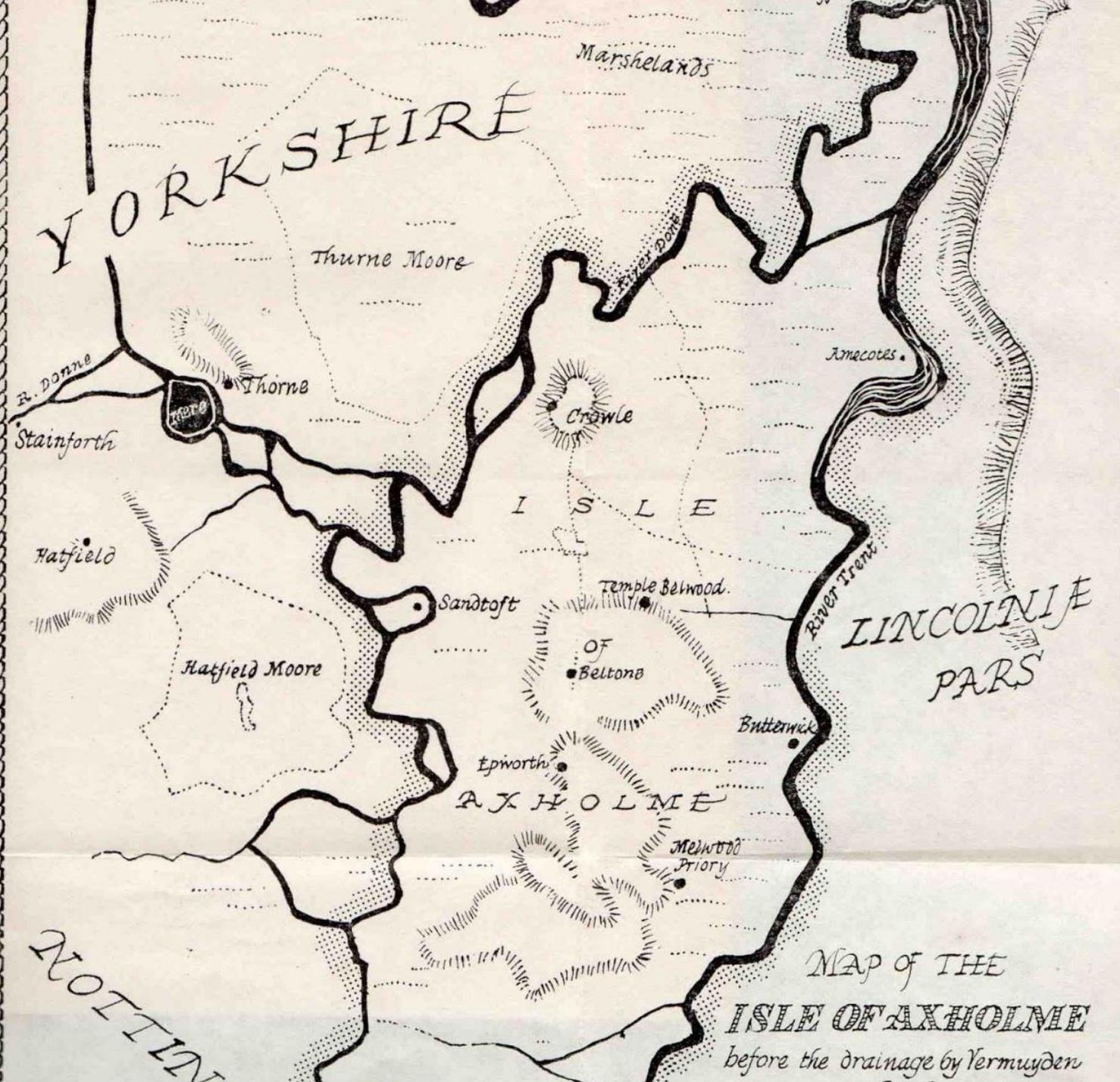


DRAINAGE OF THE THE ISLE OF AXHOLME

Angus Townley



THE ISLE OF AXHOLME



MAP OF THE
ISLE OF AXHOLME
before the drainage by Vermuyden

PHASES IN THE DRAINAGE OF THE ISLE

- Pre-Vermuyden
 - Roman
 - Medieval
- 17th Century
 - Vermuyden's drainage
- Late 18th Century
 - Smeaton
- Early 19th Century
 - John Rennie
 - Foster
- 19th Century
 - Pumping Stations
 - Enclosures
 - Warping Drains
- 20th Century
 - Further developments
 - 21st Century
- Current layout
- The future



GEOLOGICAL HISTORY

- 11-15,000 Years Ago
 - Lake Humber
 - glacial lake formed by a blockage across the Humber Gap.
 - Post Ice age
 - The river Humber and its tributaries
 - Incised valleys to depths of 25m below sea level
 - At end of glaciation
- c.13,000 BC Land covered by clays and sands left by glacier melt waters.
- As ice caps melted so sea level rose flooded incised valleys silting them up Forest inundated which over centuries have turned to peat.



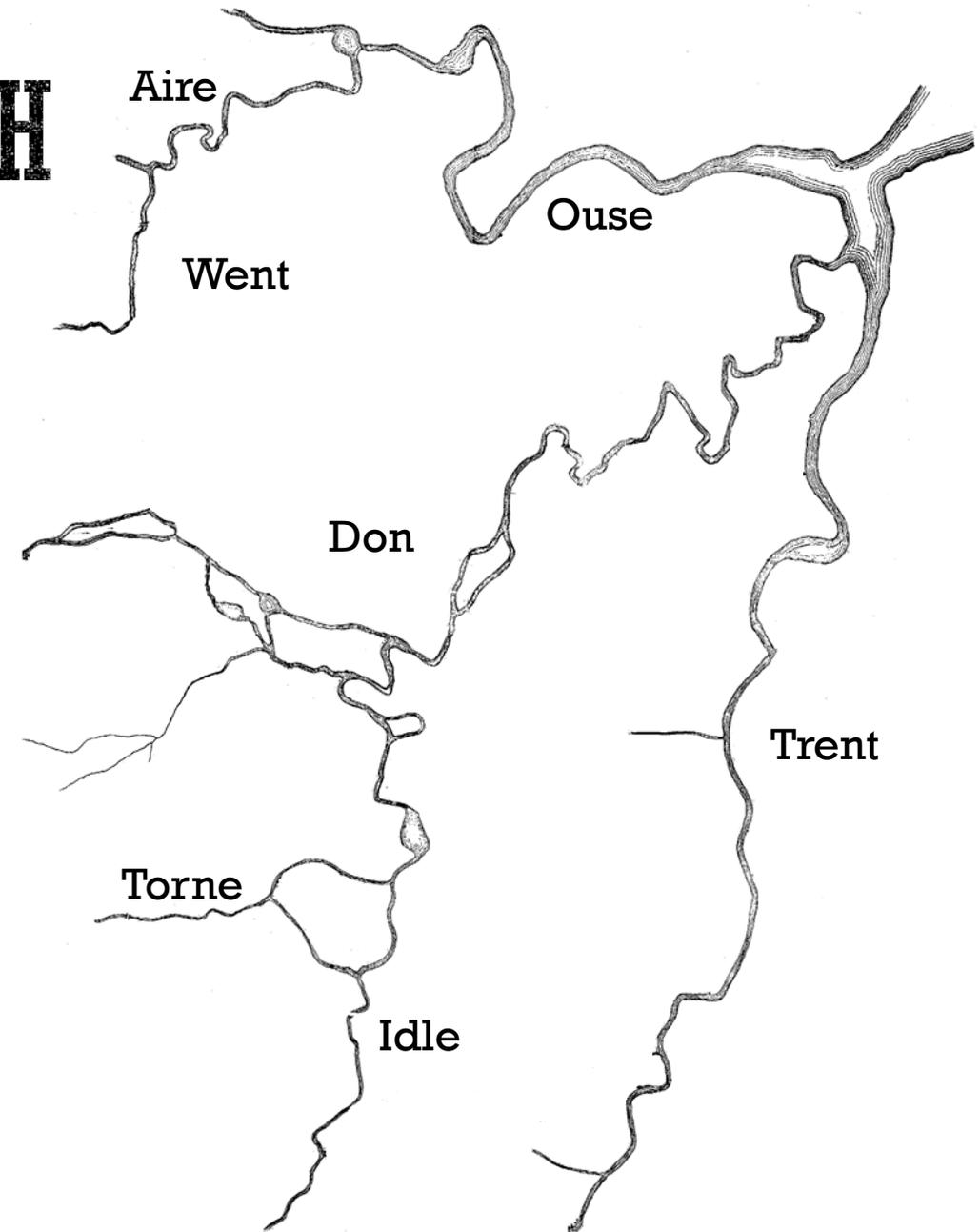
EARLY MAN

- Neolithic Period 4,000-2,000 BC
 - Man began to cultivate the land.
 - Evidenced by stone and flint axe heads found near Crowle and around the Isle
 - A Neolithic wooden trackway was found under peat on Hatfield Moor in 2004
- Bronze Age 2,000-600 BC
 - Metal artefacts discovered at Low Burnham and Keadby
 - A Bronze Age wooden trackway found under peat on Thorne Moors in 1972



RIVERS FLOWING THROUGH THE ISLE OF AXHOLME

- River Trent
 - E. Boundary.
- River Aire/River Ouse
 - Northern Boundary
- River Idle
 - Source: confluence of the River Maun and River Meden, near Markham Moor.
 - Flows north through Retford and Bawtry before entering the River Trent at Stockwith near Misterton.
- River Don
 - Rises in the Pennines and flows for 112 km (70 miles) eastwards, through the Don Valley,
 - Flows through Penistone, Sheffield, Rotherham, Mexborough, Conisbrough, Doncaster and Stainforth.
 - It originally joined the Trent, but (re-engineered by now joins the River Ouse at Goole.
- River Torne
 - Rises neat Tickhill
 - Flows through New Rossington, Auckley, Wroot,
 - Originally into the Idle at Tunnel Pits.



ROMAN DRAINAGE

- Bycarrsdike
- Turnbridgedike
 - Abraham de la Pryme reported that 2/3 coins of Emperor Vespasian were found constructing the Dutch River.
- Romano-British Settlement at Sandtoft excavated during construction of M180.
- Geological evidence
 - Rivers not incised
- Bycarrsdike, mentioned in Domesday Book
- Turnbridgedike, existed 1344.
- Built for navigation
 - Appear to have been constructed to improve communications between Lincolns and York.
 - Avoid tides and Aegir.
 - Not ideal location for drainage.
 - Importance of Bawtry as a port





Rawcliffe

Thorntree

MEDIEVAL DRAINAGE 14TH CENTURY

- 1327
 - Ralph de Willoughby, William Basset, William de Skipworth, Illard de Usflete, Robert de Haldenby, John de Lasingcroft, and John de Flete of Bulwiche constituted as commissioners to view and repair the banks of the Rivers Trent and Don within the hundred of Crowle
- 1331
 - de Warenne given right to 'approve' wastes in Thorne and Hatfield
- 1344
 - 16ft wide channel dug from Crulleflete Hill unto Denwmyrn (mouth of the Meredyke) possibly Pauper's Drain. On the 1638 Manorial plan this is called Mar Dyke, which means boundary ditch. • Meredyke – between Crowle and Luddington possibly created at this time as well.
- 1400
 - Abbott of Selby instructed by the King:
 - “to contribute to the upkeep of dykes, sewers and drainage. To ensure the river Don was dug to a breadth of 16 feet and one grain of barley nor was the river to be obstructed by bridges, weirs and other things so that the said breadth is not kept whereby the passing of ships is impeded.”
- 1413
 - Abbott of Selby “did cause a strong sluise of wood to be made upon the River of Trent, at the head of a certain sewer, called Mare-dyke, of a sufficient height and breadth for the defence of tides coming from the sea and likewise from the fresh waters descending from the west part of the before specified sluice to the said sewer, into the said River of Trent and thence into the Humber.”





INCLESMORE MAP 1407



aldenby

Wigton

Wigton



Birchhof



Silberberg



Tolle et ibi

Tolle cruce

Tolle cruce

Tolle cruce

Tolle cruce

Tolle cruce



tralle



Kross





Castellum

de Holsom

Castellum

Castellum

Herbytryg



AGRICULTURE BEFORE VERMUYDEN

- Much of the common land lay under water in Winter from Martinmas (11 Nov) till May Day
 - “Thick fatt water” enriched land
 - Natural warping
- There were still much common land that remained dry in winter
 - Epworth & Westwood kept 12,000 cattle over winter
 - Crowle had 400 acres of “good and drye pasture” in winter and would be able to keep a great number of great Cattell and shepe going in their fennes and Common in Wynter season.”
 - A shortage of pasture in the southern part of Axholme in the late 16th Century led to a dispute between the islanders and their neighbours in Nottinghamshire.
- Fowling and fishing rights were valuable
 - Copyholders' fishing rights in Crowle valued at £300/year in 1650
- Not surprising then that the drainage proposed by Charles 1st and Vermuyden was opposed by the locals
- Dugdale in his “History of Imbanking and Draining”, 1662,
 - deplored the opposition seeing the islanders as obstinate, ignorant peasantry clinging to a miserable life because they were incapable of grasping the superior benefits of drainage.
- Joan Thirsk suggests that Vermuyden's drainage did not create an agricultural economy where none existed but substituted an arable economy for a pastoral economy.



AGRICULTURE BEFORE VERMUYDEN

- Principal produce;
 - Meat
 - Dairy produce
 - Leather
 - Barley, Wheat
 - Peas
 - Hemp & Flax
 - Sack and canvas industry already underway
- Demand for these items in 16th Century England
- Small farms of no more than 4 or 5 acres
- The high ground in the area was renowned for its fertility
 - Leland “meatly high ground, fertile of pasture and corne”
 - Evidence that arable land was unusually fertile. Crowle & Eastoft rotations did not include fallow years
- Commons
 - Peat
 - Wood for fuel
 - Hay
 - Fish & Fowl
 - Crowle common capacity so great that they took in extra stock during the summer. The profit of about 40/- put to the use of the town.



1596 MAP





KING JAMES 1

- The Crown owned large areas of land in Hatfield Chase
- King James saw the benefits for improvement and asked landowners to report on potential to improve
- In July 1622 they report that they did not believe it possible to drain and improve the area.
- In 1624 the King asked Vermuyden to examine the matter
- Vermuyden willing to take on the task but in March 1625 King James died



1609 HUNTING ON THORNE MERE





KING CHARLES I

- 24 May 1626
 - Agreement between Charles I and Cornelius Vermuyden
 - Lands concerned were;
 - Hatfield Chase & Ditch Marsh
 - Manors of Wroot, Finningley and the Isle of Axholme
 - Divers other lands
 - The manor of East Greenwich
 - To make fit for tillage or pasture and forever maintain fit for tillage or pasture
 - In return Vermuyden to receive 1/3rd of land
 - 1/3rd remain with the Crown and 1/3rd with the commoners.
 - On completion of works a corporation to be formed to ensure maintenance



CORNELIUS VERMUYDEN

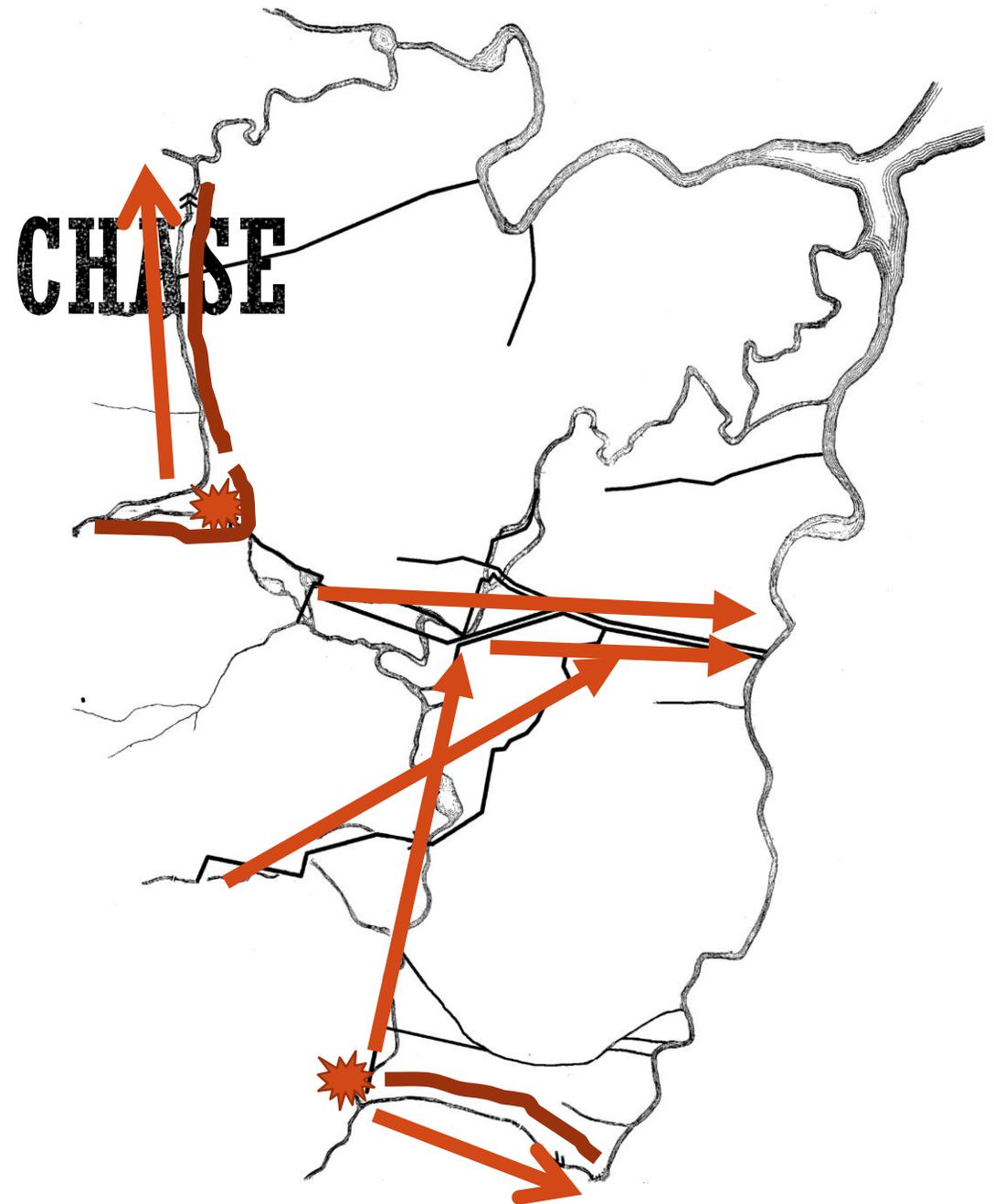
- Born: Sint Maartensdijk, 1595
- Died: London, 11 October 1677
- 1621-1623
 - Sea wall at Dagenham
 - Reclamation of Canvey Island
- Knighted 1629
- Became British Citizen 1633
- After Hatfield Chase went on to 'The Great Fen'
- Lead mine in Wirksworth.
- Vermuyden's 'General Rule of Drayning' - 1642
 - " There is in use a general rule of Drayning and gaining of drowned lands, which is by imbanking all the rivers on each side, and by leading away the downfall by draynes and sluices ; and this is the ordinary way of draining, as is usual in all such cases."
 - Also to maintain land as receptacles for sudden downfalls of water.



1626-1628

DRAINAGE OF HATFIELD CHASE

- River Idle diverted at Idlestop to flow along Bykersdike
- Divert eastern arm of River Don up the Turnbridgedyke
- Ashfield Barrier bank
 - Bank built on south bank of River Don
 - Navigable Sluice in Ashfield Bank
- Barrier bank on East Side of River Don, Dikesmarsh Bank
- Barrier bank on north bank of Idle from Idlestop to Stockwith
- New Idle – Idlestop to Dirtness then to Althorpe
 - Collected surface water
- Drain from Thorne to Althorpe
- And River Torne.....





IDLE BANK



NORTH RIVER

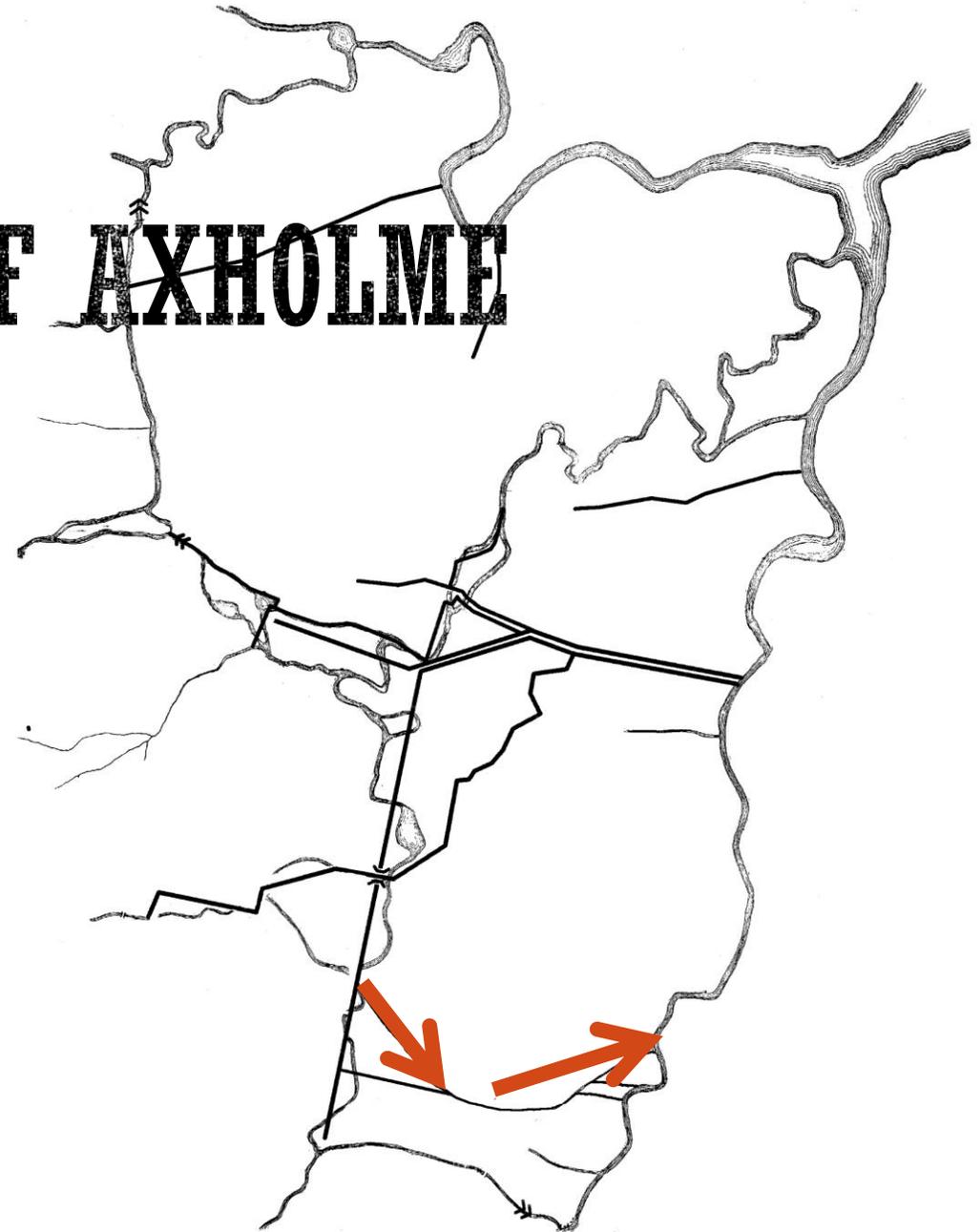


ASHFIELD BANK

1628-1631

DRAINAGE OF THE ISLE OF AXHOLME

- Drainage of Haxey, Epworth & Belton.
 - Drained into a main drain (Monkham Drain & Snow Sewer) for Haxey Carrs running to an outfall sluice on the Trent at Owston.
- Court of sewers for the level of Hatfield Chase
 - Appointed 1629.
 - Commissioners of Sewers empowered to hold court, oversee all issues relating to waterworks and drainage.
 - Assessed and collected scots, employed engineers,
 - John Liens one of its members
- Vermuyden Knighted by King Charles on 6th January 1629



THE RIVER TORNE

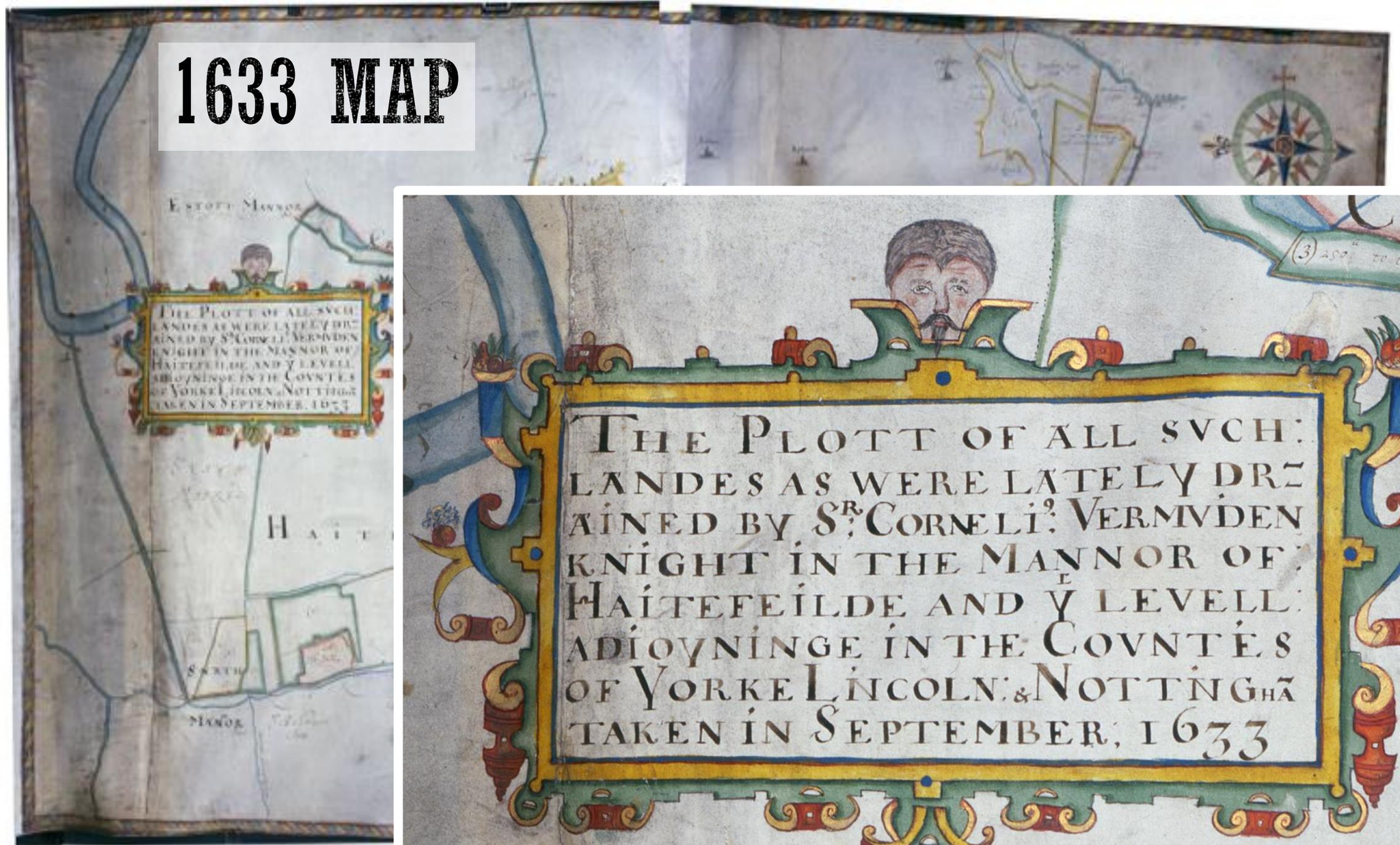
- Accepted wisdom is that Vermuyden constructed new River Torne more or less in its current location but it is not shown on 1639 Aerlebout Map.
- 1633 Map
 - Annotation indicates that Torne was originally diverted around Hatfield Moor to join New Idle near Sandtoft
- At some time the New Torne was constructed.
- Not in its current location but near by
- For a great part of its length, through Westgate, it followed what is now the folly drain
- The New Torne crossed the Idle at Tunnelpits



1633 MAP



1633 MAP



ESTOTT MANNOR

HAITEFEILDE

SARRE

MANNOR

CRO

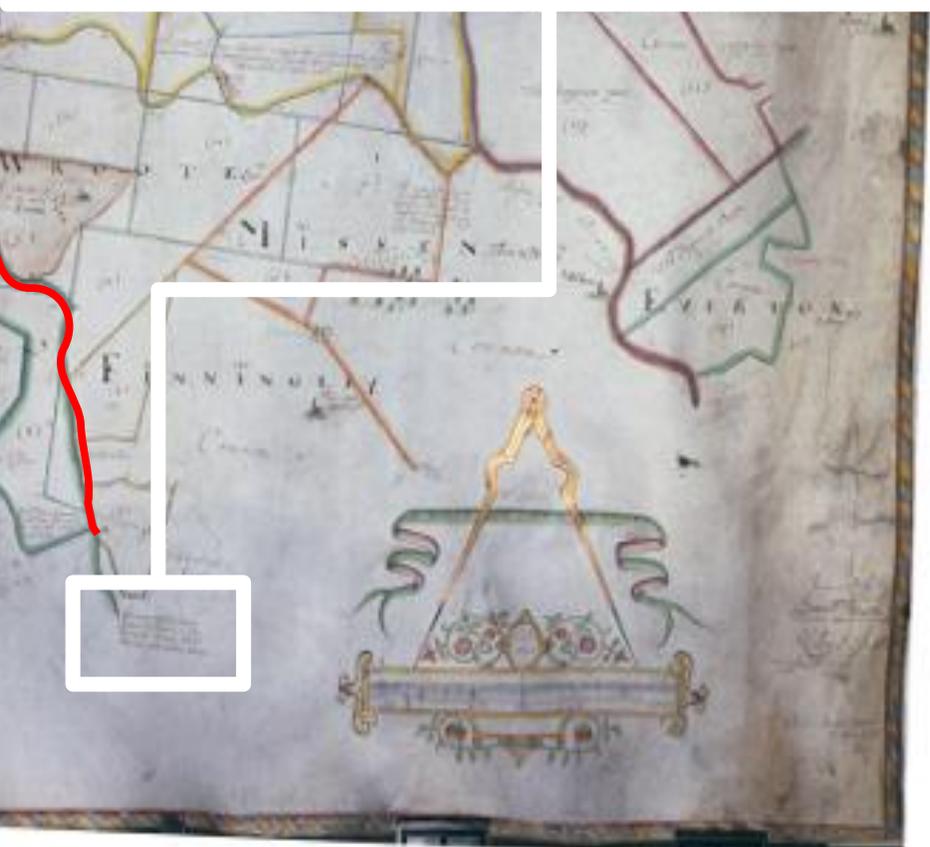
(3) 250 to the town

THE PLOTT OF ALL SVCH:
LANDES AS WERE LATELY DRZ
AINED BY S^R CORNELI² VERMVDEN
KNIGHT IN THE MANNOR OF
HAITEFEILDE AND Y LEVELL:
ADIOYNINGE IN THE COVNTÉS
OF YORKE LINCOLN: & NOTTINGHÅ
TAKEN IN SEPTEMBER, 1633

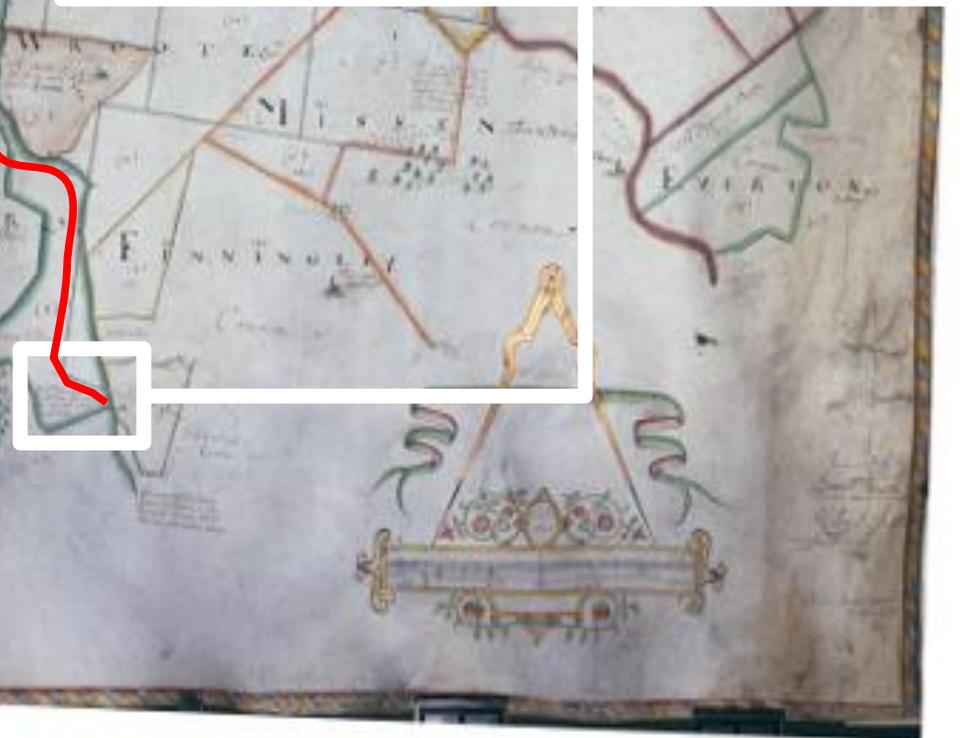
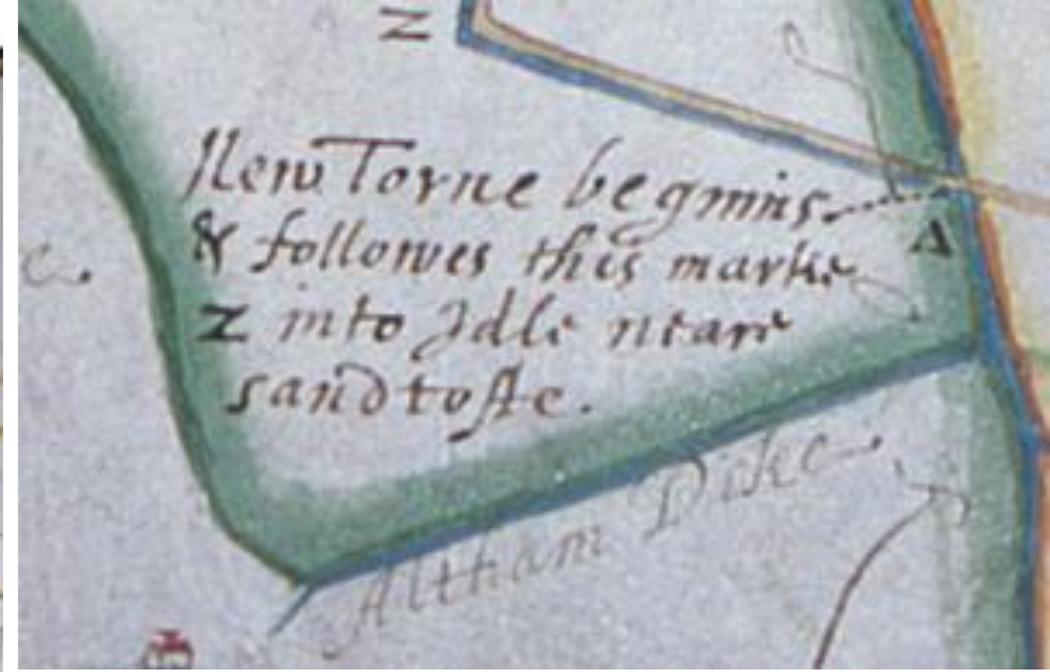
1633 MAP



*This river of old torne
Runns Eastward as this
Δ marke directts till itt
fall into Jelli at Ben intaks.*



1633 MAP



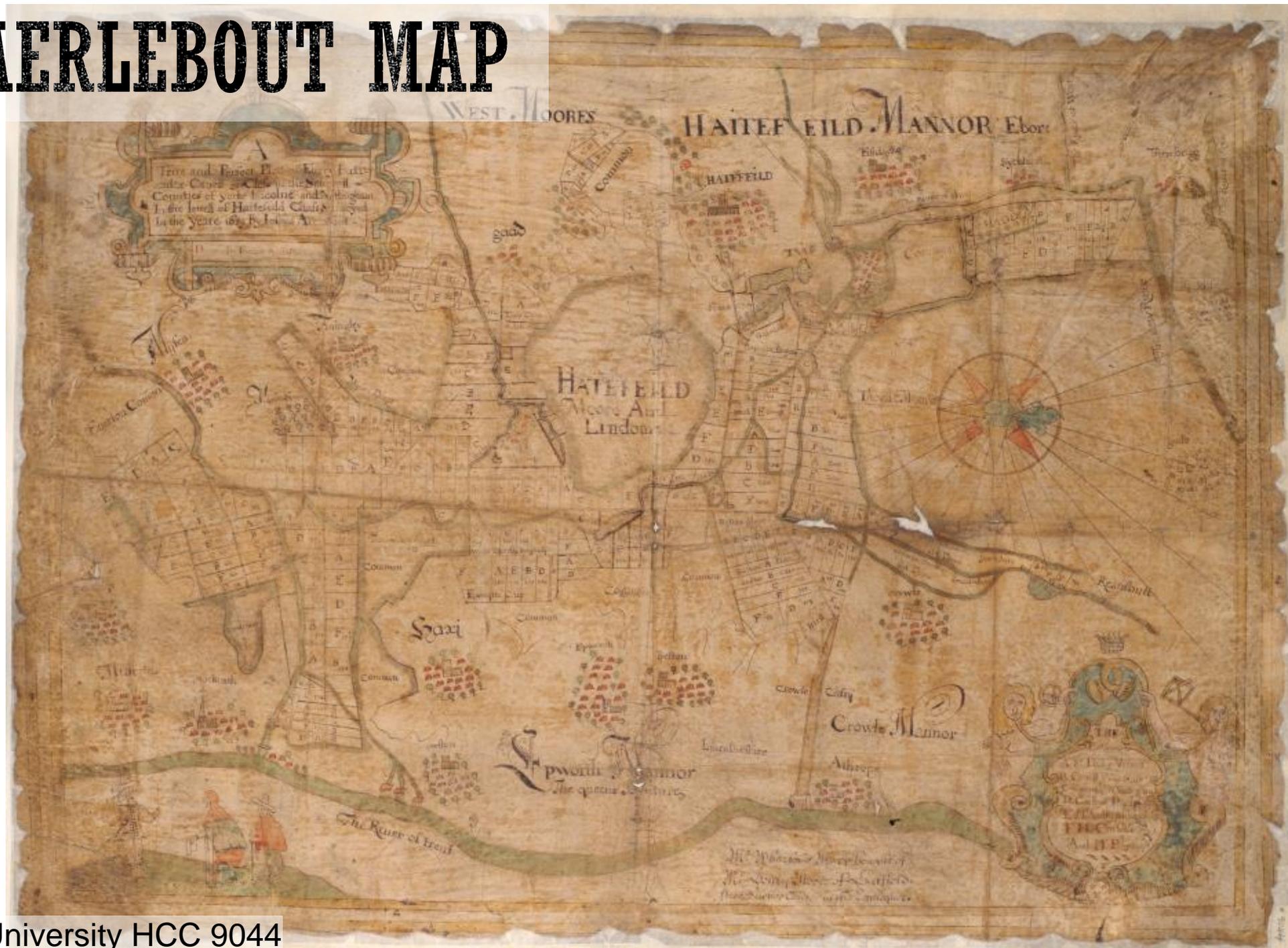
1629-1630

VERMUYDEN'S SUBSIDIARY WORKS

- Navigable Sluice constructed at Misterton Soss (or Sass)
 - 60ft long x 18ft wide
 - Built by John Liens, Vermuyden's Nephew
- 1628
 - Severe flooding in Sykehouses and Fishlake
 - May 1630 – Inhabitants of Fishlake and Sykehouses paid Vermuyden £200 and he was compelled to restore ancient river banks
 - Sluice constructed at Turnbridge in 1629
 - A large outfall sluice built alongside with 17 openings each 6ft wide and 8ft high
 - Completed by end of 1630
 - Engineer - Hugo Spiering
- August 1630
 - Lord Wentworth and Lord Darcy compelled participants to build new drain to ouse.
- Dutch River & sluice
 - Originally 2 drains
 - Sluice washed away
 - New sluice 1651
 - Only used for drainage as navigation continued through to the Aire at Turnbridge.
- Navigation
 - Vermuyden sasses
 - Turnbridge 18'x60'
 - Thorne 16'x50'
 - Stockwith is like that at Turnbridge
- Boats
 - Route to Sandtoft
 - Boating Dyke
 - Peat Transport



1639 AERLEBOUT MAP



1639 AERLEBOUT MAP



1639 AERLEBOUT MAP



1639 AERLEBOUT MAP

Mr. Wharton's Mapp bought of
Mr. Henry Moore of Hatfield.
Proved in two Causes in the Exchequer.

Mr. Wharton's Mapp bought of
Mr Henry Moore of Hatfield.
Proved in two Causes in the Exchequer

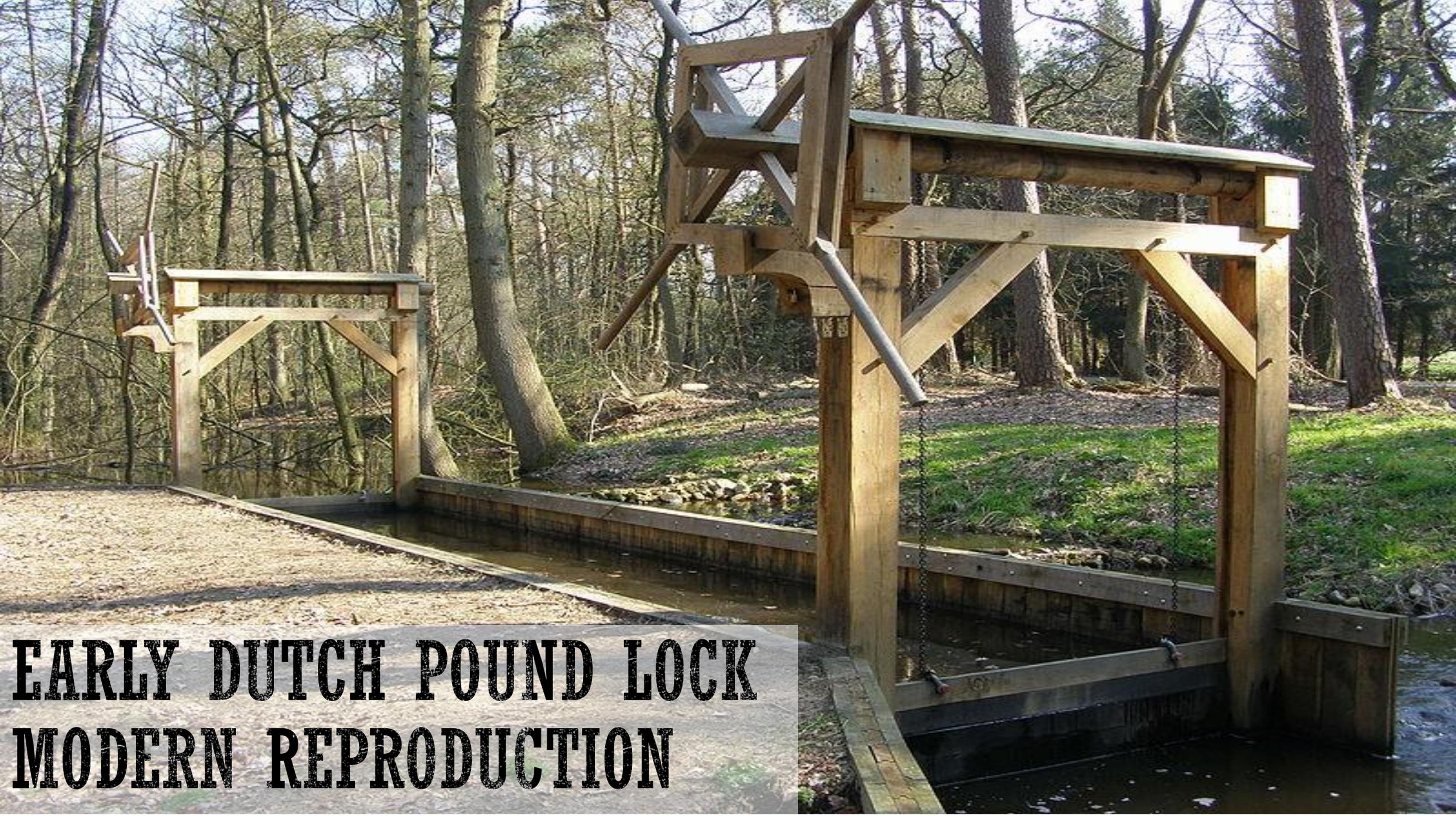


1639 AERLEBOUT MAP



1639 AERLEBOUT MAP



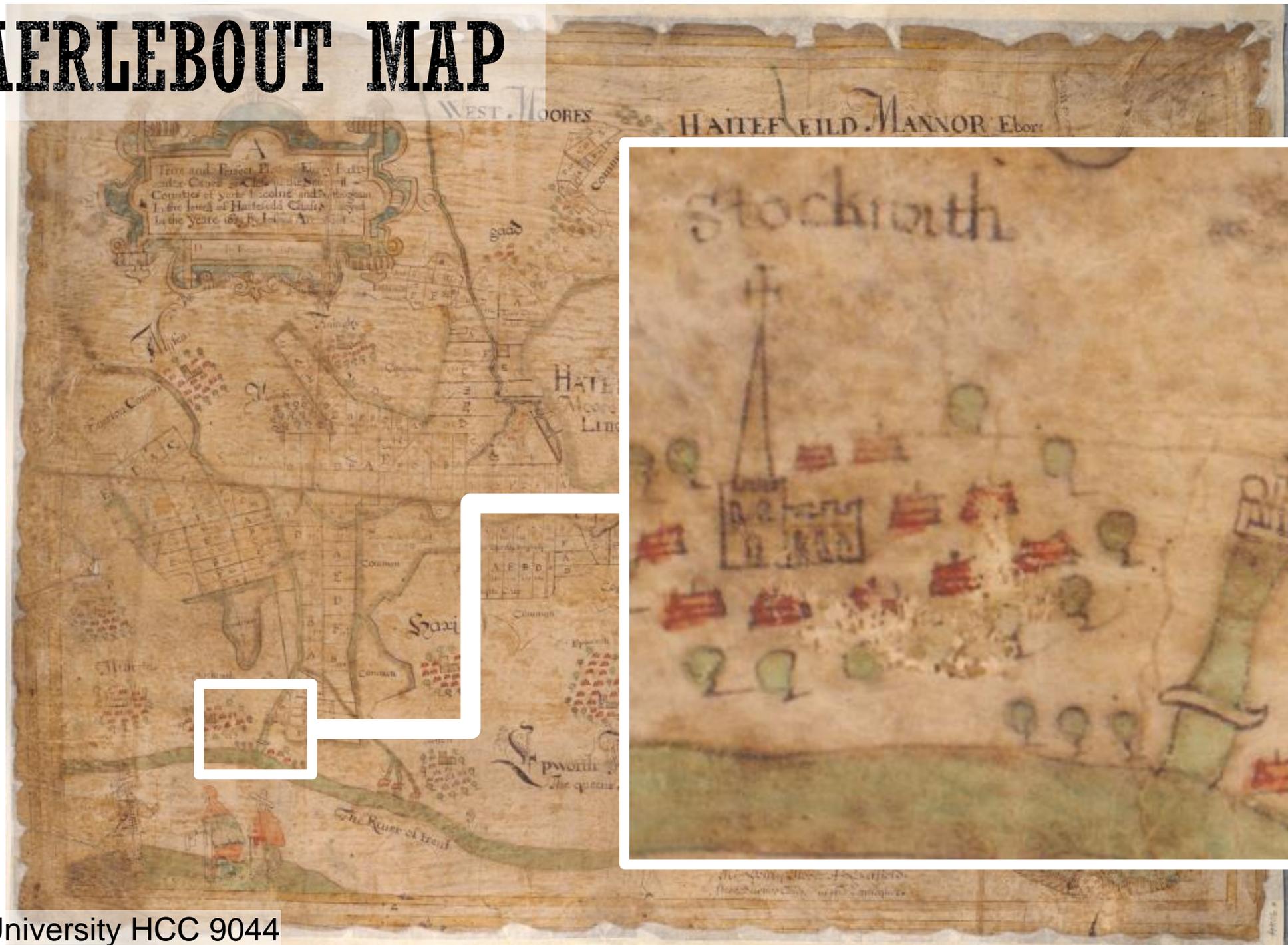


**EARLY DUTCH POUND LOCK
MODERN REPRODUCTION**

1639 AERLEBOUT MAP



1639 AERLEBOUT MAP



BOATING DYKE

- Used until about 1805 for transporting turf from the moors to the River Don.
- Evidence given in Thorne 1817

11th August 1817
Minutes of Evidence taken in view of
the Boating Dyke by the Survey
on of the ~~Surveyors~~ ^{of the Township of Thorne} for the purpose
W^m Pilkington of Thorne Land Surveyor, on behalf
of the Township of Thorne. With that where allotments
have been set out to proprietors lying on each
side of the Boating Dyke they are set out subject
to the Drain or Canal and subject to any Rights
which the Participants or others may have in
the Drain or Canal. ~~And that the said~~
~~Township of the Drain or Canal is only~~
~~intended to be set out on one side~~ - That
where allotments have been set out on one side
of the Boating Dyke only, the Land is only
admitted to the side of the Drain
Evidence on Part of the
Participants.
Mr Joseph Wynn Collector & Referee to
the Participants & With
Q. What permission will it be to the Town of Thorne
if the Land permission to be granted to take
away the Materials &c -
A. The Carrying taking the Materials of the
Dyke & taking away will not be any
infringement to the Town of Thorne or any
Person -
Q. If the Town of Thorne has a right to that
the Privilege of receiving a fresh supply of
Water up Boating Dyke then taking any
Materials would be an Injury could it be

17TH & 18TH CENTURY

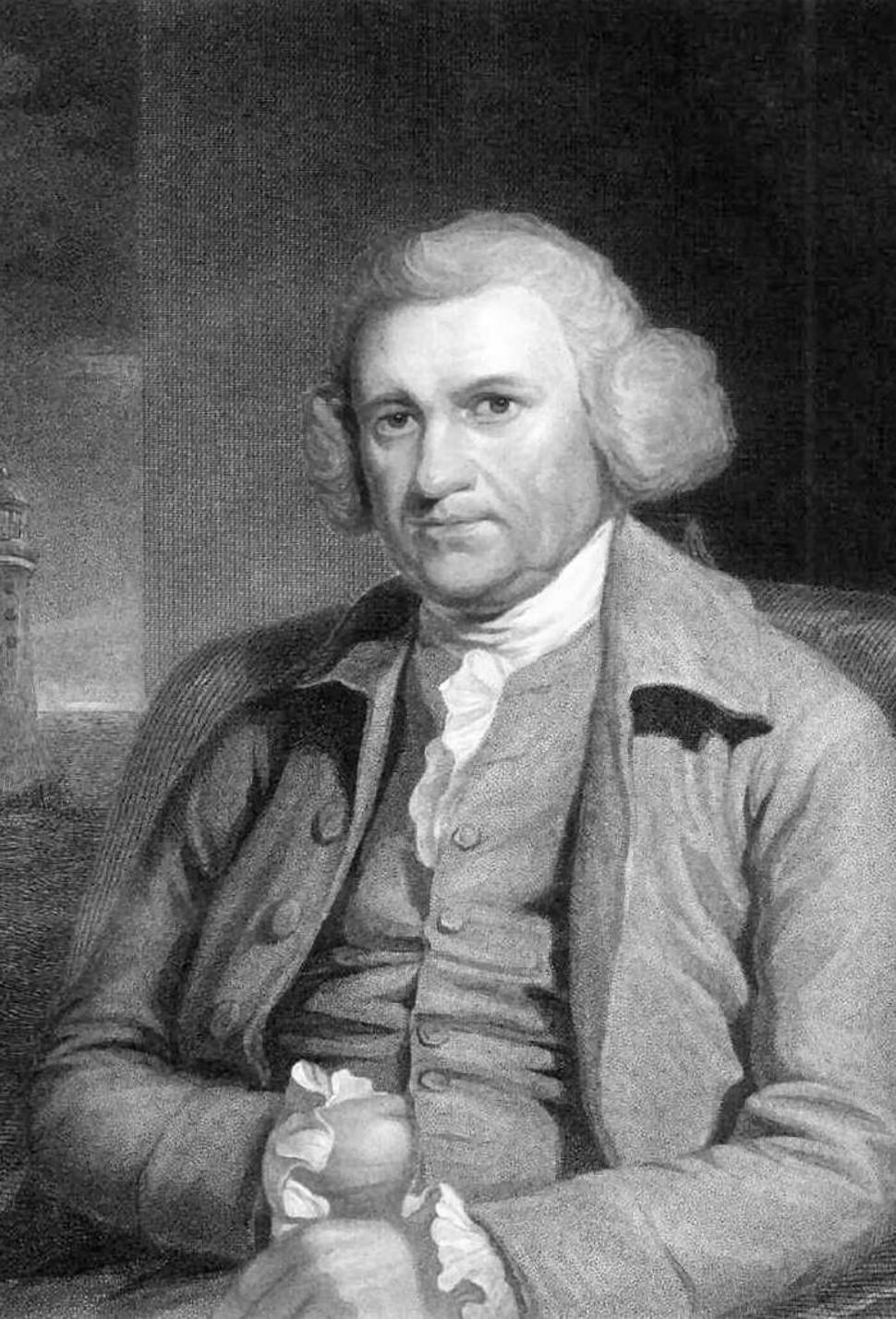
- Much argument over land rights centering on the Mowbray Award.
- One legal case was settled by a decree dated 20 February 1692/3.
 - Divided certain pieces of land between the Participants and the petitioners.
 - These 'Decreed Lands' were granted to trustees for the Participants.
 - The rents and profits of these properties were applied to the maintenance of the drainage works, and helped to reduce the scots charged on the Participants' Scotted Lands.
- Civil War
 - 1643 – Sluices destroyed on Snow Sewer
 - 1645 – orders issued to restore Axholme drainage.



18TH CENTURY

- From 1719 very little done to improve drainage.
- Most work was maintenance
- 1763
 - River Idle and Torne broke their banks





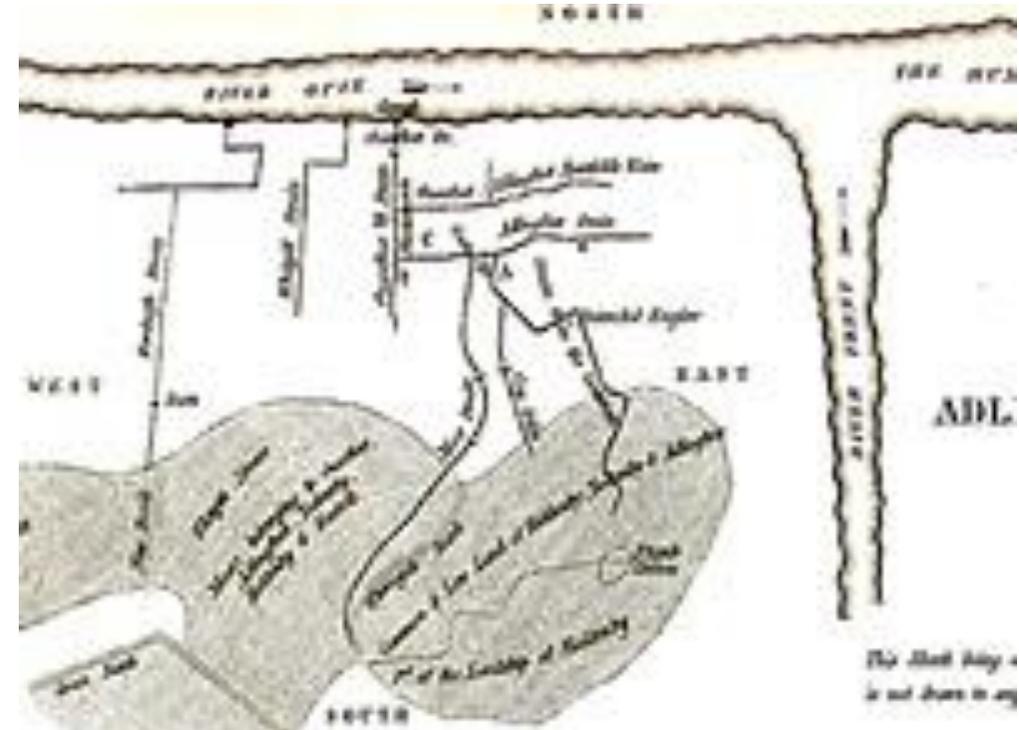
JOHN SMEATON 1724-1792

- Regarded as founder of Civil Engineering
 - FRS
 - 1759 Eddystone Lighthouse
 - Calder & Hebble
 - Forth & Clyde Canal
 - Harbours, fen drainage, steam engines, industrial water mills.



JOHN SMEATON 1764

- Smeaton had been working in Potteric Carr
- Adlingfleet Drain
 - Report 1764
 - 2 Options
 - Act obtained 1767
 - John Grundy appointed Engineer
 - Main works completed 1769 29km drains completed 1772
- Misterton Sas and Snow Sewer
 - 14th August 1764
 - Recommended an additional sluice or weir at the Sass to allow greater volumes of flood water
 - Recommended deepening of Ferry Sluice and deepening of drain



PROPOSED CHANGES TO DRAINAGE 1770'S

- Thomas Tofield September 1773
 - Proposed diverting the Torne into the Don near Thorne.
- Thomas Yeoman Report 1774
 - Proposed a new cut to an outfall 4 miles North of Althorpe.
- John Smeaton Report Sept 7th 1776
 - Recommended new outfall at Waterton.
 - Phased work started summer 1776 and completed
- Matthias Scott – Surveyor of works for Hatfield Chase
 - Proposed to take Northern Drain to a new outfall at Keadby
 - Act of Parliament March 1783





THE

Belton Common

Rofs Common

New Course of TORNE

RIVER

BELTON

Sandloft

Wood Carr Ingle

Belton Mozard

Wgt Carr Common

Wgt Carr Bridge

Rofs Bridge

Scausit Br.

Westgate

Belton Common

IDLE

Sam's Clases Br.

Proposed New

Thorp Hall

The End

Belton North

Jonus' s' Bridge

Wgt Carr Bridge

Scausit Br.

Proposed New

Beite

Crowle Bridges

The End

Belton North

Jonus' s' Bridge

Wgt Carr Bridge

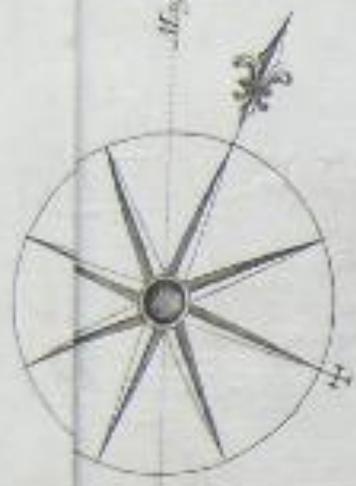
Scausit Br.

Proposed New

Thorp Hall

The End

Belton North



Magnetic

Commons belonging to Eastoft Luddington
The proposed N^o Outfall Drain
Amcotts Common
Luddington
Stinted Pasture
Cott's Hall

Kidby and Amcotts

E A T E R
Amcotts North Field
Amcotts South Field
The Hook

Belton North
Mozard
NORTH
SOUTH

Kidby

Kidby South Field

Kidby North Field

Amcotts Sewer

Kidby Sewer

Amcotts

Grantby Col
Waherton Farm



RIVER TORNE 1776 MAP



RIVER TORNE 1801 MAP

RIVER TORNE

MEMBERS ONLY
DANGER DEEP WATER

EPWORTH ENCLOSURES ACT 1795

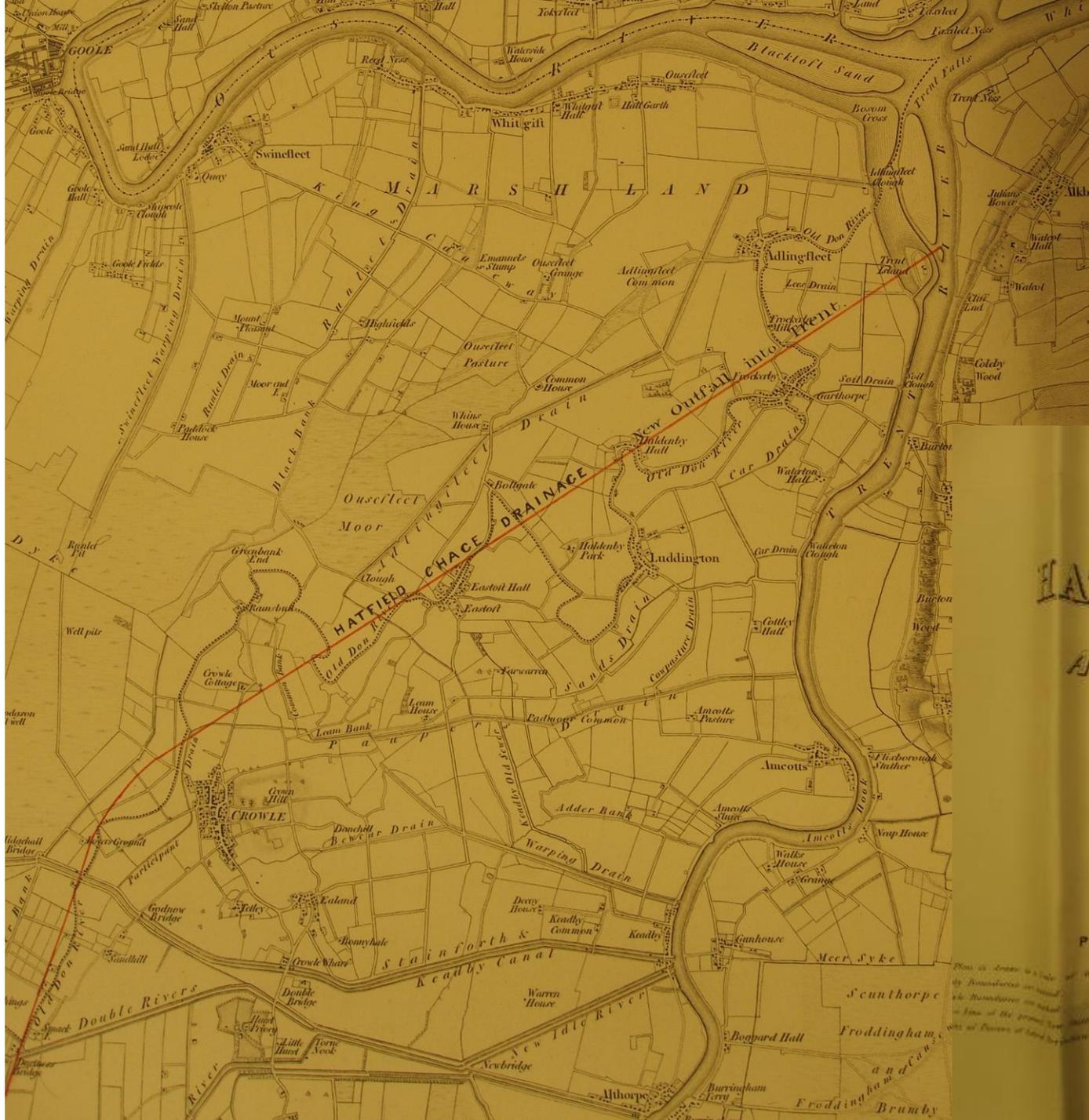
- Engineers – Jessop & Hodgkinson. John Dyson, resident Engineer.
- Completed in 1803
 - £20k of drainage works
 - New Idle River running parallel with Idle Drain
- Foster
 - Snow Sewer into New Idle
 - Torne into North River
 - New drain from Pilfrey to Keadby
 - North Drain to Althorpe
 - Folly Drain follow old idle and discharge at Derrythorpe
 - New Ferry Drain parallel to Snow Sewer to Owston Ferry



19TH CENTURY

- Crowle Enclosures 1813
 - Allowed compulsory warping to improve lands
 - 1816 amendment giving full powers to warp land in Pilfrey, Rainsbutt in addition to Crowle and Luddington
 - Empowered to make drains at Keadby and Amcotts
 - 2000 acres warped
- 1812 Thackray employed to take levels of drains
- 1813 John Rennie
 - Recommended outfall at Waterton
 - Est cost £81k
 - 'High land' water to be separated from 'low land' water.
- Thackray works
 - New Idle passed under River Torne and run parallel to Keadby
 - River Torne discharged by both Sluices at Althorpe
 - High land waters separated from low land water – new drains





HATFIELD CHASE DRAINAGE BILL 1851

HATFIELD CHASE DRAINAGE AND NEW OUTFALL INTO TRENT.

Plan and Section

SESSION 1851 & 1852.

REFERENCE OR EXPLANATION.

PLAN.

SECTION.

This is a plan of the Hatfield Chase Drainage and New Outfall into the Trent. The horizontal scale is 100 feet to the inch. The vertical scale is 40 feet to the inch. The datum horizontal line of the section is taken from a point 21 1/2 inches below a mark set in the top of the Stone Spring Course at West side of the principal bridge at Swinfleet.

The horizontal scale for the section is 100 feet to the inch. The vertical scale is 40 feet to the inch. The datum horizontal line of the section is taken from a point 21 1/2 inches below a mark set in the top of the Stone Spring Course at West side of the principal bridge at Swinfleet.

JOHN RENNIE 1761-1821

- Canals & Waterways
 - Lancaster Canal
 - Kennet & Avon Canal
- Bell Rock Lighthouse
- Leith Docks
- Sheerness Dockyard
- Buried in St Paul's Cathedral



The Building of a New Aqueduct and other Works.

To be LET.

At the house of Mr. WELLS, at BOOTH FERRY, on Monday the 12th day of May, 1817, by Eleven o'clock in the forenoon;

THE BUILDING, with Stone and Bricks, of the intended AQUEDUCT or CULVERT, about sixty yards in length, with three openings, under the high road leading from Crowle to Althorpe, and also under the river Torne and its banks, near to the Pilsfrey.

Also the Building, with Brick, Stone, and Timber, of the intended Bridge across the Woodhouse sewer, in the turnpike-road leading from Thorne to Bawtry.

And also the Cutting, Digging, and Embanking, of the intended New Drain, from a point near Godney Bridge along the North side of Colt Hill to the crook of the Moor, and from Green Bank to the Double Bridges, being nearly two miles in length.

The Contractors must find all Materials, and will be required to give approved security for the due execution of the works.

The plans and specifications may be seen, and further particulars known, by applying to Mr. Thackray, of Gainsburgh.

Doncaster, April 12, 1817.

STAMFORD MERCURY

2 MAY 1817





PILFREY BRIDGE SYPHON



SANDTOFT SYPHON

SANDTOFT SYPHON



1828 JULY & AUGUST

- Flood water in the Trent prevented sluice doors being opened for several weeks.
 - Snow sewer sluices not opened for 5 weeks.
 - Keadby sluices only opened for two hours at a time
 - Low land flooded and crops lost
- Committee appointed to consider best methods to improve drainage
 - Recommended ambitious scheme of new wide river from Dirtness to Trent Falls – outfall 4 feet below Keadby.
 - Also to be used for navigation & warping
- 1830 Act authorised
 - fell through lack of cooperation by the landowners who objected to the great expense
 - Estates in Marshland were particularly against it
- 1830 George Leather Jr reported on three occasions
 - Recommended outfall at at Trent Falls – start at New Idle drain, Thorne Moor and follow a straightened version of the old river Don.
 - Advised that use of pumping engines was not necessary but that if they were to be used then one should be placed in the south of the area.



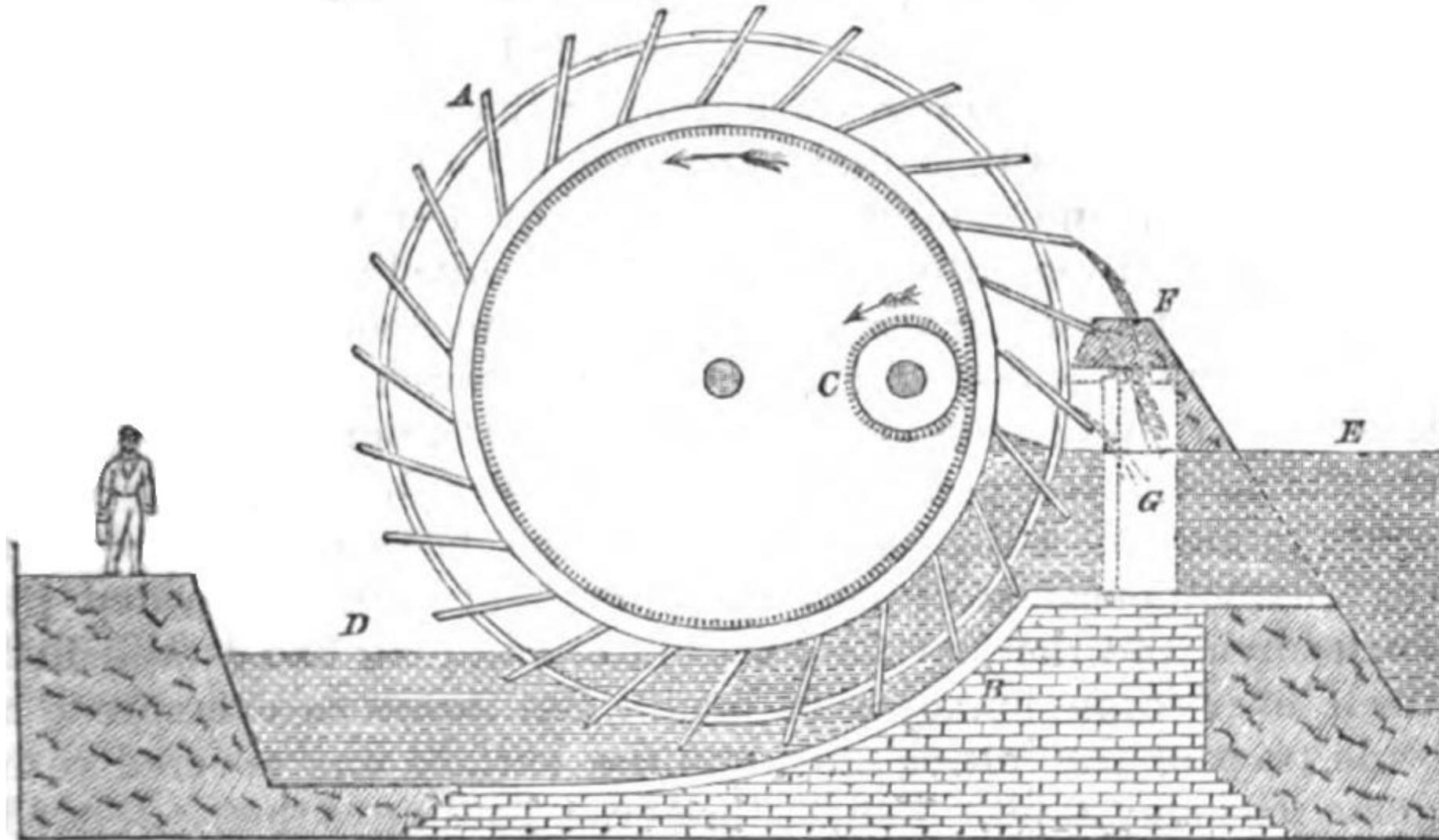
PUMPING ENGINES

- 1828
 - 40hp on Mother Drain near Misterton Soss
- 1831
 - Hirst Priory
- 1837
 - Butterwick South Moor •
- 1839
 - 2nd steam engine installed on mother drain
- 1846
 - Rush Carr
- 1854
 - Act of Parliament for warping using Snow Sewer and Ferry Drain
- 1858
 - Bull Hassocks
- 1862
 - Corporation Formed
 - Pumping Station at Dirtness Bridge
- 1867
 - Dirtness
 - James Watt Engine
 - Replaced by electric dc engine in 1928
- 1910
 - Owston Ferry
 - 1964 Diesel
- 1930
 - Land Drainage Act
 - Keadby Pumping Station
 - 6 crossley diesel engines 420bhp
 - Althorpe & Derrythorpe discharges discontinued
- 1945
 - Keadby also pumped N
 - North & South Soak Drains
- Pumping Stations
 - New Zealand
 - Medge Hall
 - Wikewell
 - Candy Farm
 - Goodcop 1939
- 1962
 - New Idle/Torne intersection
- 1970
 - Greenholme
- 1981
 - West Stockwith on Idle/Bicarsdike



SCOOP WHEEL

EXPLANATORY DRAWING OF A SCOOP-WHEEL.



MOTHER DRAIN PUMPS



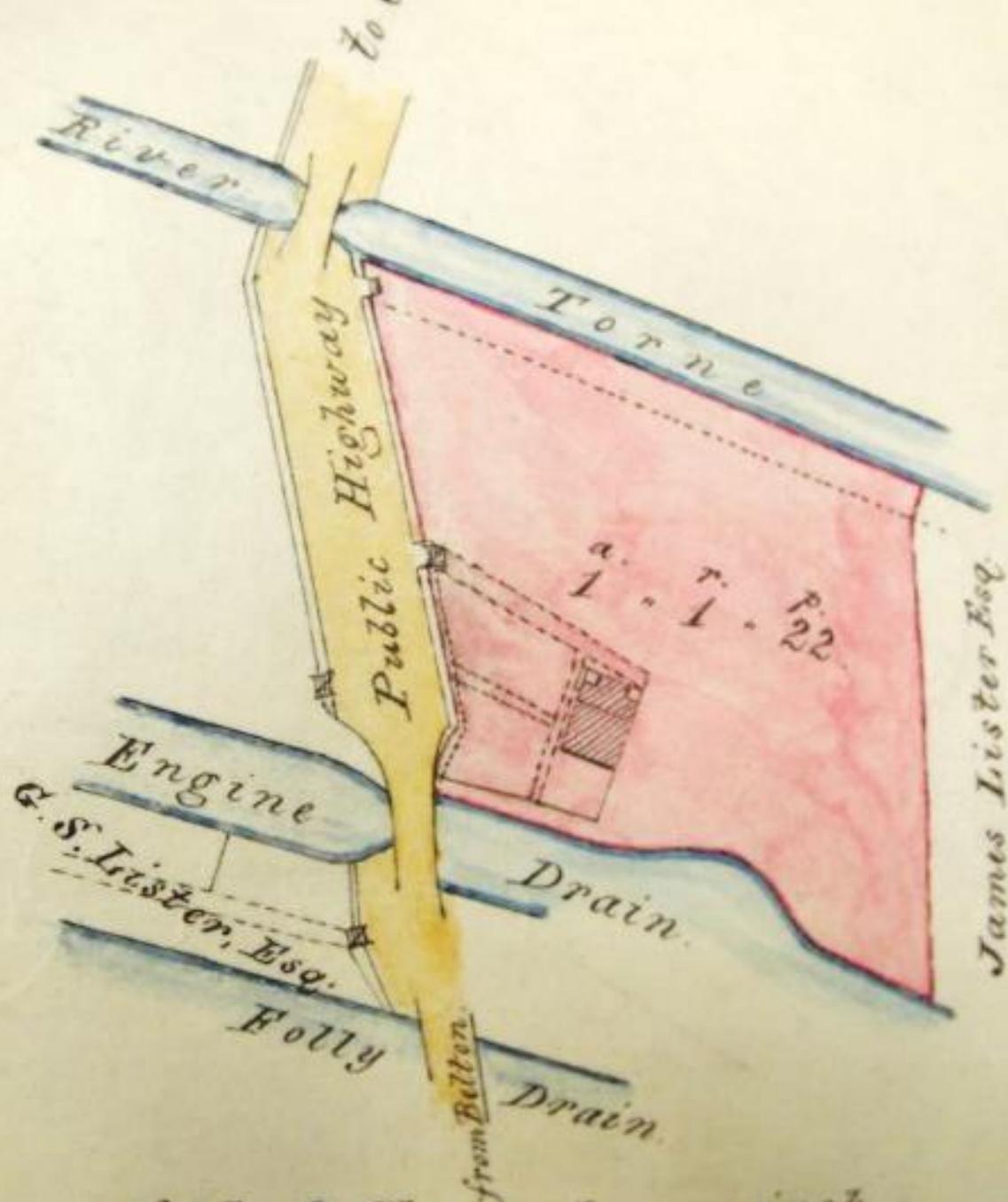
HIRST PRIORY ENGINE

- Leeds Intelligencer - Thursday 10 March 1831
- The engine was not new when purchased, having been constructed for marine purposes. It is a side lever engine of 40 horse power nominal, equivalent to 70 water horse power. The scoop wheel is 30 feet diameter and 2 feet 11.5 inches wide, and works at a rate of 4.5 revolutions per minute with an average lift of 5 feet.
- The Drainage of Fens and Low Lands: By Gravitation and Steam Power
- By William Henry Wheeler

CONTRACT for a STEAM ENGINE.—The Commissioners for the better Drainage of Lands in the Level of Hatfield Chace, are desirous to **CONTRACT** for the **ERECTION** of a **STEAM ENGINE** of Forty Horse Power, with the requisite Stop Gates and Buildings to be placed upon the North Idle Drain, at Double Bridges, near to Crowle, about Five Miles from the River Trent, and Fifteen Miles below Gainsbro'. Any Person desirous to Contract for the same, are requested to send in Plans and Estimates to the Commissioners at the Red Lion Inn, Doncaster, on or before Twelve o'Clock on Monday the 28th of March Instant.

Further Particulars may be had by Application to Mr. **PIEKINGTON, Thorne.**





Scale 2 Chains to one inch.

HIRST PRIORY PUMPING ENGINE

15 Dec 1863

Land that formerly had the Hirst
Priory Pumping Engines sold back
to James Lister esq.



HATFIELD CHASE.

(Amendment of Chase Drainage Acts.)

APPPLICATION will be made to PARLIAMENT in the next Session thereof for a BILL to amend an Act passed in the 53rd year of the reign of King George the Third, c. 161, intituled "An Act for the more effectually draining and improving lands within the level of Hatfield Chase and parts adjacent, in the counties of York, Lincoln, and Nottingham," and to enable the Commissioners appointed, or to be appointed, under that Act to remove the steam-drainage engine, with the accessory works thereto, now standing near a place called Hirst Priory, in the parish of Belton, in the county of Lincoln, and to place the same on or near the New or Old Idle, above a place called Tunnel Pit, in the parishes of Wroot, Belton, Epworth, or Haxey, or one of them, in the parts of Lindsey, in Lincolnshire; and also to enable the said Commissioners to enter and purchase lands by compulsion, and to levy rates and taxes upon the owners and occupiers of the lands which will be improved by such engine, or which will drain, or the drainage whereof will be facilitated and improved by means thereof, within the parishes of Wroot, Epworth, Haxey, Misson, and Belton, in the county of Lincoln, and of Misson and Finningley, in the county of Nottingham, and of Cantley, Finningley, and Hatfield, in the county of York.

The Bill will extinguish all rights and privileges now existing which will interfere with the objects aforesaid.

The said Bill will also alter, extend, amend, and enlarge, some of the powers and provisions of the following Acts relating to the level of Hatfield Chase, and to the lands intended to be affected by the said Bill, 35 Geo. 3, c. 107; 23 Geo. 3, c. 13; 27 Geo. 3, c. 53; and 56 Geo. 3, c. 58.

Printed copies of the Bill will be deposited in the Private Bill Office of the House of Commons before the 1st day of January, 1854.—Dated this 10th day of November, 1853.

BAXTERS and CO., Solicitors, Doncaster.

LINCOLNSHIRE CHRONICLE - NOVEMBER 25 1853

- Removal of Hirst Priory pumping engine to near Wroot



ISLE OF AXHOLME: DRAINAGE OF THE SOUTH LEVELS OF HATFIELD CHACE.—Since the year 1813, various schemes have been projected, and reports made by engineers (of different opinions) on the means to be adopted for the better drainage of the South Levels. Up to the present time, all attempts at drainage have failed; and on no occasion have the proprietors and occupiers suffered so much, or the land

“Since the year 1813, various schemes have been projected”..

“Up to the present time, all attempts at drainage have failed; and on no occasion have the proprietors and occupiers suffered so much, or the land been so seriously flooded, as was the case from last August until Michaelmas.”

“Prior to 1832, Mr. Leather's views were published in favour of a drainage without the aid of steam power. “...” however, steam was resorted to, and the gigantic engine for the purpose was fixed at Hirst Priory, near Crowle. Time has now proved that this scheme has been a failure.”

“The arduous task of the removal of the engine is now progressing along the new Idle drain, via Tunnel Pit, and some thousand tons of solid masonry, hitherto fixed at Hirst Priory, have reached the spot where the works are being erected. We regret to hear that on the stormy night of 1st inst., two vessels, heavily laden with stone work, sank near to Tunnel Pit; some difficulty and expense have, of course, occurred in raising the cargoes.”

Commissioners carrying out their outfall through this deposit. Out of this bed of warp, below Tunnel Pit, a great portion of Hatfield and Thorne Heaths, or Moors, has been reclaimed; and is now annually growing crops of every description of farm produce, of good quality. Others prize the material for brick making, having already tested the quality of the bricks, in the erection of dwelling-houses in Wroot, &c. The Commissioners, however, are obdurate, and persist in requiring the course set out, and have already made partial purchases. With others, arbitration as to the value of their property has been agreed to—the

any part of the South Level, persist in requiring the course set out, and have already made partial purchases. With others, arbitration as to the value of their property has been agreed to—the

as such (and in proportion to its depth), or merely in the bars pretty certain, that the vein of warp on the verge of the river) would prove leaky, and only an inefficient protection against the pressure of the water. The arduous task of the removal of the engine is now progressing along the new Idle drain, via Tunnel Pit, and some thousand tons of solid

where the works are being erected. We regret to hear that on the stormy night of 1st inst., two vessels, heavily laden with stone work, sank near to Tunnel Pit; some difficulty and expense have, of course, occurred in raising the cargoes.”

its matter worthy of research. Con- to the depth of warp deposit, there must, at a former period, have been a much lower outfall drainage down this natural water-course; and this supposition is borne out by the underground timber found in the peats of the district.

bottom of the drain, with the same spread, and the stem growing state. The vast area of this low locality—extending miles, presents various kinds of underground timber, including hazel nuts as very frequently found

NOTTINGHAMSHIRE GUARDIAN - THURSDAY 18 MARCH 1858

**Drainage of the South Levels of
Hatfield Chace.**

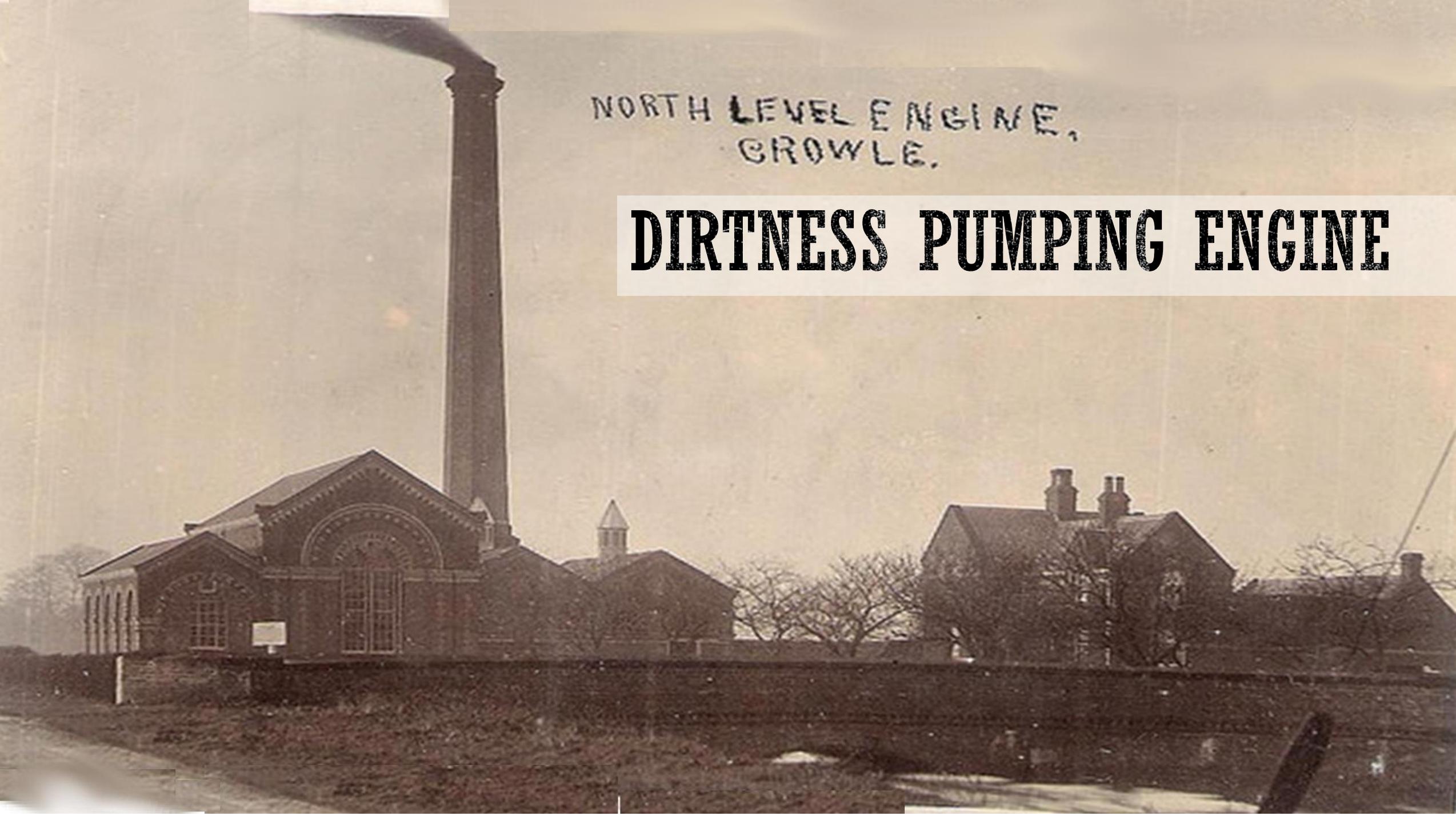


BULL HASSOCKS ENGINE



BULL HASSOCKS ENGINE





NORTH LEVEL ENGINE,
CROWLE.

DIRTNESS PUMPING ENGINE



DIRTNESS PUMPING STATION





FERRY PUMPING STATION

KEADBY PUMPING STATION



KEADBY PUMPING STATION



GOODCOP PUMPING STATION



TUNNELPITS PUMPING STATION



GREENHOLME PUMPING STATION





DEMISE OF MISTERTON SOSS

- 1938
 - River Trent Catchment Board build new Sluice at West Stockwith
- 1963
 - Misterton Soss Sluice abandoned
- 1981
 - Second sluice and pumping station built



MISTERTON PUMPING STATION



MISTERTON SOSS



MISTERTON SOSS



CURRENT SITUATION

- 2 Major Pumping Stations
 - Keadby
 - West Stockwith
- 14 inland pumping stations owned by the Environment Agency
- Over 40 further pumps owned & operated by either IDBs or privately
 - Some pumping stations funded by the Coal Authority – Mining Subsidence
- 90km of flood defence embankments
- 1km of floodwall



ACKNOWLEDGEMENTS

- Manuscripts & Special Collections, University of Nottingham
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- West Yorkshire Archive Services
- British Library
- National Archives, Kew
- Martin Taylor
- Stephen Garner
- Environment Agency
- Geoff Heald, JBA Consulting (Engineer, Hatfield Chase IDB)
- Crowle & Ealand Heritage Society
- Crowle Library





PILFREY BRIDGE 1905





TUNNEL PITS 1904



Upwards of forty years ago a steam-engine was erected at a place called Little Hirst, about $3\frac{1}{2}$ miles from the outfall at the Trent; but experience showed that it was placed too far from its work, and in 1857 it was removed to its present position, Bull Hassocks, near Wroot. The engine was not new when purchased, having been constructed for marine purposes. It is a side-lever engine of 40 horse-power nominal, equivalent to 70 water horse-power. The scoop wheel is 30 feet diameter and 2 feet $11\frac{1}{2}$ inches wide, and works at the rate of $4\frac{1}{2}$ revolutions per minute, with an average lift of 5 feet.

North District, Dirtness Engine.—This district contains 10,660 acres. The entire works of drainage were previous to the year 1862 vested in the "Trustees of Decead Lands"; but in that year, by Act of Parliament, they were incorporated under the title of the "Corporation of the Level of Hatfield Chace," and twelve commissioners were appointed in the usual manner. Powers were taken to improve the drainage of the entire Level, and to erect machinery for the north district at Dirtness, about two miles from the town of Crowle. The new engines were built in 1864-65 by Messrs. Watt and Co., of the Soho Works, Birmingham, and comprise two compound condensing beam engines, each 50 horse-power nominal. The high-pressure cylinder is 20 inches diameter, with a stroke of 4 feet $4\frac{1}{2}$ inches. The low-pressure is 35 inches diameter, with 6 feet stroke. The two engines are coupled at an angle of 90° to a crank shaft carrying the fly-wheel, and a pinion which gears into a wheel with wooden cogs and shaft passing through the engine-house wall, and carrying a pinion gearing into teeth cast with the rim of the scoop wheel. Steam is supplied by four double-flued boilers, 20 feet long by 7 feet diameter, working to a pressure of from 20 lb. to 30 lb. steam. The scoop wheel is 33 feet 3 inches diameter and 6 feet wide, and is capable of raising and delivering 12,000 cubic feet of water 7 feet

high per minute, equal to 159 water horse-power. It contains 36 scoops, with a radial length of 7 feet 10 inches each. These enter the water at an angle of 13° and leave it at 31° . Extreme dip, 7 feet; average dip, 4 feet; and average lift, 4 feet 9 inches. Number of revolutions of engines per minute, 26; and those of the scoop wheel, 4. The wheel has 8 spokes each in one casting of the width of the wheel, with three rims bolted to the spokes, and each carrying a set of oak start-posts 7 inches by $3\frac{1}{2}$ inches at the rim, and $4\frac{1}{4}$ inches by $3\frac{1}{2}$ inches at the circumference. Each set of start-posts is held together by two wrought-iron rings $2\frac{1}{2}$ inches by $\frac{1}{2}$ inch, one in the middle and the other about 4 inches from the water end of the start. The floats are of 1-inch fir, and planking is also carried round the wheel at the inner end of the floats. The wheel contains in planking 166 cubic feet of fir timber, equal to about $2\frac{1}{2}$ tons, and in oak start-posts 115 cubic feet, weighing about $2\frac{1}{2}$ tons. The buildings cover 3990 superficial feet of ground, the boiler-house being 41 feet square; the engine-house is 52 feet 6 inches by 28 feet; and the wheel-house, 52 feet 6 inches by 16 feet.

The cost of the engines, boilers, and scoop wheel was 4340*l.*, and of the building, 4547*l.* Taking the horse-power at 159 W.H.P. this gives 26·30*l.* for the machinery, and 28·60*l.* for the buildings; together, 55·90*l.* per horse-power in water lifted.

WEXFORD HARBOUR RECLAMATION WORKS, IRELAND.—A 1866

The Drainage of Fens and Low Lands: By Gravitation and Steam Power

By William Henry Wheeler

1888

