reductions in branch lines.

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Essex Railway Pioneers



John Braithwaite—Civil and locomotive engineer



Sir Samuel Morton Peto, MP, Contractor, financier and developer.

In Context – Brief histories of the early railway companies in Essex

The early railways were the creation of entrepreneurs who stood to benefit economically from the construction of the railway. The railway companies were Statutory, being created by individual Acts of Parliament (See Box). Solicitors in towns en-route acted as agents for the promoters and offered shares to local business people. Take-up of shares was not restricted and in the face of poor local interest the shares in the Eastern Counties Railway, the first line in Essex, were mainly acquired by investors from Lancashire, chiefly from Liverpool. This caused problems and by 1847 Suffolk and Norfolk Directors had been excluded from the Board. Sir S. M. Peto, one of the greatest railway contractors of the age benefitted so enormously from the profits of construction that he went on to promote lines himself.

Before being given parliamentary assent, the Bills describing the construction of the Lines were widely debated. National newspapers carried letters in support or critical of the lines and the route they should take. The railway mania, as it was called by contemporary journalists, reached a crescendo between 1835 and 1843 at the time when the first lines were driven into Essex from east London. The frantic pace of construction picked up once more in 1848 after a lull of a few years.

The Eastern Counties Railway (ECR) from London to Colchester

Originally called the Great Eastern Counties Railway, this received parliamentary assent on 4th July 1836. The railway was at that time the longest sanctioned by a single Act of Parliament and was to be driven to Yarmouth via Ipswich and Norwich, a distance of 126 miles. Construction of the line began in 1837 and soon encountered physical obstacles, such as the Stratford Marshes and eventually the Brentwood cutting which slowed progress and ran away with costs. The ECR benefitted from having an excellent engineer—John Braithwaite—who designed the “Novelty” that competed against “Rocket” in the Rainhill Trials and whose company, Braithwaite and Co, supplied the locomotives for the line itself. In 1839, the Board of Directors, dominated as we have seen by members from outside the region, argued that there had never been any intention to carry the line to Ipswich and beyond and made a decision to terminate the line at Colchester. This caused a furore at Board level and resulted in the exclusion of the Suffolk directors. The local Directors eventually brought a private Amendment Bill before Parliament to extend the ECR into East Anglia, but the opposition proved so strong that the Bill was defeated. The ECR to Colchester was eventually opened in 1843. (See Box)

The Eastern Union Railway (EUR) from Colchester to Ipswich

The defeated Suffolk and Norfolk Directors of the ECR promoted a new scheme to link with the ECR at Colchester and extend to Ipswich and beyond. This was the EUR or Eastern Union Railway which was to be initially financed entirely by Ipswich business interests. The Company succeeded in its primary objective of linking Ipswich with the ECR at Colchester 1846 and Norwich in 1849. The EUR also developed other local railways including the Manningtree-Harwich line which opened in 1856. The EUR also financed the short-lived Colchester, Stour Valley, Sudbury and Halstead railway which it absorbed at the opening in 1849. Engineer to the line was Peter Bruff who designed Chappel Viaduct and went on to develop the seaside resort of Clacton-on-Sea.

The Great Eastern Railway

The GER was formed in 1862 as an amalgam of several existing lines in East Anglia none of whom had the resources or parliamentary assent to create a wider network. Amongst these were the ECR and EUR but already by 1854 a working agreement had resulted in the virtual amalgamation of the two lines with the Norfolk Railway. This agreement eventually became formalised by the formation of the GER in August 1862. Whilst GER goods traffic was vitally important to maintain the working economy of the region, the greatest impact of the GER was the provision of passenger services. As we shall see in the second lesson plan, the eastern London suburbs were growing rapidly in the later nineteenth century. The GER rapidly intensified its passenger services and by 1902 its commuter railway services were reorganised by the American Henry Thornton into a highly efficient system. From 1864, GER finances were seriously overstretched by the purchase of land for its new state-of-the-art London terminus at Liverpool Street, which opened in 1874.



Emblem of the Great Eastern Railway

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Construction: How the Essex railways were built

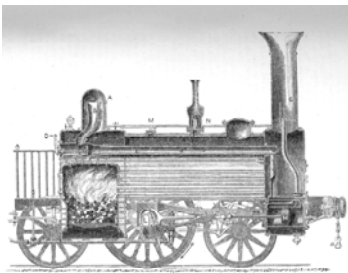
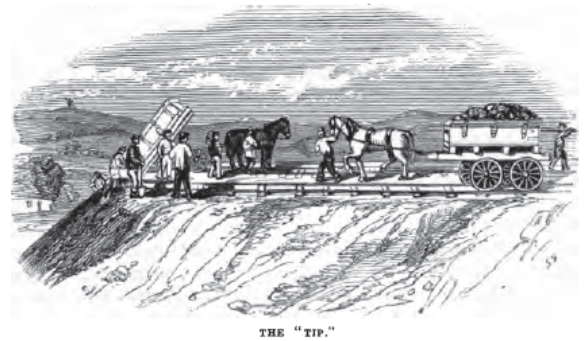
Once the shares had been subscribed, the lines were constructed in the fastest possible time. In order to organise construction along a full line simultaneously, work was split up into many separate contracts which were then let to individual contractors to finance and organise a labour force. Smaller contractors remained dependent on regular cash payments to pay their labour and were anxious to press on with the work quickly and efficiently. Some larger contractors such as Thomas Brassey and Sir Samuel Morton Peto took payments in shares as well as cash and became progressively very wealthy. Brassey and Peto dominated railway construction in the UK and overseas during the heydays of construction with Peto operating a labour force of up to 14,000 men.

Survey and layout

We are so used to the presence of the railways in the modern landscape, that is easy to overlook the difficulties encountered by the promoters and more especially the surveyors of the line. Promotion of a route was often a matter of local politics and resolving conflicts of interest between the enthusiasm of towns and the opposition of entrenched landowners, who sometimes obtained large sums in compensation for the railways crossing their land. Powerful magnates such as Lord Petre of Ingatestone Hall, Essex, exerted influence over station location and individual designs, that were the subject of contracted negotiations between the Railway and the landowners agents. Detailed surveys of the lines were commissioned from leading surveyors and sometimes had to be carried out in secrecy, or at night to avoid arousing local indignation.

Navvies

The development of the canal system created a ready-made labour force available to the railway builders. They were used to long working hours in arduous conditions and life in temporary accommodation. Navvies formed the backbone of a labour force but numbers were made up by hiring agricultural labourers from the areas through which the railway passed. Harvest times remained a problem however as every available labourer was required to help and construction rates fell in the late summer as a result. In spite of industrialisation, virtually every construction task remained dependent upon manual labour.



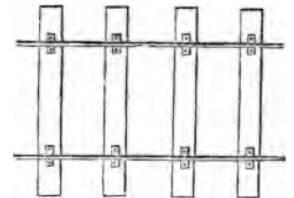
Section through early locomotive , 1837

Embankments and Cuttings

Railways required a nearly level track to enable the locomotive's smooth driving wheels to develop enough resistance against the iron and later steel railway tracks. The attraction of building railways in the east of England lay in its relatively smooth terrain. In Essex, the ECR proved more complex than expected and eventually more bridges were needed per mile than on any other main line constructed at that time. Cuttings and embankments were often constructed simultaneously. The spoil from cutting operations was transferred to horse-drawn tipping carts pulled along a "temporary way" to the start of the embankment by the labouring gangs. (See picture). If insufficient material was available, the contractors bought land adjoining the railway and extracted material they needed from huge "borrow-pits".

The Permanent Way

The construction of the "permanent way", the trackbed of the railway, involved the supply of materials in huge quantities. Early railways consisted of heavy timber cross-wise "sleepers", on which the rails were mounted in cast-iron "chairs". Sleepers were then surrounded with stone ballast to keep the line in position.



The chairs determined the gauge of the line, which at 4 feet 8 and a half inches was a national standard even when John Braithwaite selected 5 feet for the working gauge of the ECR. This proved a costly mistake when in 1844 ECR converted to the larger gauge and the rails had to be moved. The massive increase in the availability of iron during the development of the railways resulted in vast fortunes for the ironmasters in Wales and the north of England, although prices of iron had

significantly reduced. Crossings and points had been developed in the coalfields of north east of England and the midlands well before the advent of the main line railways but now had to become much more sophisticated. Train movements were controlled by semaphore signals which had to be linked to point movements and which from the beginning had used red and green as indicators for stop and go routines. More efficient methods of signalling had to await the development of electricity and electrical technology from 1875 onwards.



Station Signal with Cottage.

Contemporary illustrations in the lesson plan are from "Our Iron Roads", by Frederick .S.Williams, Ingram Cooke, & Co, London, 1852

ALSO SEE PAGE 10 :
ADDITIONAL OS MAPS
OF CHELMSFORD'S
INDUSTRIAL AREAS

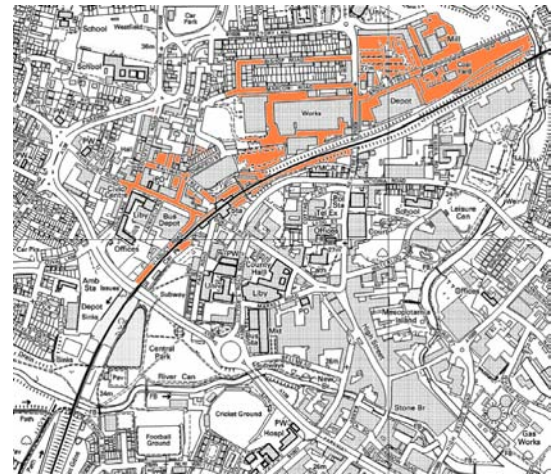
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Chelmsford—From market town to manufacturing and commuting centre

Chelmsford was typical of the market towns that endorsed the railways. The efficiency of the GER in encouraging commuting traffic was eventually to eclipse the local importance of Chelmsford's manufacturing. Chelmsford was relatively slow in responding to the availability of cheap transportation. New industries were slow to emerge and remained concentrated in the south of the town adjoining the Chelmer and Blackwater canal at Springfield. 1858 saw the emergence of agricultural and general engineers Christy Brothers and later still in 1880 Colonel R.E.B Crompton founded his electrical engineering company in the west of the town at Anchor Street. In 1890 Hoffmann's introduced pioneering US technology to the town proving ball-bearings for all aspects of transport and heavy industry. Hoffman's, like Marriages Flour Mills, found it convenient to locate their premises to the north of the mainline railway where private railway sidings could be constructed for the transport of their goods.



Above: Chelmsford's expansion into former agricultural land north of the line of the Eastern Counties Railway. Steamer Terrace and the Steamer Inn date from this time.

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Chelmsford's Heritage of Marconi



Guglielmo Marconi the radio pioneer is closely associated with Chelmsford, where he established his production facilities.

Places of particular interest:

New Street Complex. Blue plaque and descriptive board describing the father of wireless.

Hall Street Works.

Marconi Hut at the Sandford Engine House Project. Used for first regular radio broadcasts from the UK.

Writtle Road factory used from 1968 to 1994

Statue in Essex Record Office

Collections in Chelmsford Museum



Above: Marconi's New Street Works dates from 1922. This was the world's first purpose-built radio factory and scene of the world's first radio broadcast by Dame Nellie Melba in 1920.

Marconi

Most importantly Chelmsford is the birthplace of radio, attracting Guglielmo Marconi to the town in 1884, to set up in the former silk mill and furniture depository that still stands in Hall Street. In 1912, the expansion of Marconi gave the impetus for the construction of a new factory in New Street with access to the railway system. The New Street factory incorporated the products of other local manufacturers including boilers from Davey, Paxman of Colchester as well as line shafts to transfer power mounted on Hoffmann ball bearings and driven by Crompton motors.

Marconi remained in the town for over 100 years gradually developing their business in many sectors particularly in marine and defence engineering.

Growth of Commuting

Chelmsford is now one of the busiest commuter railway stations in the UK, outside the London termini. As London's population expanded in the nineteenth and early twentieth centuries, pressure on housing has increased with people moving further out of London to take advantage of lower house prices. The fast train services from Chelmsford to London Liverpool Street were an important factor for many people who worked regularly in London.

Chelmsford's unusual station is located on summit of the Great Viaduct that extends through the town. It is now a jumble of structures from different periods including this disused signal box. Like all locations on the Eastern Counties Railway, Chelmsford received a timber-only station in 1843. This was subsequently rebuilt in brick but the location still retains many original features including stone-dressings to arches of the viaduct.



ALSO SEE PAGE 11 :
BRAINTREE 2nd Edition
OS MAPS REVEALING
THE 1923 INDUSTRIAL
LANDSCAPE.

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Branch Line Success—Braintree Joins the Industrial Age

The Maldon, Witham and Braintree Railway dates from 1848

By the 1830's the industrial progress in other areas was beginning to leave Braintree behind. Isolated amidst a network of Turnpike roads, and without access to rivers and the sea, firms in Braintree depended upon carts to bring materials in and send out finished goods to their customers. Silk manufacturers such as Courtaulds, one of the largest local employers, packed their cloths into large willow hampers which were loaded onto horse-drawn wagons. With the arrival of the Eastern Counties Railway at nearby Witham, in 1838, pressure grew in the town for a rail connection. Anticipating the arrival of the railways, Samuel Courtauld was quick to take advantage and repur-

85. Braintree's first railway station, built in 1849, was the terminus of the line from Maldon and Witham. The buildings comprised a waiting room together with a booking office and storage area. Passengers went through the building to the platform set at right angles. It was replaced in 1869 by the present station. This picture was taken, c.1905, when the little building had been taken over as a builder's merchant's office and continued in this use for many years.



Braintree's first passenger station which was eventually relegated to a coal yard office..

urchased his fathers mill at Chapel Hill in 1843 (See map P12).

EASTERN COUNTIES' RAILWAY.

CHEAP TRIP
TO
LONDON.

On **MONDAY, Aug. 13th, 1860.**

JOHNSON'S
FIRST SPECIAL
EXCURSION TRAIN,

FOR THE SEASON.

Will leave Braintree Station at 6.30 a.m. calling at Witham at 6.50 a.m., returning from Bishopsgate Station at 8 p.m.

Giving ELEVEN HOURS IN LONDON.

FARES THERE & BACK.
FIRST CLASS. COVERED CARRIAGES

5s. 2s. 6d.
Children, under 12 years of age half-price.

TICKETS may be had up to Saturday, the 11th Inst. of Mr. Finney, Bocking; Mr. Joseph Godfrey Downing, Chemist, Mr. Fred. Andrews, Grocer, and Mr. I. Clayden, Railway Tavern, Braintree; and Railway Stations, Witham and Braintree.

Any further Information may be had of the Contractor
Wm. JOHNSON, Railway Coal Depot.

86. The opening of the railway quickly created a demand by the general public and by 1860 enterprising businessmen had realised the possibilities of cut-price day excursions to London.

Detail from the Ordnance Survey 2nd Edition of 1923 (see page 11) shows the extent of industrialisation at that period. The original terminus station had been transformed into a goods depot from which private sidings extended into a cluster of industrial enterprises that had developed in the immediate vicinity. The railway goods handling facilities included cranes and trucks designed for very heavy goods.

Immediately to the north of the goods station lay Crittall Windows new Manor Works. A railway siding had been laid across Manor Road into the rear of the factory. The factory was designed to produce components for shipment by rail. Crittall's railway street siding took in raw materials such as iron bars and consigned to their customers completed products such as industrial and commercial window units and later, agricultural equipment. To the east lay the maltings, suppliers to the towns breweries. Maltings were found in most large towns as large quantities of beer were consumed by working men at this period. Maltings were heavy freight users handling bulk grain products.

Alongside lay Braintree Gas Works which had superseded the original works in New Street to take advantage of easy access to coal supplies from the railway goods yard. The Gas Works roasted coal in huge retorts, producing coke, a bulky

by-product and town gas which was stored in a huge gasometer to the south of Manor Road. The largest factory of all lay to the south east north of the railway line from Witham. This was Lake and Elliott's Albion Works, which incorporated its own electricity generating station, built in 1917 which also supplied neighbouring firms and the town until 1946. Lake and Elliott were general engineers, making castings and components for a wide range of customers, but with the advent of the internal combustion engine the company specialised in vehicle jacks, becoming one of the foremost manufacturers of these tools.

In 1869, a new railway line had been constructed from Braintree to Bishop Stortford, isolating the original railway terminus building, a small single story wooden structure, which remained in use as a builders merchant office. A brand new station, still in use today, replaced the former terminus building to cater for the through traffic. Though Braintree now faced both east and west. We will explore the implications in the next section.



Braintree's latest industrial success—
The new Warner Silk Archive is located in a former silk weaving mill and dye works.

THE MALDON, WITHAM & BRAINTREE RAILWAY

Ambitious construction plans:

- Designed to extend to Bury St. Edmunds and Thetford
- Private Act of Parliament received Royal assent 16 June 1846
- Taken over by ECR the same year; controlled by George Hudson "The Railway King"
- Constructed by Thomas Jackson in 1847 using up to 1,000 "navvies" in the summer months.

Opening the line:

- First goods traffic in 1848;
- Quickly develops as distribution system for corn merchants
- Coal, lime, slates, timber farming equipment in return;
- Reduced to single track from 1854 ; steel needed for Crimean War.

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Flitch Way Country Park

The Essex part of the former line was subsequently acquired by Essex County Council and in the early 1990s became a designated country park. The park follows the linear nature of the railway, utilising for the most part the former track bed, but deviating from the route around Great Dunmow, Felsted Station and across the A120, and with temporary diversions around former the railway bridges which have deteriorated to the point where they are unsafe to carry walkers, cyclists or horse riders.



Braintree Station in the heyday of steam traffic.

Braintree to Bishops Stortford Railway —One branch line too many

In 1869, a new railway line had been constructed from Braintree to Bishops Stortford, retaining the original railway terminus building, a small single story wooden structure, as a builders merchant and coal office.



J17 No. 65545 with freight train at Rayne in March 1958. *J Spencer Gilks*

The Bishop's Stortford, Dunmow and Braintree Railway belongs to the second phase of railway building in East Anglia. The railway network had become firmly established in East Anglia by 1860. After this date further expansion was mainly confined to 'filling in the gaps' by providing branch lines to connect those towns and villages economically disadvantaged by their lack of access to the rail network. Although the railway arrived in Bishop's Stortford in 1842 and a branch line

connected Braintree with Witham six years later, Dunmow, with a population of around 3,000 in 1861, was isolated. The impetus for a railway linking Dunmow to both Braintree and Bishop's Stortford, did not, however, come from the town itself but from a combination of Hertfordshire businessmen with vested interests in the transport of malt and barley from the east, and from the Eastern Counties Railway (ECR) being galvanised into action by the threat of competition from a proposed London-Bury St Edmunds Railway .

The route was surveyed in 1860, and a year later the Bishop's Stortford, Dunmow and Braintree Railway Company was incorporated by Act of Parliament to build a railway to connect the towns, with a provision to link with an extension (never built) to the Epping Railway from Ongar at Dunmow. Despite a shortfall in share take-up, when the Eastern Counties Railway amalgamated with the Eastern Union and Norfolk Railways to form the Great Eastern Railway (GER) in 1862, the new company carried through its commitment to build the line. Financial difficulties, however, continued to beset the project from the ceremonial cutting of the first sod in February 1864, to the official opening five years later in 1869.



Rayne Station today

The line was provided with new stations at Braintree, with the former station to the north-east becoming a goods yard, Rayne, Felsted (spelt Felstead by GER), Dunmow (now demolished) and Takley. All the main station buildings were built in the ECR/GER corporate "Italianate", style. This style was also used for the crossing keeper's house at Little Canfield (later to become Easton Lodge Halt), the other manned level crossing on the line at Rayne being served by station staff.

By 1952, passenger traffic had dwindled to virtually nothing and British Railways withdrew passenger-carrying services from the line. Goods services continued to be operated for a variety of users, including Fyffe's Bananas who had constructed a ripening facility at Felsted. This was the last freight to be carried and the Bishops Stortford Braintree railway ceased operations altogether in 1972. One small section of the line remains in use to this day, leading to Braintree Station.

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Wagons to suit the business

In 1901, the GER owned over 28,000 vehicles but at any one time considerable numbers of these would be found on other parts of the national railway system. In addition, large numbers of trucks were in private ownership.

The GER fleet comprised over 20,000 general goods vehicles, of which 14,000 had wooden frames, over 2,000 loco coal wagons, over 1,900 cattle wagons. The rest comprised specialised vehicles such as brake vans (needed at the end of every goods train), oil fuel tankers, ballast wagons for renewing the line and even 7 gunpowder vans!

Specialised types of general goods vans were constructed for individual trades. These included:

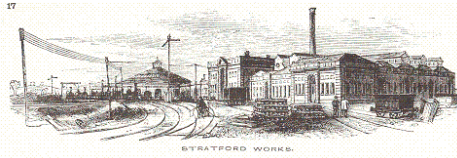
- Ale— Carried in ventilated vans
- Egg—Huge vans called Jumbo's for eggs imported through Parkeston Quay
- Furniture vans
- Machinery wagons
- Refrigerator wagons—For butter (supplied with ice boxes and insulation)
- Vitriol wagons—For carrying acid
- Wool wagons— Flat decked intended for carrying bales of wool
- Timber wagons up to 17 feet in length
- Fish vans (often attached to passenger trains)

The system for carrying goods remained largely unchanged until the nationalisation of the railways in 1948, when many of the wagon types were standardised.

All rail freight is now containerised allowing simple transfer of goods between rail, road and sea transport.

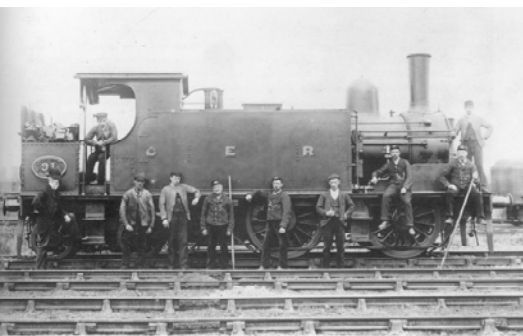
Goods locomotives and rolling stock

Power from steam



The first locomotives for the eastern counties were designed and built by the engineer John Braithwaite. As engineers were inexperienced in the use of the locomotives and unsure of their pulling-power, the lines were built as flat as possible. The original steam locomotives used coke, which was put aside in favour of coal as new designs of locomotive were developed. Locomotive construction, and later wagon and passenger vehicles too, was concentrated at Stratford Works in London. The world record for the fastest construction of a railway locomotive was set at Stratford Works in 1891 with a time of 9 hours and 47 minutes.

Many of the locomotives used for mainline work were quite modest and the GER and later the LNER used many small 0-6-0 tank engines for hauling goods trains (see Box). However, these locomotives carried large wheels for fast working and were amongst the most powerful of their types in the country.



Stratford Works superintendent (left) with a brand-new 0-4-4 tank locomotive and crew, 1897.

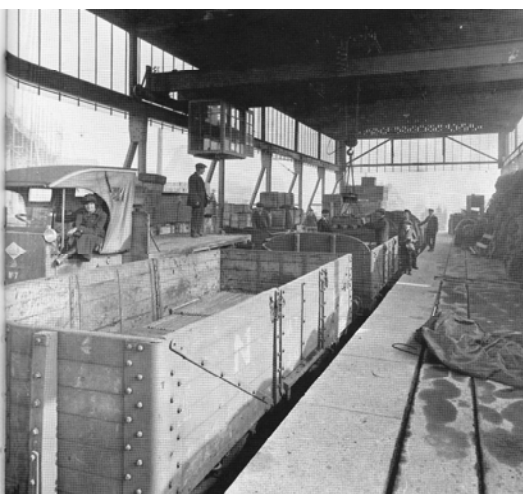
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Wheel arrangements of conventional steam locomotives were classified according to the system developed by Frederick Methvan Whyte. The first number describes the leading wheels, the middle number (or numbers) gives the arrangement of driving wheels; the last is the number of trailing wheels. "T" at the end denotes a tank engine. Sometimes the type of tank was expressed: PT – pannier tank; WT - well tank; ST - saddle tank. Whyte (Often seen spelled "F. M. White") was a mechanical engineer on the New York Central.

The table below gives only the most important Whyte arrangements, with the names that became associated with them.

Symbol	Wheel arrangement	Type name
0-6-0	000	6-wheel tank
2-6-0	0-000-0	Mogul
2-6-2	0-000-0	Prairie
2-10-0	0-00000	Decapod
4-4-2	00-00-0	Atlantic
4-6-2	00-000-0	Pacific

From the factory to the consumer— The importance of rail freight



Direct loading of rail way wagons within Crittall Windows factory, Manor Works, Braintree.

From the beginning railways were designed around the notion of carrying freight. Early stations were always designed with goods handling facilities and sidings where empty wagons were stored and goods trains were assembled. This required large land holdings often close to passenger stations with easy links to main roads. Conveyance to the station was originally by horse and cart and later by road lorry from the factory gate to the station goods yard. The largest factories such as Crittalls at Braintree had their own goods sheds linked to the factory to avoid excessive handling of heavy goods. Other industries such as cement factories and coal handling required large fleets of specialised vehicles. Railway wagons were a mixture of private owners vehicles and general freight vehicles

owned by the lines (see box) many large railway users had railway wagons in their own colours and which were easily identified. Handling general freight was a labour intensive activity as each parcel needed to be lifted by the yard crane and placed in an appropriate wagon. Livestock were also an important traffic in rural areas.

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QUESTIONS ON THE CASE STUDY

(A) Why did heavy freight used so much more coal and water than express passenger services?

(B) Using the data in table 2 calculate the total consumption of water per km for each of the three types of operating services

(C) How would you set about using this data for estimating the total average consumption of water for the entire railway system? What other data would you need for your calculation? Clue: In 1925, the consumption of water by railway locomotives was estimated as 10 billion gallons per annum.

(D) How much coal was consumed by steam locomotives in 1950? The railways were economically important for coal mining communities in South Wales and Yorkshire in particular. Investigate what happened to economic and social life in these communities after 1965 when steam locomotives were replaced by diesels on the railway network.

(E) The steam era ended on British Rail in 1965. What do you think were the major implications of this for communities and industries in Essex?

CASE STUDY: Railway steam locomotives and water usage

This case study provides a link to “Water in Essex”, Lesson Plan No.2 in this series.

Steam locomotives need to run at constant pressure and had a continuous need for supplies of fresh water. Facilities beside the line enabled later engines to pick up water but generally it was necessary to supply locomotive servicing areas with water tanks and pumps.

In 1946, the newly constituted British Railways inherited a wealth of different locomotive designs and decided to run a series of trials to see which types were the most efficient. They also collected data on the average usage of coal and water according to various operating categories.

Express passenger locomotives were very powerful and were employed on the fast long-distance routes such as Virgin trains and others are employed today. They pulled trains offering the fastest journey times, with fewer stops at the fastest average speed commensurate with safety.

Until nationalisation in 1948, locomotives for fast passenger services where resplendent in livery, or colours appropriate to the individual lines such as Great Western, Southern or Great Eastern. Long-distance fast passenger trains were pulled by locomotives with a separate tender for the water and coal, but the shorter suburban services often used large “Tank-engines” in which the water was carried in tanks alongside the long boiler and the coal within a bunker behind the drivers compartment. After nationalisation, passenger locomotives were mostly painted green or black. Heavy freight locomotives were equally powerful were always painted a uniform black. Some were occasionally used for passenger services. Mixed traffic used much lighter engines often running on cross-country branch lines, offering a service but carrying little traffic. Small tank engines were widely used.



The experimental Great Eastern Railway Decapod—with 10 driving wheels it was the heaviest tank locomotive in Britain when built in 1902.

Coal and water usage—the BR locomotive exchange trials in 1946

Locomotive type	Coal Consumption		Water Consumption	
	Pounds (lb)/mile	Kg/km	Gallons/mile	litre /km
Express Passenger	44.33	12.52	37.2	105.1
Heavy freight	62.96	17.78	50.6	143.0
Mixed Traffic	44.01	12.43	35.8	101.1
Total				

We can match the data on locomotive usage against information from another source; the numbers of locomotives in use by British Railways just 4 years later in 1950. This was the final decade of the steam age, with as yet very few diesel and electric locomotives in service, although interest was growing. In 1950, the Locomotive Magazine published data on the numbers of steam locomotives that were in service according to various operating categories.

Numbers of steam locomotives on British railways in 1950

Locomotive type	Number of locomotives	Water used - litre /km	Total water used/km
Express Passenger	5916	105.1	
Heavy freight	6828	143.0	
Mixed Traffic	6854	101.1	
Total	19608		

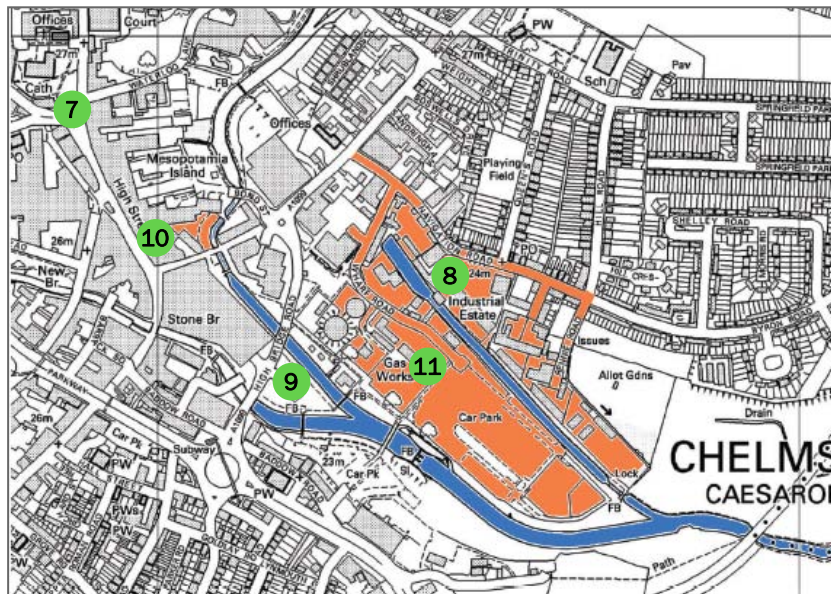
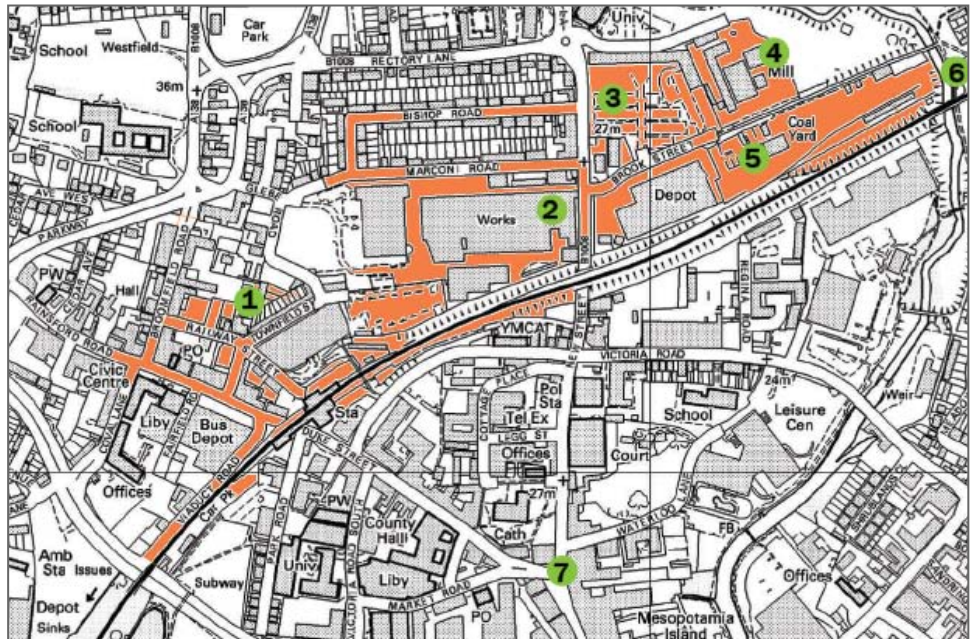
Source: Locomotive Stock Returns December 1950, “Locomotive Magazine” 1951

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LOCAL STUDY— Chelmsford industry in context; maps of Chelmsford



Above and left:
 1:10,000
 Ordnance Survey
 TL70 NW .
 2004.

Figure 1: The areas shaded were developed following the construction of the Eastern Counties railway and Great Viaduct in 1843.

- Key:
- 1—Terrace Housing
 - 2—Marconi New street (1912)
 - 3—Hoffman Bearings
 - 4—Marriges Flour Mills
 - 5—Railway coal and goods yard
 - 6 - Chelmer viaduct
 - 7—Historic town centre
 - 8- Springfield Basin , Chelmer and Blackwater Navigation
 - 9—Navigable waterways marked in blue
 - 10—Grays Brewery
 - 11—Former warehousing and industrial area



The Great Viaduct over the Rivers Can and Chelmer in the centre of Chelmsford was opened in 1843 and is one of the oldest railway structures in the country.

Right:
 1:63,360 Ordnance
 Survey First Edition
 1843;
 railways to 1888.



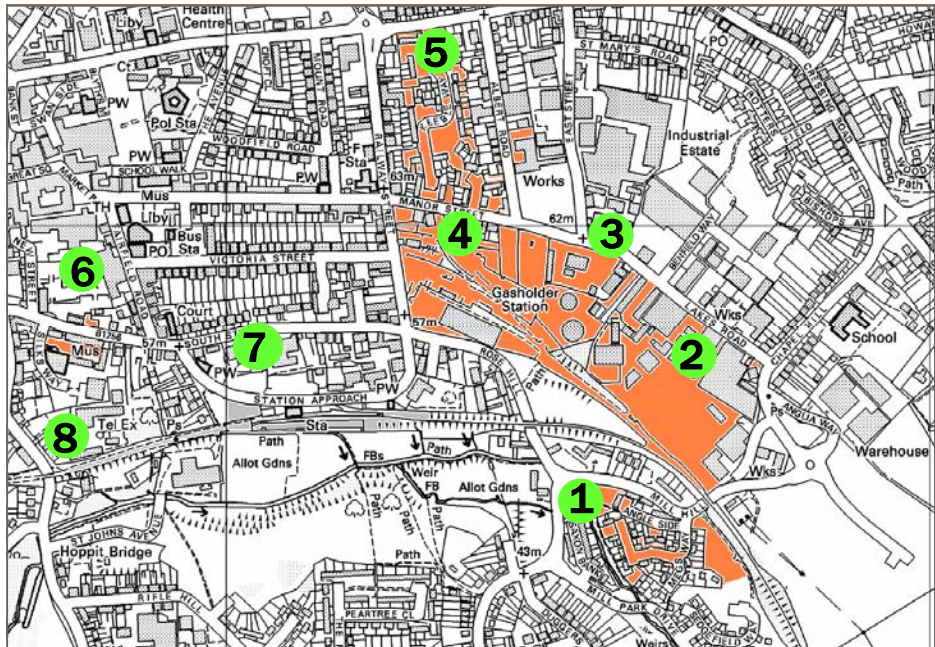
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LOCAL STUDY— Braintree industry in context; maps of east Braintree.

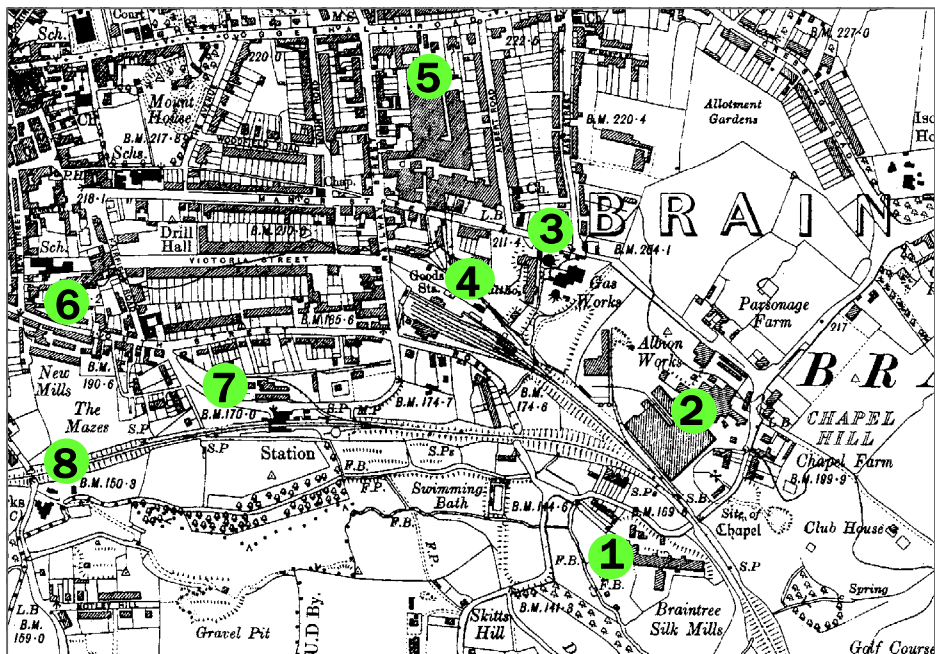


Above: 1:10,000 Ordnance Survey Map TL72 SE ; scaled to 6" map below. 2004.

Figure 2. Former industrialised areas in Braintree, Essex. The areas shaded developed after the arrival of the Braintree to Witham Railway in 1848.

Key:

- 1—Site of Braintree Silk Mills (Courtaulds),
- 2—Former Albion Works (Lake and Elliott Engineering),
- 3—Former Gas Works site,
- 4—Site of original 1848 station, and Goods Yard from 1869,
- 5—Crittalls Manor Road Works,
- 6—Warner Silk Mills ,
- 7—Braintree Station on new Bishops Stortford Line 1869,
- 8—Flitch Way Country Park on former Braintree to Bishops Stortford Railway



Above: Detail of east Braintree from 1:10,360 (6" to 1 Mile); Ordnance Survey 2nd Edition of 1923

Scale: 6" to 1 Mile

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Welcome to Flich Way

A country park passing through fifteen miles of countryside along the former Bishop's Stortford to Braintree railway.

Your journey on foot, bicycle or horseback will take you through wildlife-rich railway cuttings, Victorian stations and bridges, with views across impressive farmland, nearby villages and woods. For more information about the Flich Way visit Rayne Station Centre near Braintree.

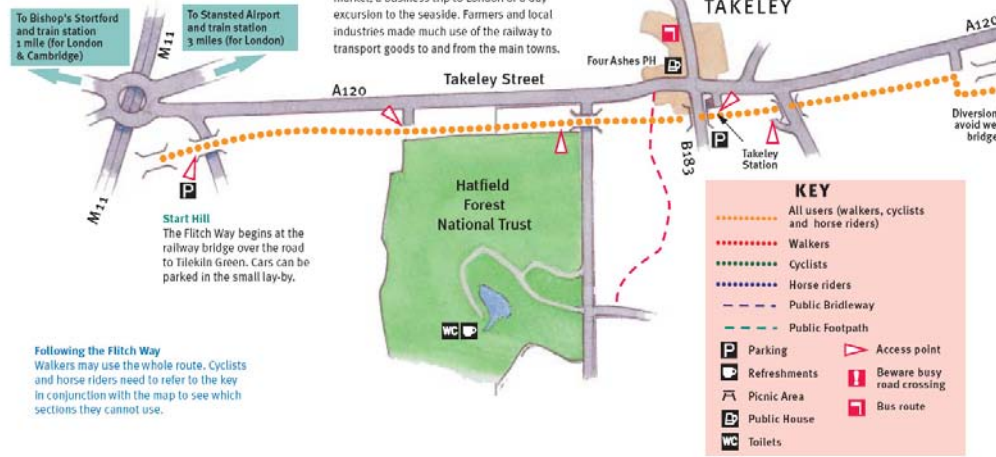


Railway Days

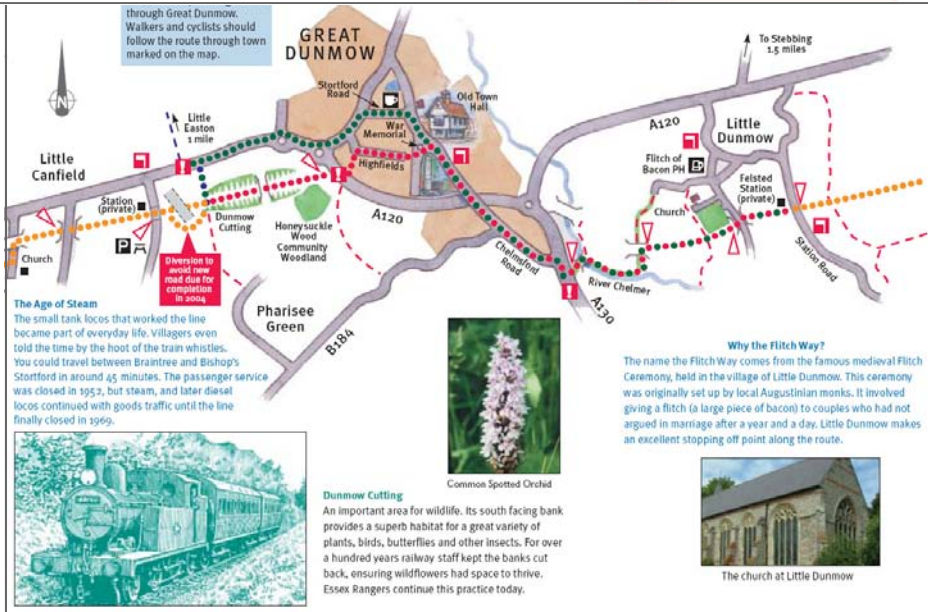
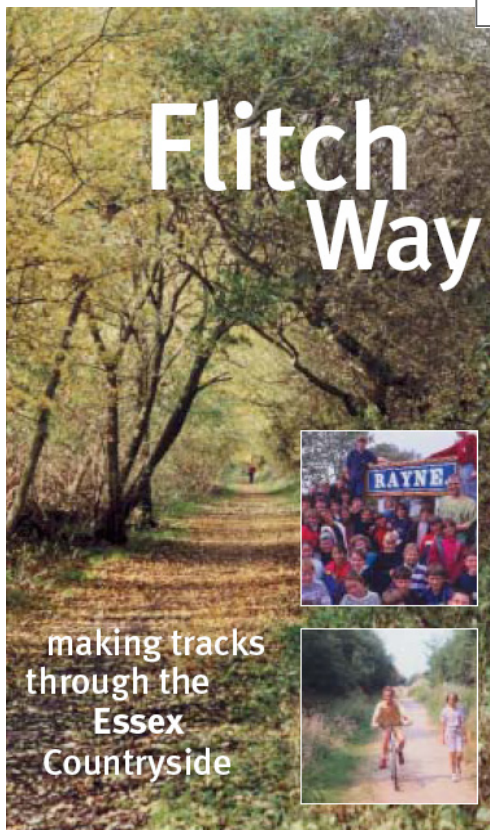
The Bishop's Stortford to Braintree branch line, a single-track railway, opened in 1869. Travel then became a real possibility for people in the many villages along the route; - going to market, a business trip to London or a day excursion to the seaside. Farmers and local industries made much use of the railway to transport goods to and from the main towns.

The Royal Forest

The Flich Way runs along the northern edge of Hatfield Forest. Once owned by the Crown, the woods and rides became popular for deer hunting. The forest is steeped in history with a landscape unchanged for over 900 years. It has many ancient trees and the plants and animals that thrive here migrate along the railway hedgerows from this natural sanctuary.



Following the Flich Way
 Walkers may use the whole route. Cyclists and horse riders need to refer to the key in conjunction with the map to see which sections they cannot use.



The Age of Steam
 The small tank locos that worked the line became part of everyday life. Villagers even told the time by the hoot of the train whistles. You could travel between Braintree and Bishop's Stortford in around 45 minutes. The passenger service was closed in 1952, but steam, and later diesel locos continued with goods traffic until the line finally closed in 1969.



Dunmow Cutting
 An important area for wildlife. Its south facing bank provides a superb habitat for a great variety of plants, birds, butterflies and other insects. For over a hundred years railway staff kept the banks cut back, ensuring wildflowers had space to thrive. Essex Rangers continue this practice today.

Common Spotted Orchid

Why the Flich Way?
 The name the Flich Way comes from the famous medieval Flich Ceremony, held in the village of Little Dunmow. This ceremony was originally set up by local Augustinian monks. It involved giving a flich (a large piece of bacon) to couples who had not argued in marriage after a year and a day. Little Dunmow makes an excellent stopping off point along the route.



The church at Little Dunmow

Pathways to Explore
 From the Flich Way you can join many public footpaths and explore the surrounding countryside.



Rayne Station Centre
 Rayne Station was built in 1866 and was one of the busiest on the line. Renovated in 1996, it is now the Visitor Centre and Range base for the Flich Way. The rich heritage of the Flich Way countryside is revealed in the exhibition. The station has public toilets and facilities for people with disabilities. Opening times: booking hall and toilets open every day from 9am to 5pm. Exhibition room open every Sunday from 1pm to 4pm.



Inside Rayne Station

Using the Flich Way
 Please use the Flich Way with consideration for others. Motorcycles are not allowed. Walkers and cyclists should note that at certain times, if the year the Flich Way may be muddy.

Volunteers
 If you would like to help on the Flich Way, at Rayne Station Centre or in any of our other parks, please contact the Ranger Service.

To download your copy of the Flich Way Booklet, as shown, visit the Essex County Council website and select "Enjoying Essex/ Country Parks".

<http://www.essex.gov.uk/>