MASTENBROEK
TRENCHING OFFSHORE ENVIRONMENTAL









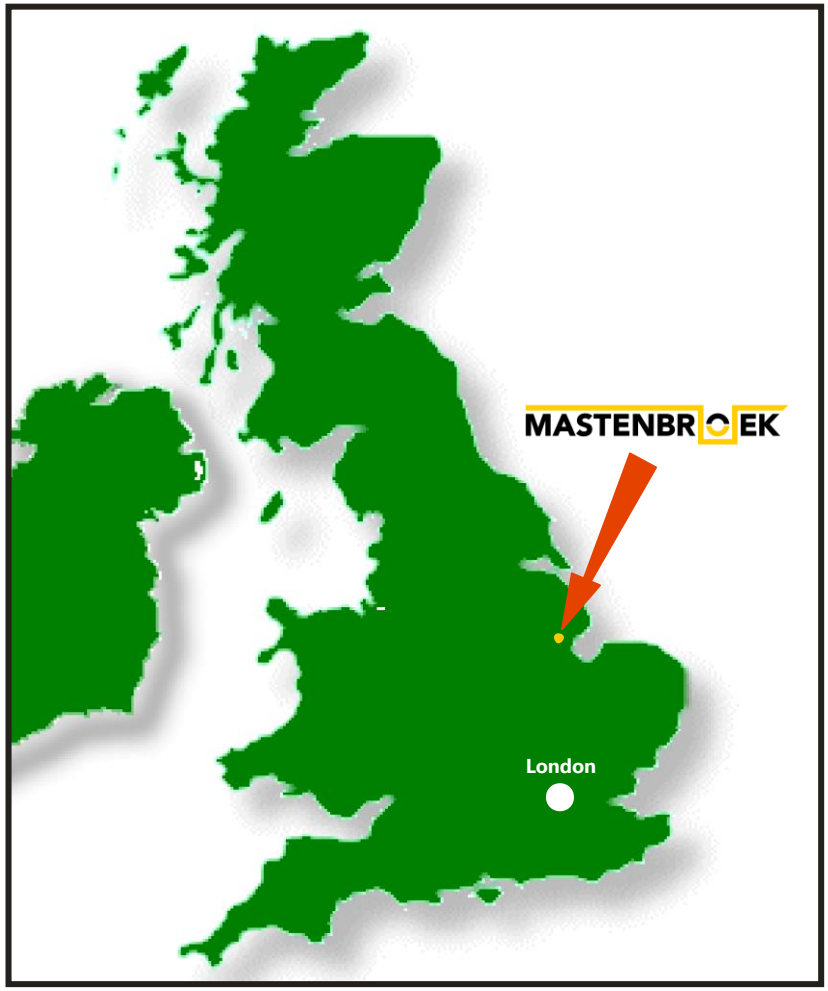


IAgrE

Fred Clarke
20th May 2015
Advances in Sub Surface Drainage Technology

Company Profile

- Founded 1965 by
  John Mastenbroek
- Family-owned business
- Head office at Boston
- 40 employees
- Up to 25 machines per year
- Authorised Trimble Dealer



Industries Served

- Sub surface Drainage
- Deep Trenching
- Utility Trenching
- Offshore
- Environmental











Sub surface Drainage

- Agriculture
- Sports Amenities





Circa 1970



2015



2015 Trencher Technology

- Increased productivity
  - High speed hydraulic controls
  - Integrated approach to site planning
- Technology-driven solutions
  - Precision farming decisions
  - Reduced environmental impact for inputs used

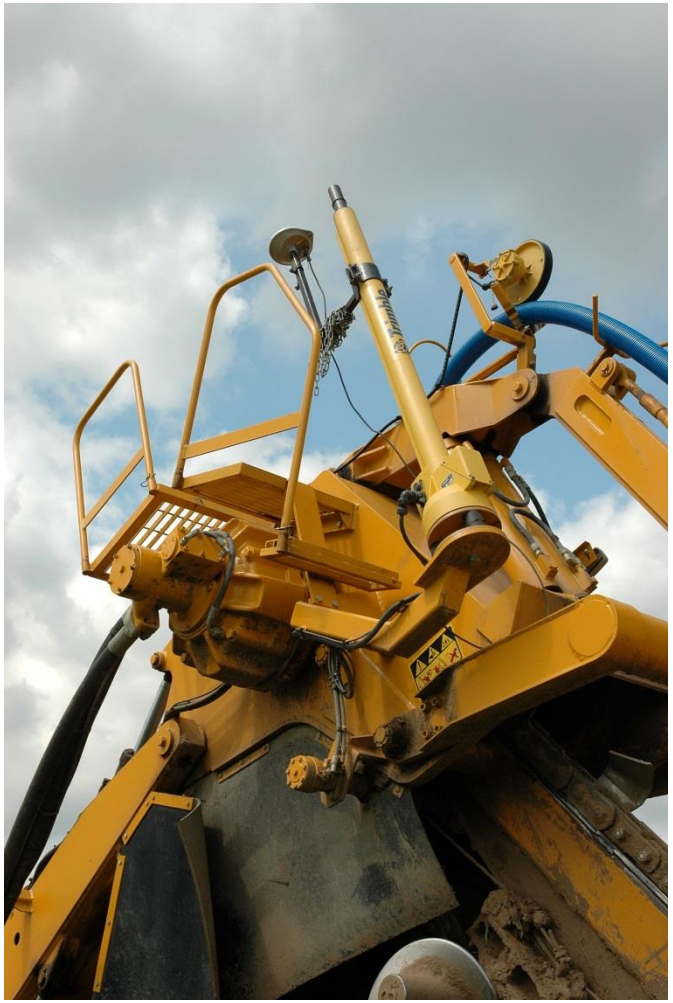
2015



Machine Control

- Trimble authorised Dealer and service centre
- Laser depth control from 1970’s
- GPS depth control from 2009





Machine Control

- Why use GPS instead of Lasers…..
  - Reduced Survey times
  - No Calibration issues
  - No Dust issues
  - No Rain issues
  - No Fog issues
  - No Snow issues
  - No Wind issues
  - Greater range in all planes
  - Earth flat vs. Laser flat
  - Save gravel
  - As-applied maps
  - Steering control for the machine
  - Interaction with precision farming decisions

GPS Work flow



Survey

- Data collection
- Whole field
- Individual drain run
- Drive or Walk or Fly!





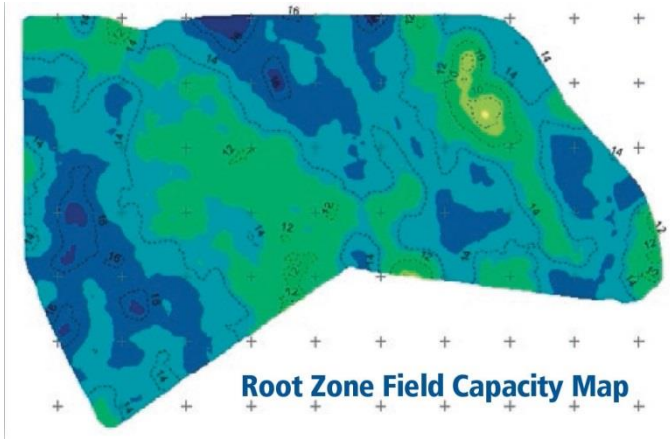


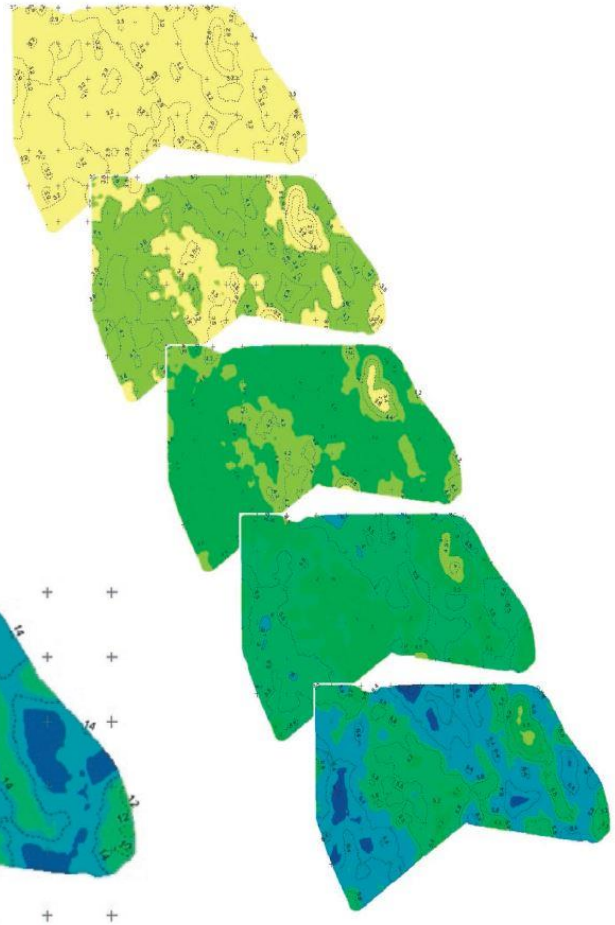
Survey

Soil Information System ™

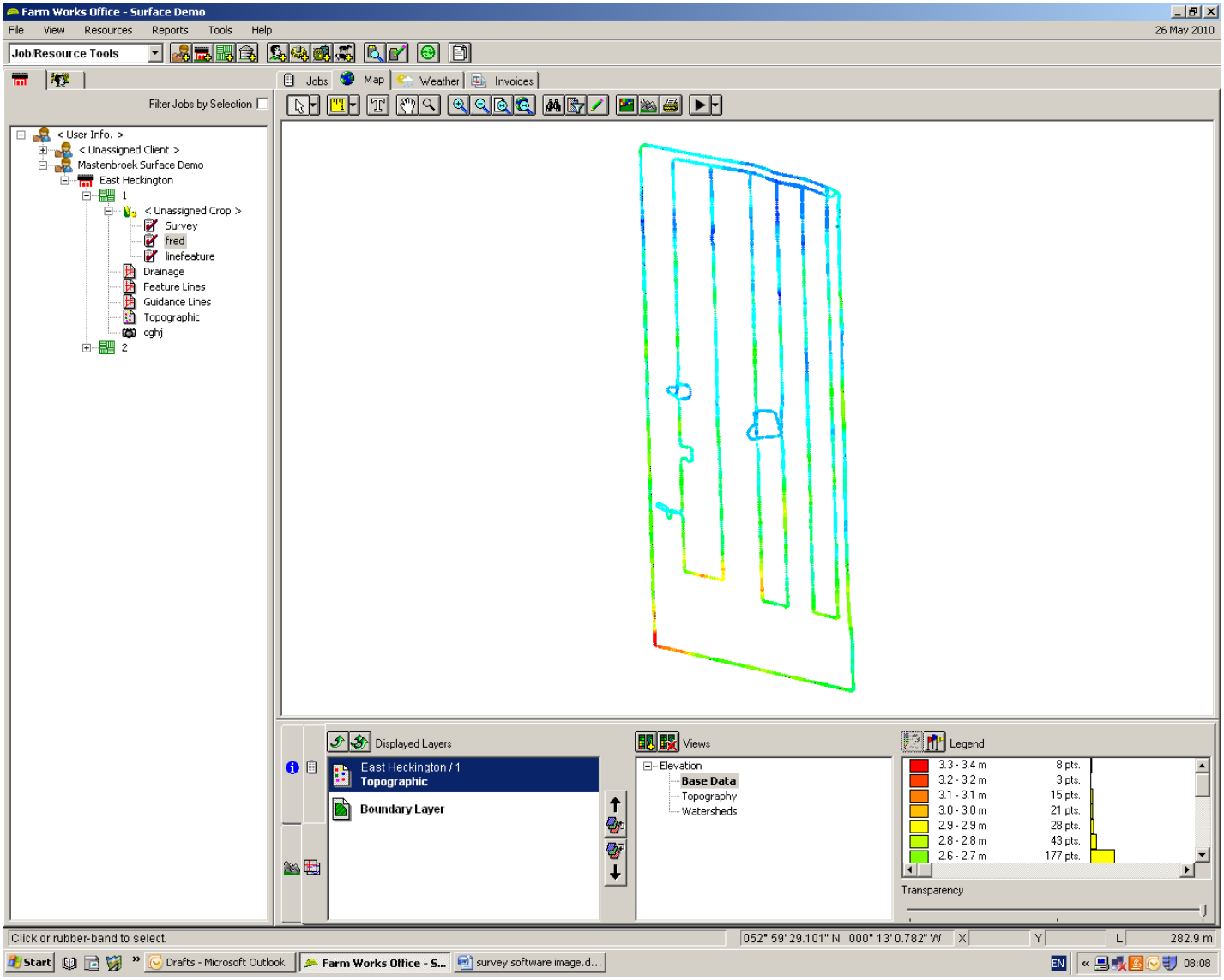
- Soil mapping technology
  - Records physical and chemical characteristics
    - Soil texture / type
    - Compaction characteristics
    - Moisture holding capacity
  - Overlay with topographical data
  - More informed drainage decisions





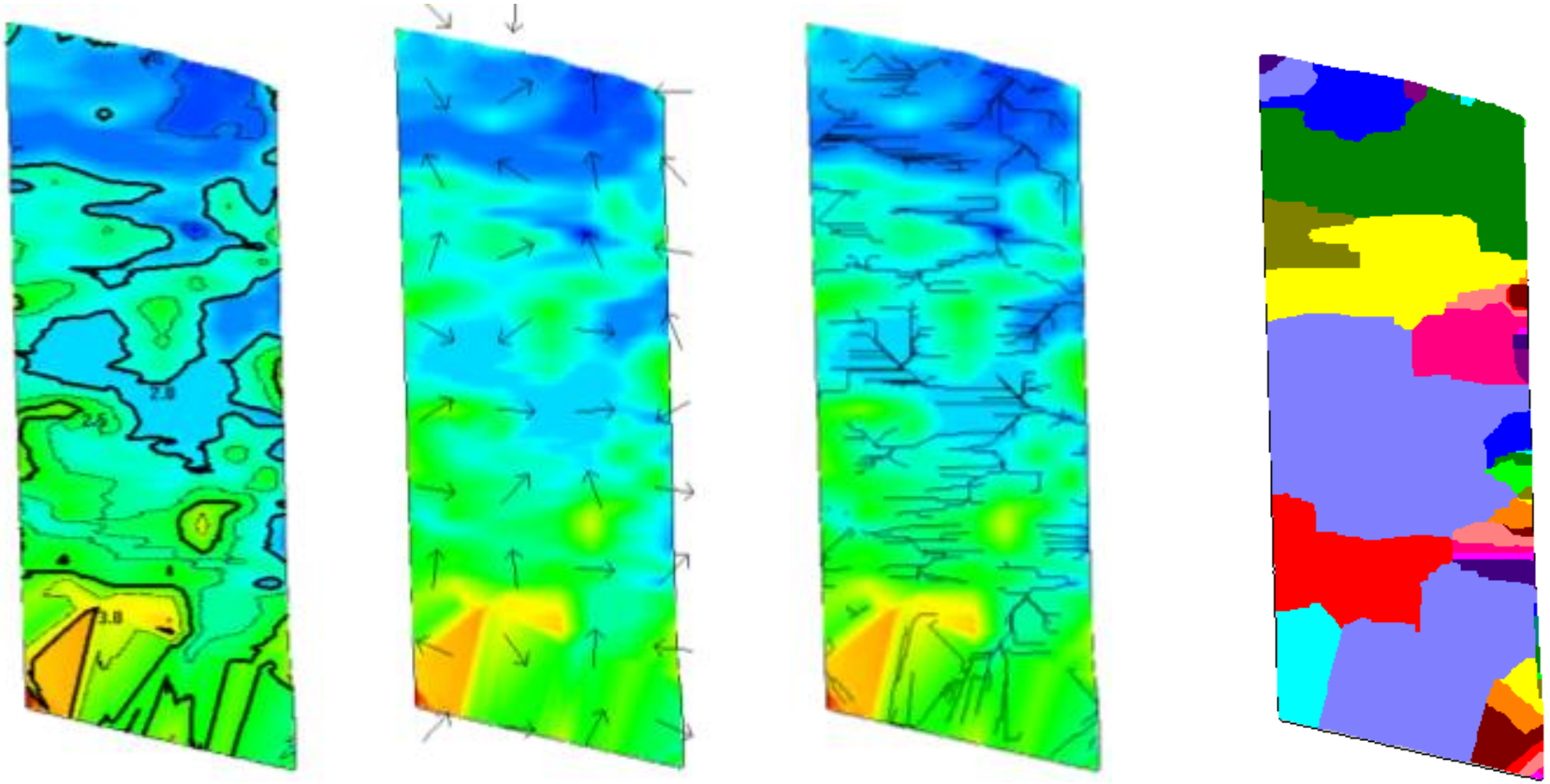


Survey


Farm Works Office - Surface Demo
File View Resources Reports Tools Help
26 May 2010
Job/Resource Tools
Jobs Map Weather Invoices
Filter Jobs by Selection
< User Info. >
< Unassigned Client >
Mastenbroek Surface Demo
East Heckington
1
< Unassigned Crop >
Survey
fred
linefeature
Drainage
Feature Lines
Guidance Lines
Topographic
cghj
2
Displayed Layers
East Heckington / 1
Topographic
Boundary Layer
Views
Elevation
Base Data
Topography
Watersheds
Legend
3.3 - 3.4 m 8 pts.
3.2 - 3.2 m 3 pts.
3.1 - 3.1 m 15 pts.
3.0 - 3.0 m 21 pts.
2.9 - 2.9 m 28 pts.
2.8 - 2.8 m 43 pts.
2.6 - 2.7 m 177 pts.
Transparency
Click or rubber-band to select.
052° 59' 29.101" N 000° 13' 0.782" W
X
Y
L
282.9 m
Start
Drafts - Microsoft Outlook
Farm Works Office - S...
survey software image.d...
08:08

Analyse

Contour flow arrows tributary watershed



Analyse

Hooghoudt's Drainage Equation

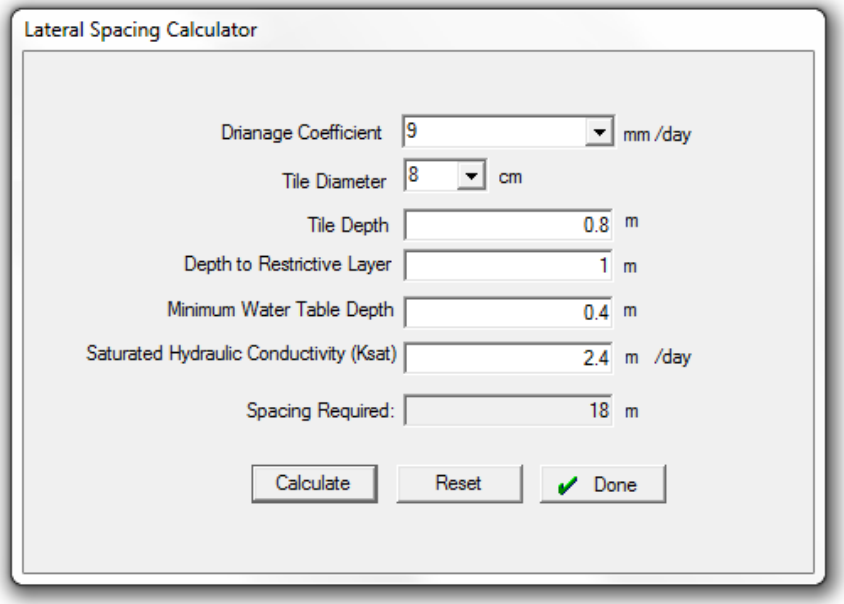
$$S = \sqrt{\frac{4Kh^2}{v}}$$

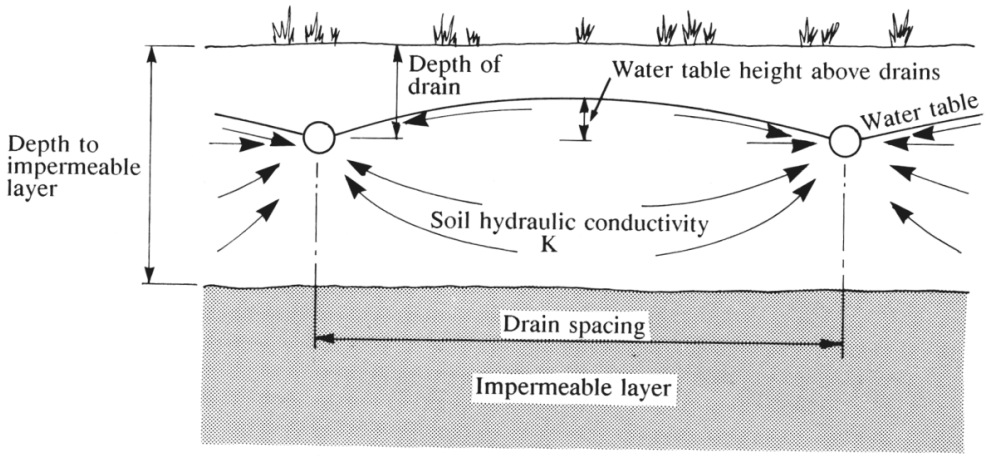
S = drain spacing (m),

K = hydraulic conductivity (cm/hr),

h = height of the watertable (usually to drains) (cm),

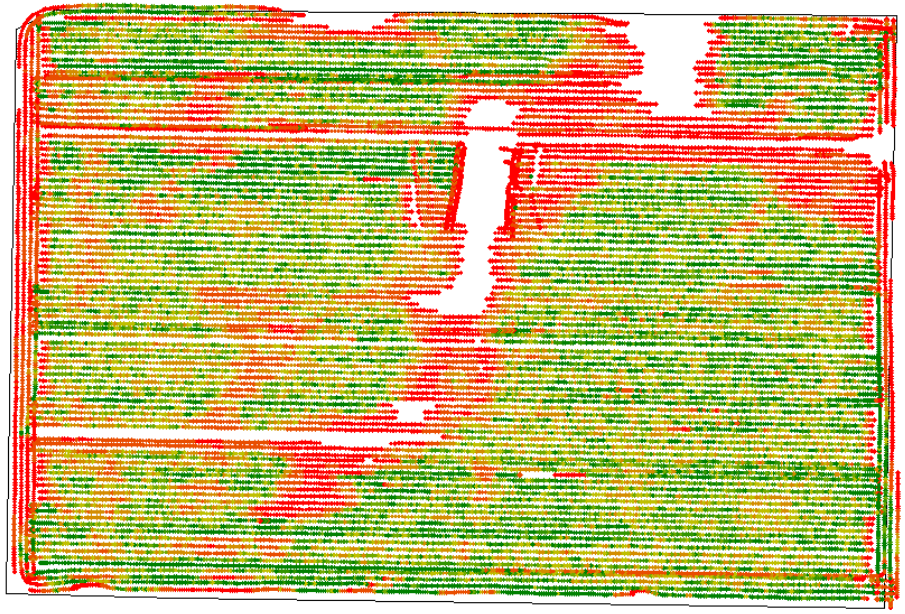
v = daily rainfall (cm/hr)

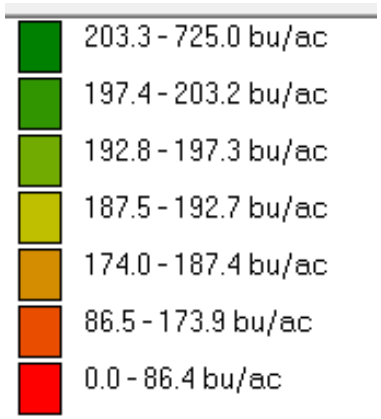




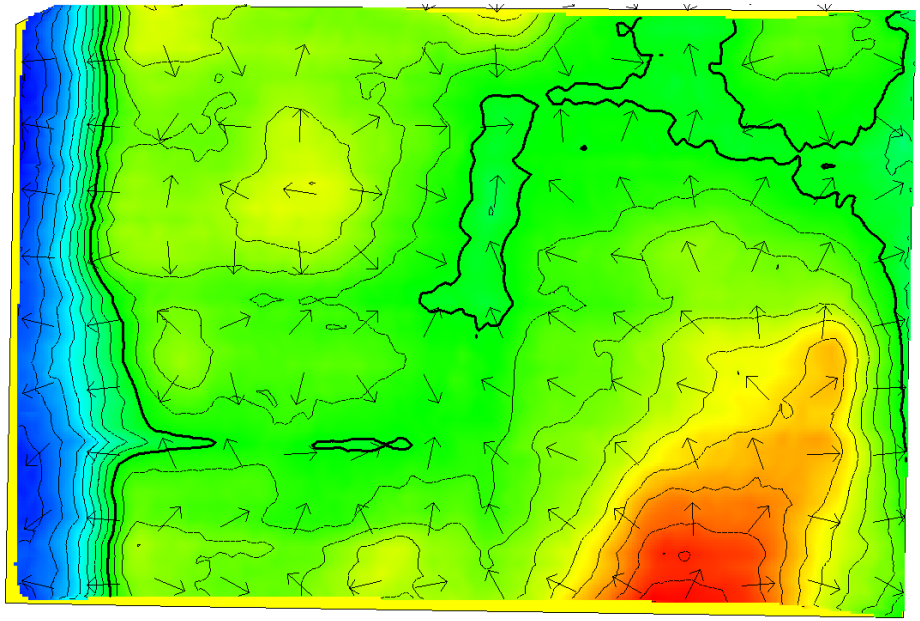
Analyse

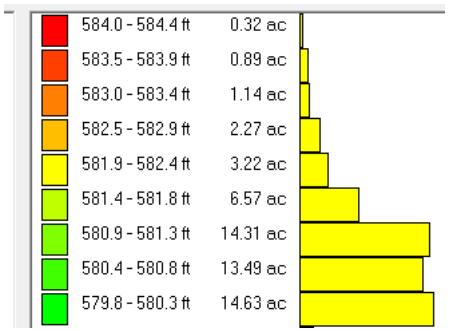
Yield Data

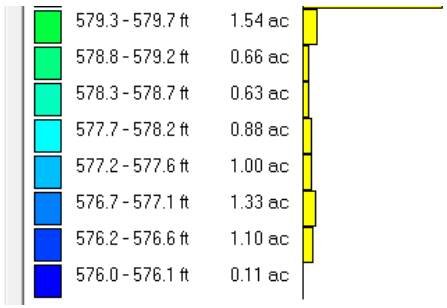




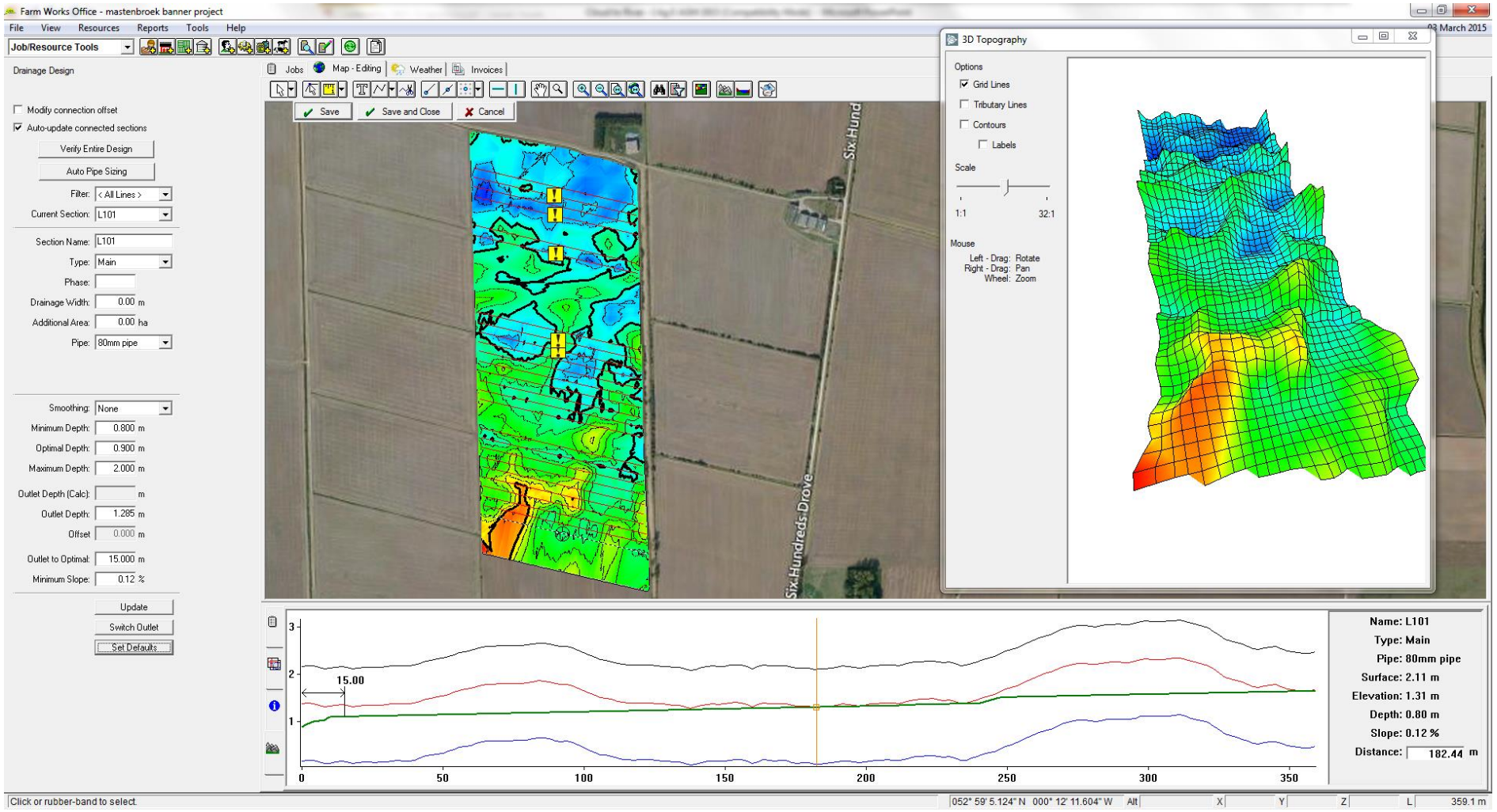
Topographic Data



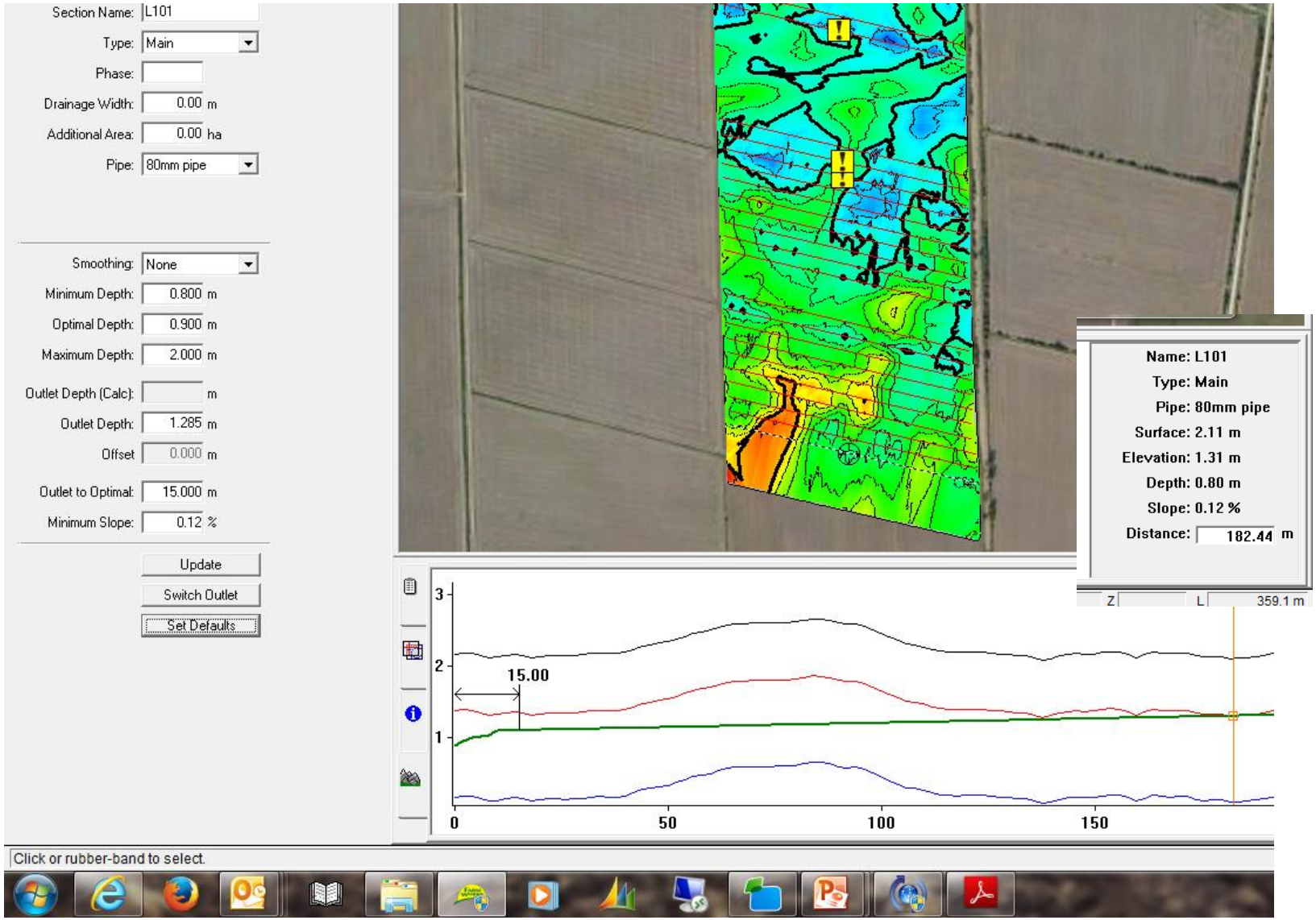




Design

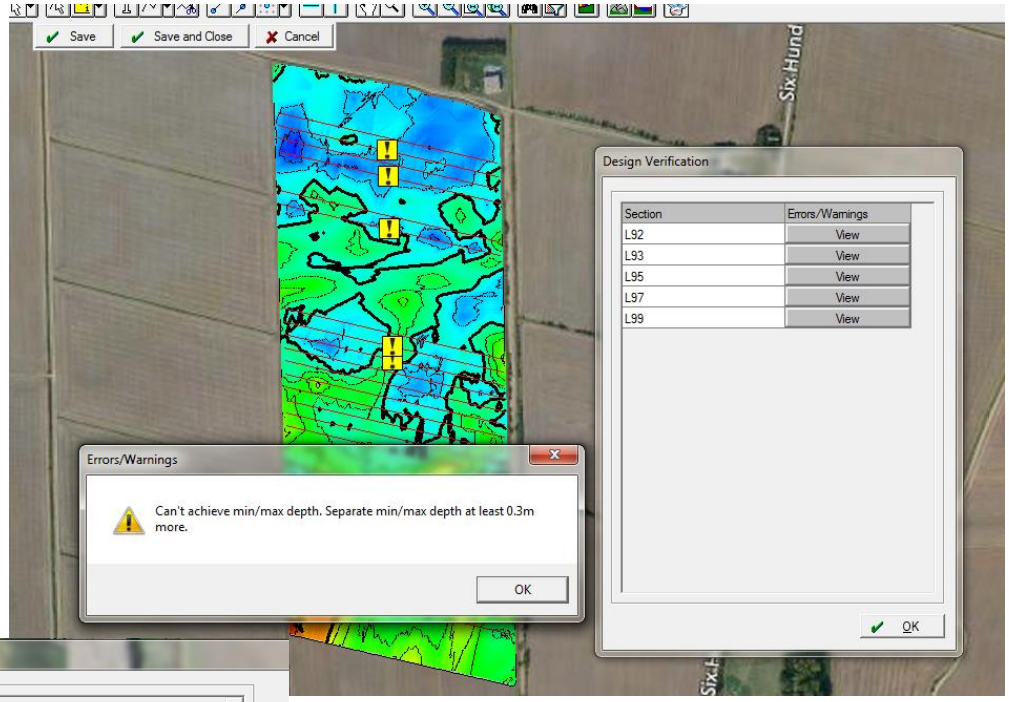

Farm Works Office - mastenbroek banner project
File View Resources Reports Tools Help
03 March 2015
Job/Resource Tools
Drainage Design
Jobs Map - Editing Weather Invoices
Modify connection offset
Auto-update connected sections
Verify Entire Design
Auto Pipe Sizing
Filter: < All Lines >
Current Section: L101
Section Name: L101
Type: Main
Phase:
Drainage Width: 0.00 m
Additional Area: 0.00 ha
Pipe: 80mm pipe
Smoothing: None
Minimum Depth: 0.800 m
Optimal Depth: 0.900 m
Maximum Depth: 2.000 m
Outlet Depth (Calc): m
Outlet Depth: 1.285 m
Offset 0.000 m
Outlet to Optimal: 15.000 m
Minimum Slope: 0.12 %
Update
Switch Outlet
Set Defaults
Save
Save and Close
Cancel
Six Hundreds Drove
3D Topography
Options
Grid Lines
Tributary Lines
Contours
Labels
Scale
1:1
32:1
Mouse
Left - Drag: Rotate
Right - Drag: Pan
Wheel: Zoom
15.00
0
50
100
150
200
250
300
350
Name: L101
Type: Main
Pipe: 80mm pipe
Surface: 2.11 m
Elevation: 1.31 m
Depth: 0.80 m
Slope: 0.12 %
Distance: 182.44 m
Click or rubber-band to select.
052° 59' 5.124" N 000° 12' 11.604" W
Alt
X
Y
Z
L
359.1 m

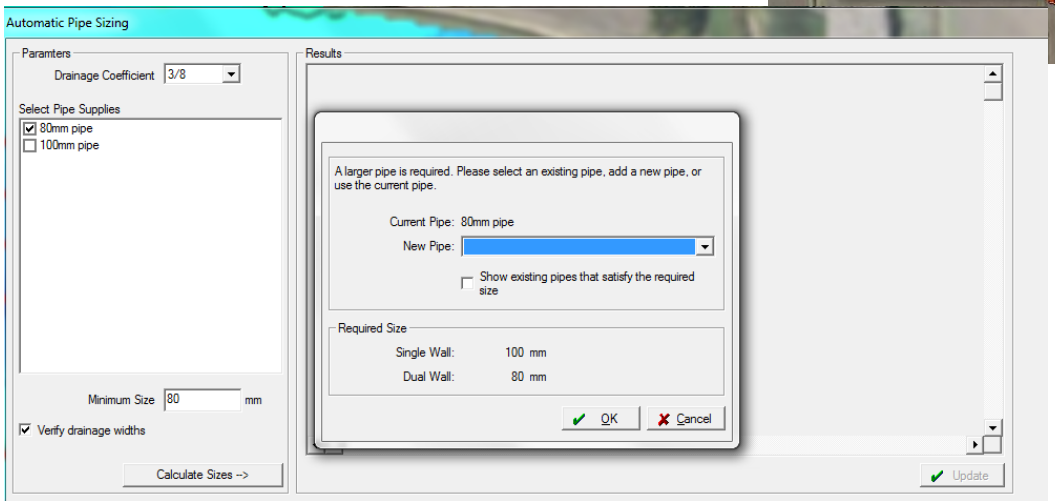
Design


Section Name: L101
Type: Main
Phase:
Drainage Width: 0.00 m
Additional Area: 0.00 ha
Pipe: 80mm pipe
Smoothing: None
Minimum Depth: 0.800 m
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Maximum Depth: 2.000 m
Outlet Depth (Calc): m
Outlet Depth: 1.285 m
Offset 0.000 m
Outlet to Optimal: 15.000 m
Minimum Slope: 0.12 %
Update
Switch Outlet
Set Defaults
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Pipe: 80mm pipe
Surface: 2.11 m
Elevation: 1.31 m
Depth: 0.80 m
Slope: 0.12 %
Distance: 182.44 m
Z
L 359.1 m
15.00
0
50
100
150
Click or rubber-band to select.

Design

- Design verification
- Automatic pipe sizing





Design

- Map of proposal
- Quantity requirement
- Cost estimate
- Machine control file



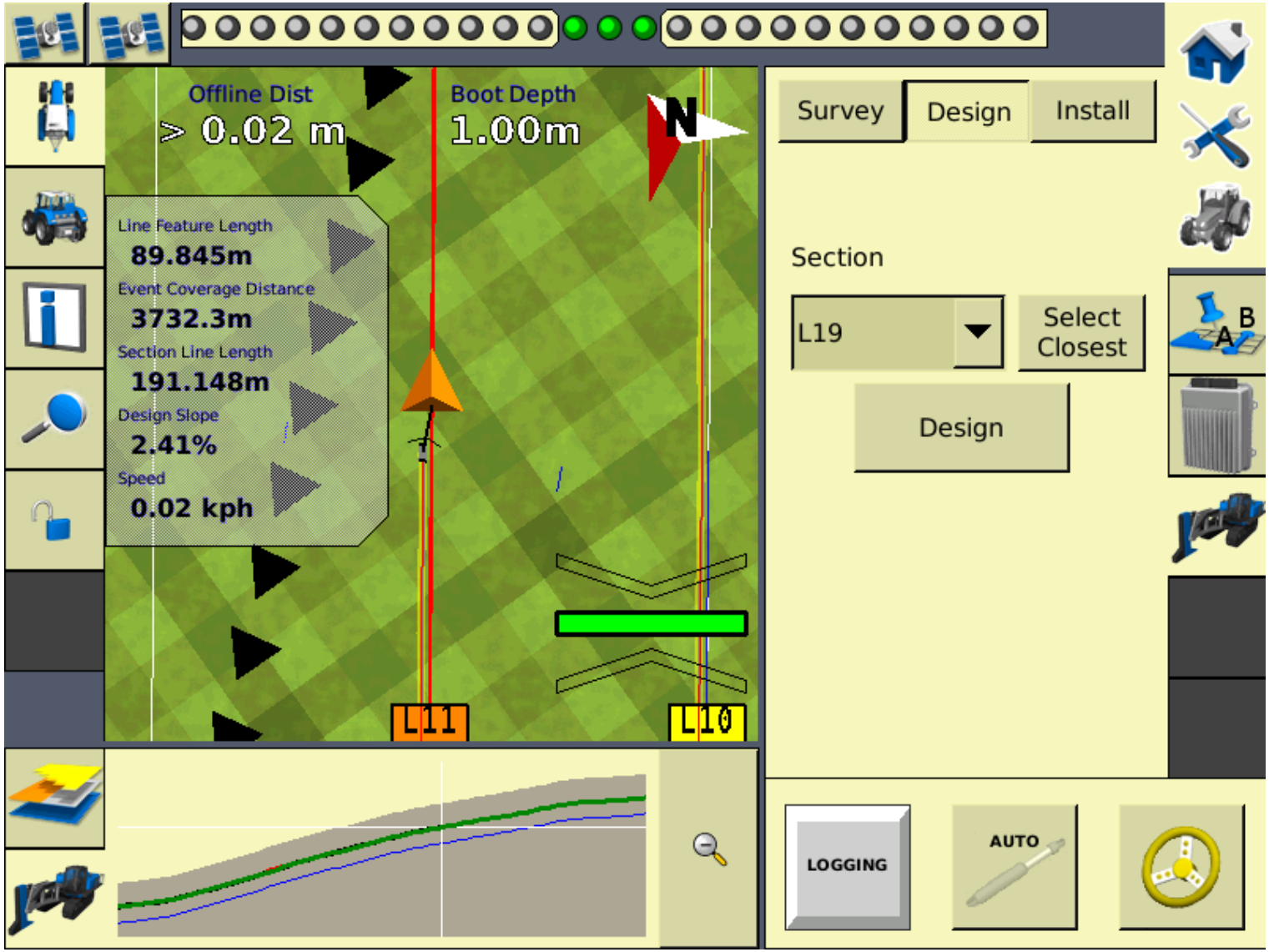
Drainage Report - Planned

Supply	Quantity	Unit Cost	Supply Cost	Total Length	Cost / m
WM Topo field survey / Topo farm / Topo field					
80mm pipe	1,560.93 metre:	£0.80/ m	£1,248.75	1,560.93	£0.80
100mm pipe	229.03 metre:	£1.00/ m	£229.03	229.03	£1.00
160mm pipe	345.20 metre:	£1.60/ m	£552.33	345.20	£1.60
			£2,030.10	**2,135.16 m**	**£0.95**

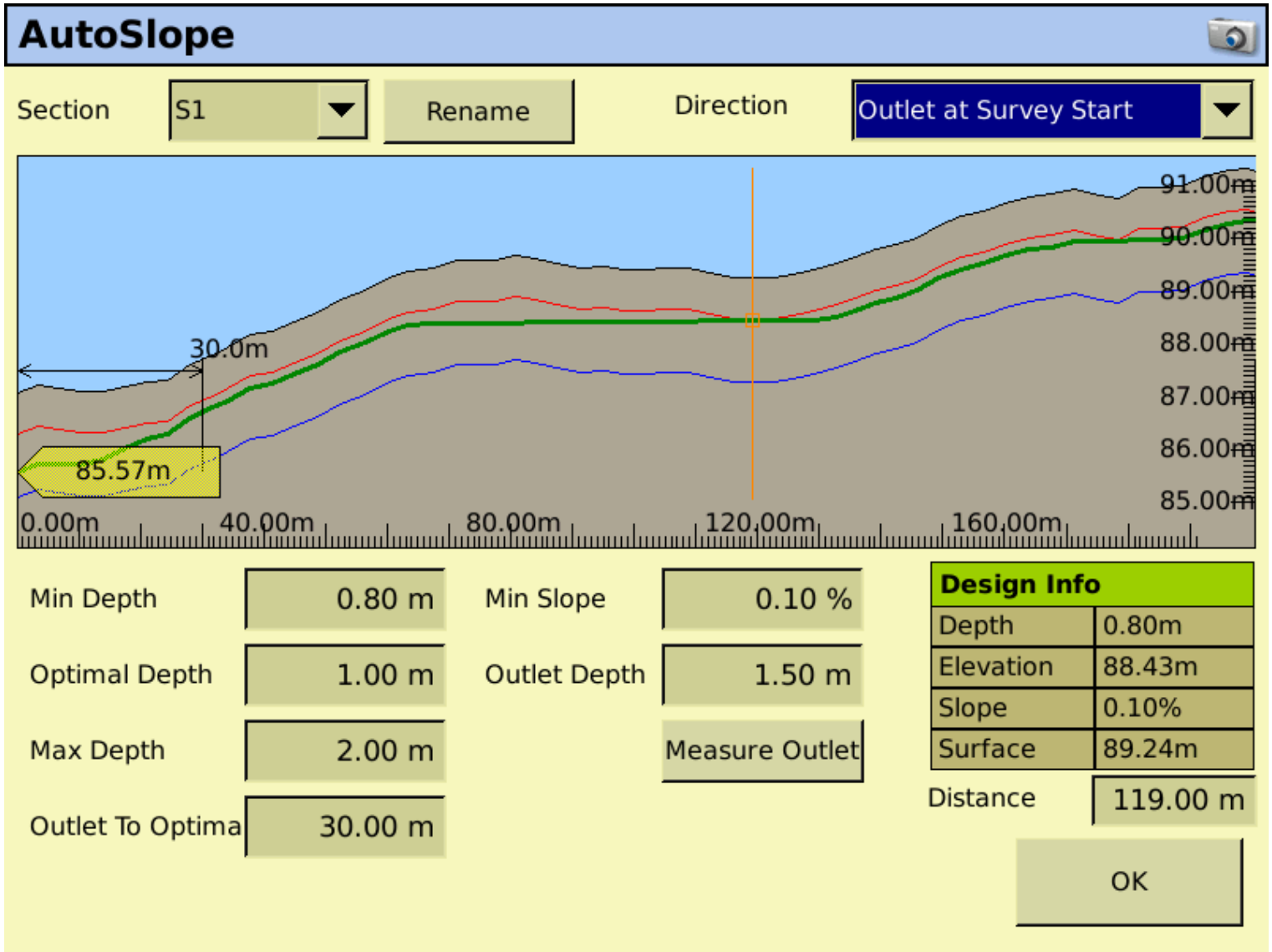
Adapters

From	To	Quantity
80 mm	100 mm	6
80 mm	160 mm	15
100 mm	160 mm	2

Install

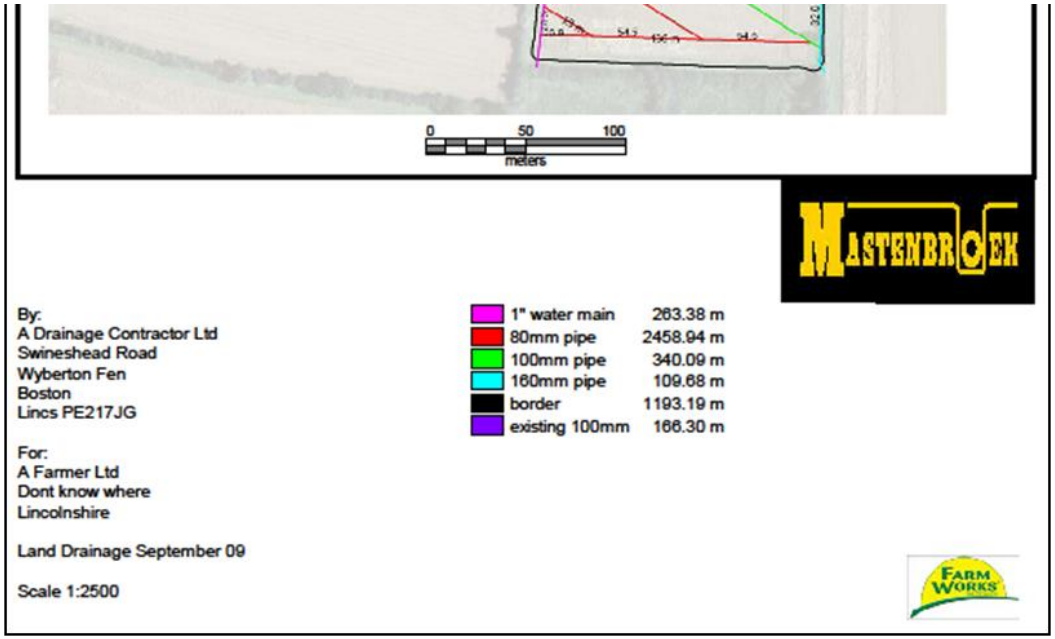

Offline Dist
> 0.02 m
Boot Depth
1.00m
N
Line Feature Length
89.845m
Event Coverage Distance
3732.3m
Section Line Length
191.148m
Design Slope
2.41%
Speed
0.02 kph
L11
L10
Survey
Design
Install
Section
L19
Select Closest
Design
A
B
LOGGING
AUTO

Install


AutoSlope
Section
S1
Rename
Direction
Outlet at Survey Start
91.00m
90.00m
89.00m
88.00m
87.00m
86.00m
85.00m
30.0m
85.57m
0.00m
40.00m
80.00m
120.00m
160.00m
Min Depth
0.80 m
Min Slope
0.10 %
Optimal Depth
1.00 m
Outlet Depth
1.50 m
Max Depth
2.00 m
Measure Outlet
Outlet To Optima
30.00 m
Design Info
Depth
0.80m
Elevation
88.43m
Slope
0.10%
Surface
89.24m
Distance
119.00 m
OK


LINCOLNSHIRE DRAINAGE CO LTD
30/20
01205 311800

Mapping


0 50 100
meters
By:
A Drainage Contractor Ltd
Swineshead Road
Wyberton Fen
Boston
Lincs PE217JG
For:
A Farmer Ltd
Dont know where
Lincolnshire
Land Drainage September 09
Scale 1:2500
1" water main 263.38 m
80mm pipe 2458.94 m
100mm pipe 340.09 m
160mm pipe 109.68 m
border 1193.19 m
existing 100mm 166.30 m


Final Drainage Plan Field reference 123
0 50 100
meters
By:
A Drainage Contractor Ltd
Swineshead Road
Wyberton Fen
Boston
Lincs PE217JG
For:
A Farmer Ltd
Dont know where
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1" water main 263.38 m
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GPS – the future



- Trimble UX5 UAS
  aerial imaging solution
- Data collection streamlined
- Agricultural agronomy
- Legislation restrictions



GPS – the future

3D point cloud

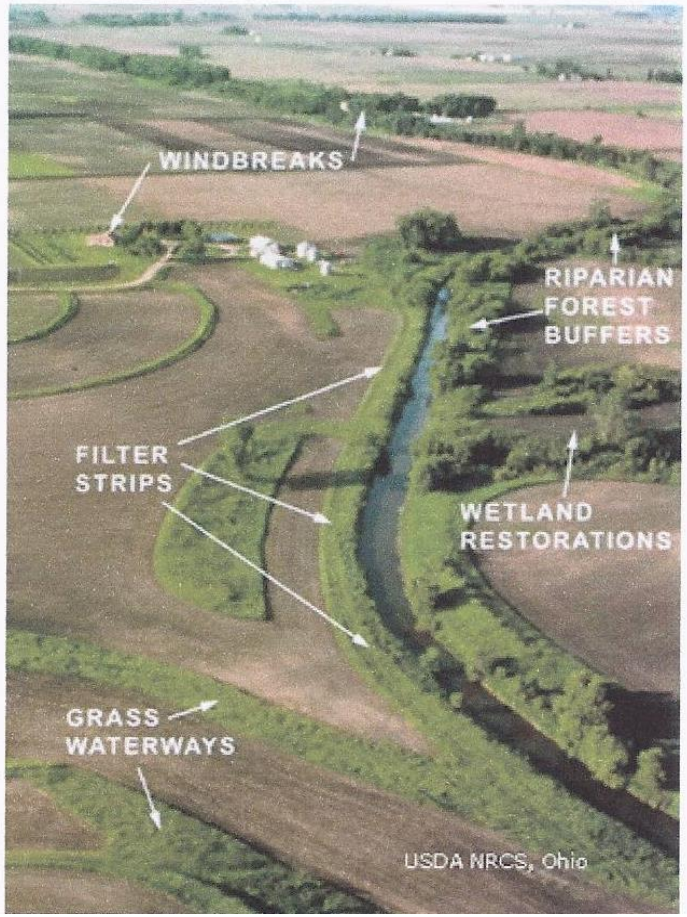


Vaxholm Castle,
Sweden
126 Images
120 m Flight Height
3.8 cm GSD
550 x 600 m

Future of drainage

Environmental / conservation drainage

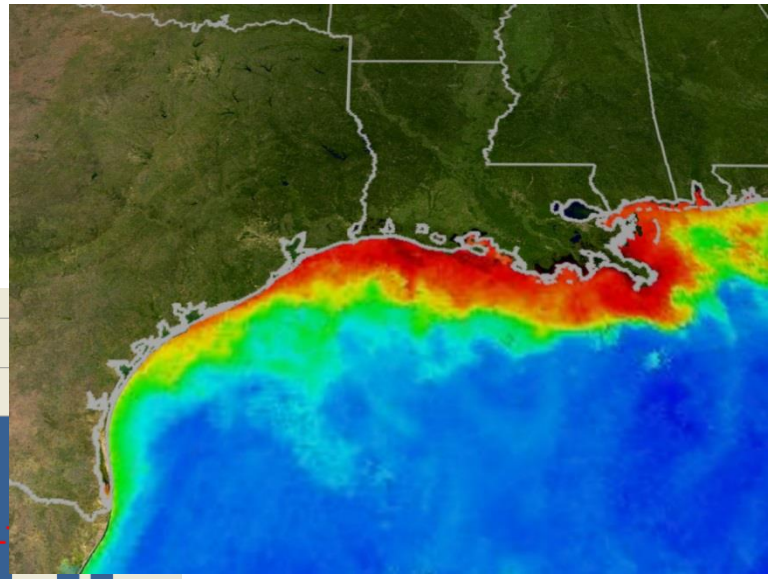
- Name for a range of emerging technologies from USA
- Aim to reduce nitrates and other pollutants in drainage water run off
- Controlled drainage
- Shallow drainage
- Bio Reactors
- Buffer zones
- Ditch designs

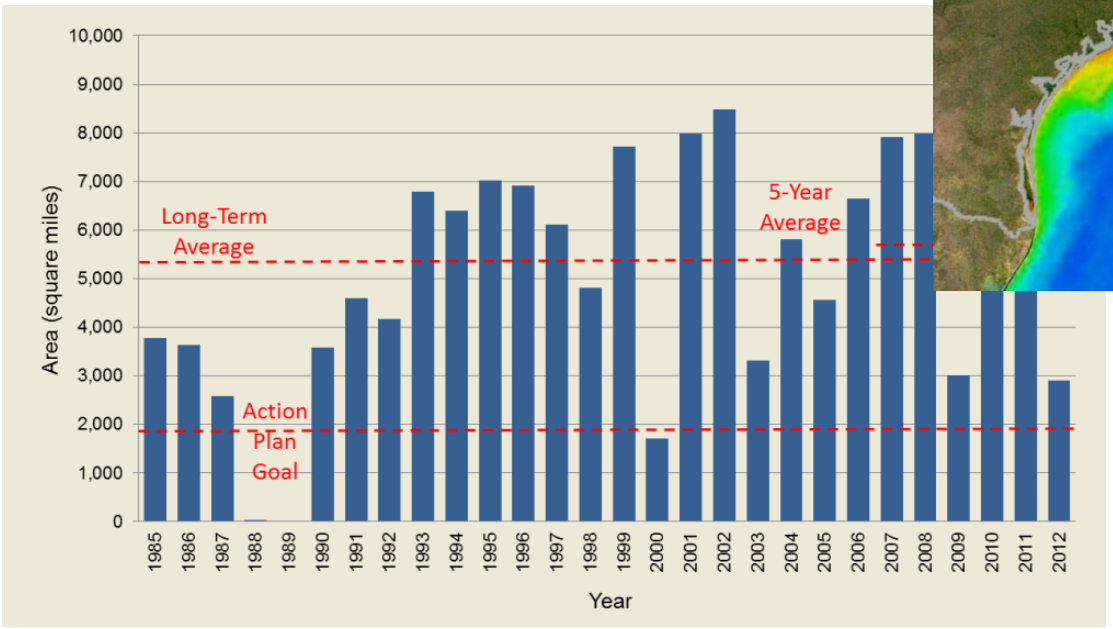


Future of drainage

Environmental / conservation drainage

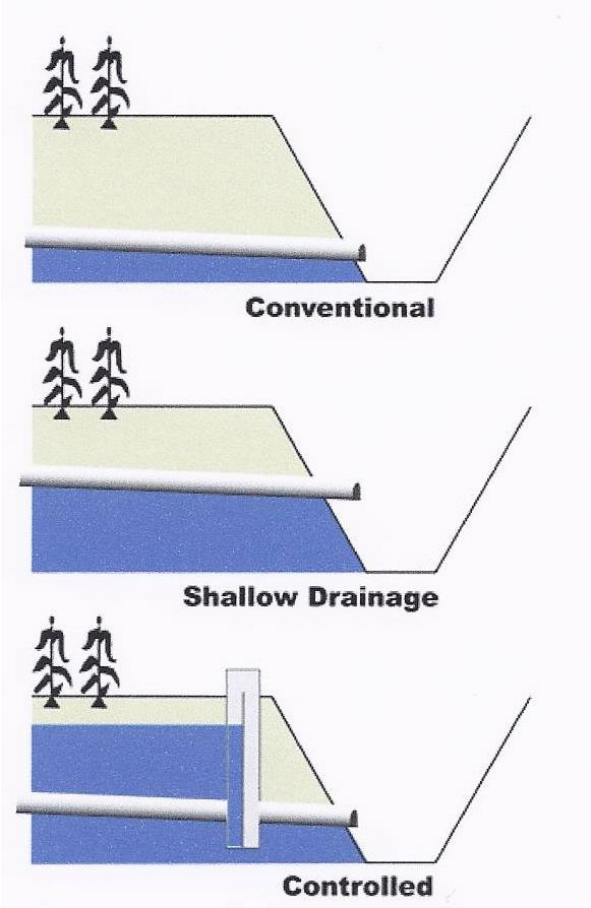
- Nitrate run-off creates algae bloom
- Decay process uses oxygen





Controlled Drainage

- Works best on flatter fields
- Controlled water release
  - Generate crop root zone
  - Ensure trafficable field conditions
- Excess drainage increases nitrate losses
- Has shown significant reduction in nitrate flows to rivers

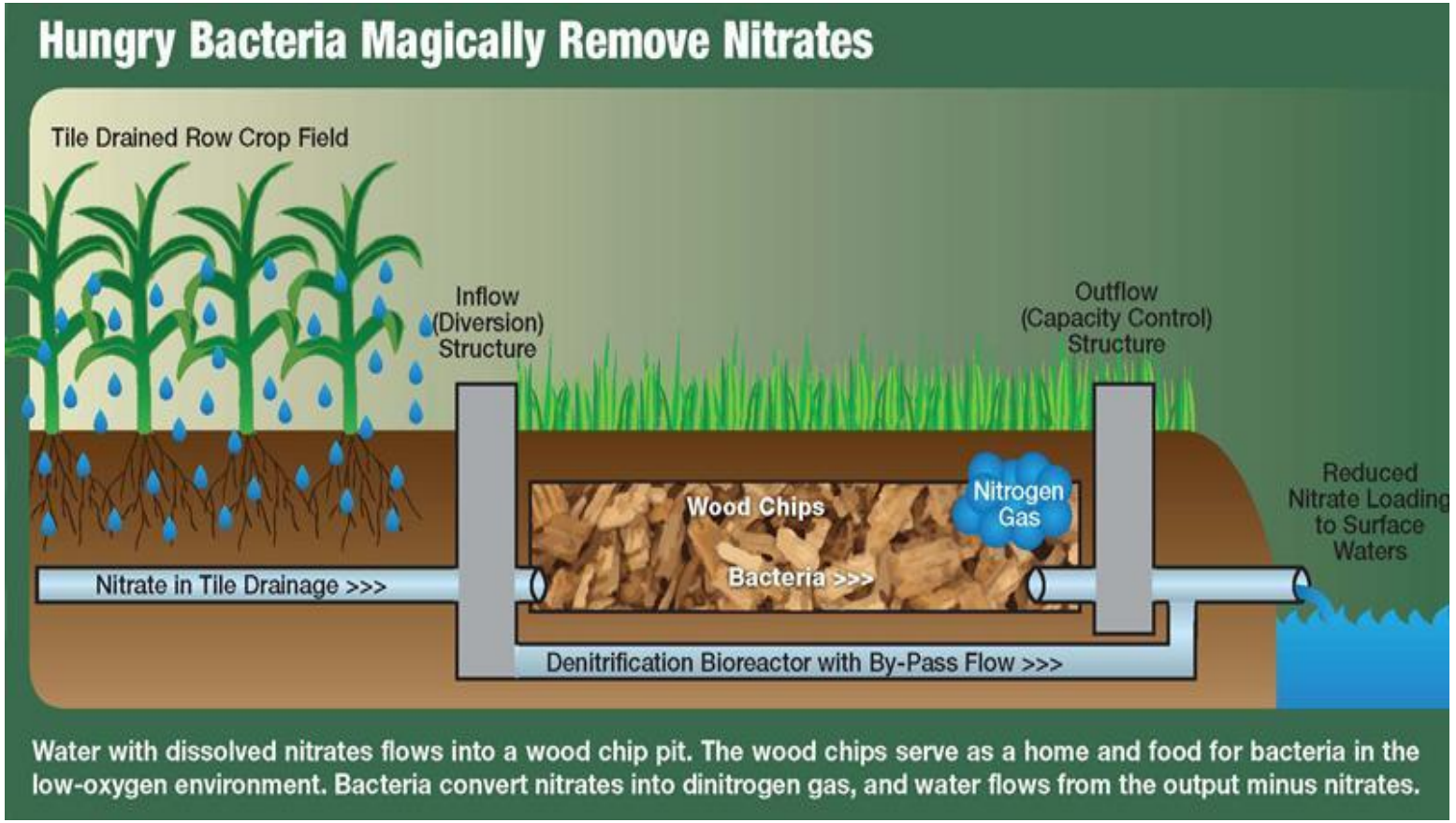


Trimble Authorised Dealer

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TRENCHING OFFSHORE ENVIRONMENTAL



Bioreactors and denitrification



Bioreactors and denitrification

- Trials in the USA for last 15 years
- Dr Richard Cook – Illinois State University
- Lifespan is unknown as they are still operating successfully after 15 years in USA
- 1st trial in the UK is just getting started

UK Trial of Bioreactor

- Rob Burtonshaw – Nuffield scholarship in 2013
- Ladbroke in Warwickshire
- Funded by Severn rivers authority and E.A.
- No benefit to land owner / producer
- Typical installation cost £1,500

Trimble Authorised Dealer

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Thank you
Any Questions?

