

# Merthyr Mawr Dune Rejuvenation Works Topographic Survey Report

**Kenneth Pye & Simon J. Blott**

Kenneth Pye Associates Ltd

Report No: 94

Date: May 2013



## **About Natural Resources Wales**

Natural Resources Wales is the organisation responsible for the work carried out by the three former organisations, the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales. It is also responsible for some functions previously undertaken by Welsh Government.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future.

We work for the communities of Wales to protect people and their homes as much as possible from environmental incidents like flooding and pollution. We provide opportunities for people to learn, use and benefit from Wales' natural resources.

We work to support Wales' economy by enabling the sustainable use of natural resources to support jobs and enterprise. We help businesses and developers to understand and consider environmental limits when they make important decisions.

We work to maintain and improve the quality of the environment for everyone and we work towards making the environment and our natural resources more resilient to climate change and other pressures.

Published by: Natural Resources Wales  
Maes y Ffynnon  
Penrhosgarnedd  
Bangor  
LL57 2DW

0300 065 3000

© Natural Resources Wales [2013]

All rights reserved. This document may be reproduced with prior permission of Natural Resources Wales

Further copies of this report are available from the library

Email: [library@cyfoethnaturiolcymru.gov.uk](mailto:library@cyfoethnaturiolcymru.gov.uk)

## **Evidence at Natural Resources Wales**

Natural Resources Wales is an evidence based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

This Evidence Report series serves as a record of work carried out or commissioned by Natural Resources Wales. It also helps us to share and promote use of our evidence by others and develop future collaborations. However, the views and recommendations presented in this report are not necessarily those of NRW and should, therefore, not be attributed to NRW.

## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013

Report series: Evidence Report  
Report number: 94  
Publication date: 29 May 2013  
Contract number: STE0141  
Contractor: Kenneth Pye Associates Ltd  
Contract Manager: Dr. Emmer Litt  
Title: **Merthyr Mawr Dune Rejuvenation Works Topographic Survey Report**  
Author(s): **Prof. Kenneth Pye & Dr. Simon J. Blott**  
Approved By: Dr. Emmer Litt  
Restrictions: None

### Distribution List (core)

NRW Library, Bangor

### Recommended citation for this volume:

KPAL (2013e) Merthyr Mawr Dune Rejuvenation Works Topographic Survey, May 2013. NRW Evidence Report No. 94. Kenneth Pye Associates Ltd., Solihull.

## Contents

About Natural Resources Wales..... ii

Evidence at Natural Resources Wales ..... iii

Contents..... v

1. Job Summary ..... 1

2. Error Checking..... 2

3. Monitoring Results..... 3

4. Field Photographs ..... 16

Data Archive Appendix..... 24

## 1. Job Summary

**KPAL Job No:** 140513  
**Report Date:** 29/05/2013  
**Client:** Countryside Council for Wales  
**Client Job Title:** Merthyr Mawr Dune Restoration Works

**Survey conducted:** 14<sup>th</sup> May 2013  
**Instruments used:** Leica ATX1230 SmartRover mounted on GLS30 pole (2 m)  
Leica GX1230 RTK base station mounted on GST20-9 tripod  
Leica RX1250XC and RX1210T Field Controllers  
Pacific Crest ADL Vantage radio transceiver (430-470 MHz)

**No. of data points:** 1123  
**RTK Control Station:** Wooden post surveyed-in using Leica Smartnet GPRS:  
Easting: 286182.551 m  
Northing: 176307.198 m  
Height: 4.891 m OD

**Summary report compiled by:** Simon J. Blott BSc MRes PhD FGS  
**Checked by:** Kenneth Pye ScD PhD MA CGeol FGS  
**Date:** 29 May 2013

## 2. Error Checking

**Table 1.** Average quality control for all 1123 data points

	<b>1-D (height) quality control</b>	<b>2-D (position) quality control</b>
Average	21.7 mm	13.1 mm
StDev	9.9 mm	6.6 mm

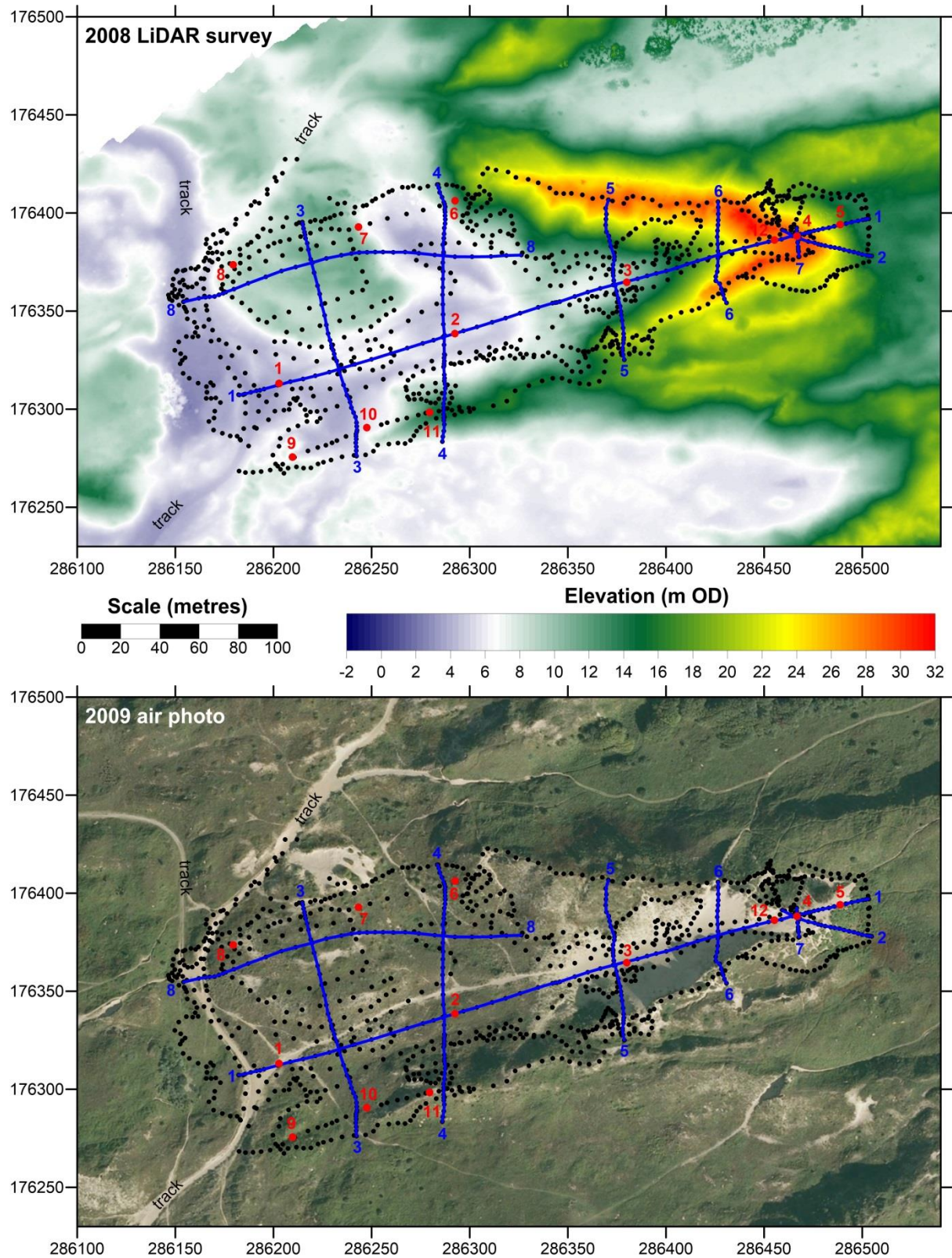
**Table 2.** Measured location of Benchmark 2 (wooden post set in dunes)

	<b>Easting</b>	<b>Northing</b>	<b>Height</b>
Surveyed with Smartnet corrections	286211.448	176304.554	5.294
Surveyed with base & rover (start) Error:	286211.404 -44 mm	176304.552 -2 mm	5.279 -15 mm
Surveyed with base & rover (end) Error:	286211.467 +19 mm	176304.470 -84 mm	5.264 -30 mm
Closing error (start to finish)	+63 mm	-82 mm	-15 mm

**Table 3.** Measured location of Benchmark 3 (signpost)

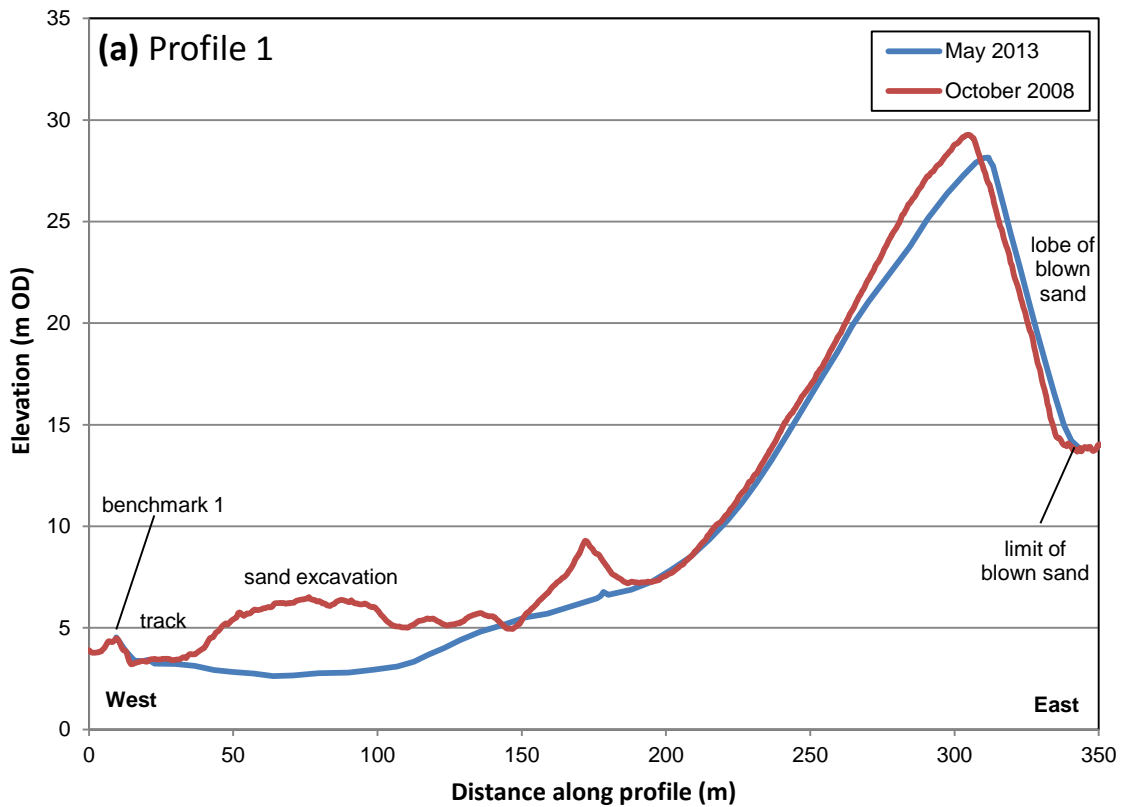
	<b>Easting</b>	<b>Northing</b>	<b>Height</b>
Surveyed with Smartnet corrections	286154.133	176354.702	4.698
Surveyed with base & rover Error:	286154.233 +100 mm	176354.772 +70 mm	4.679 -19 mm

### 3. Monitoring Results

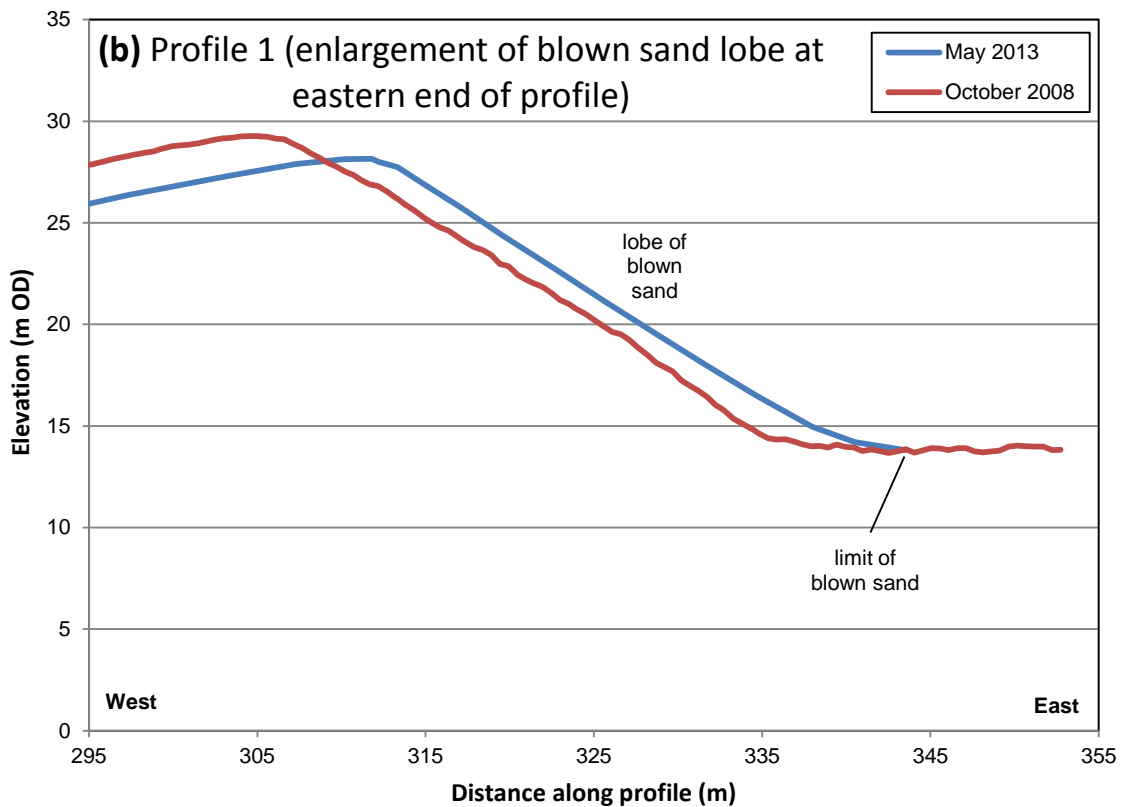


**Figure 1.** Locations of data points (black dots), sediment samples (red dots) and cross-profiles (blue lines), overlaid on 2008 LiDAR and 2009 air photographs.

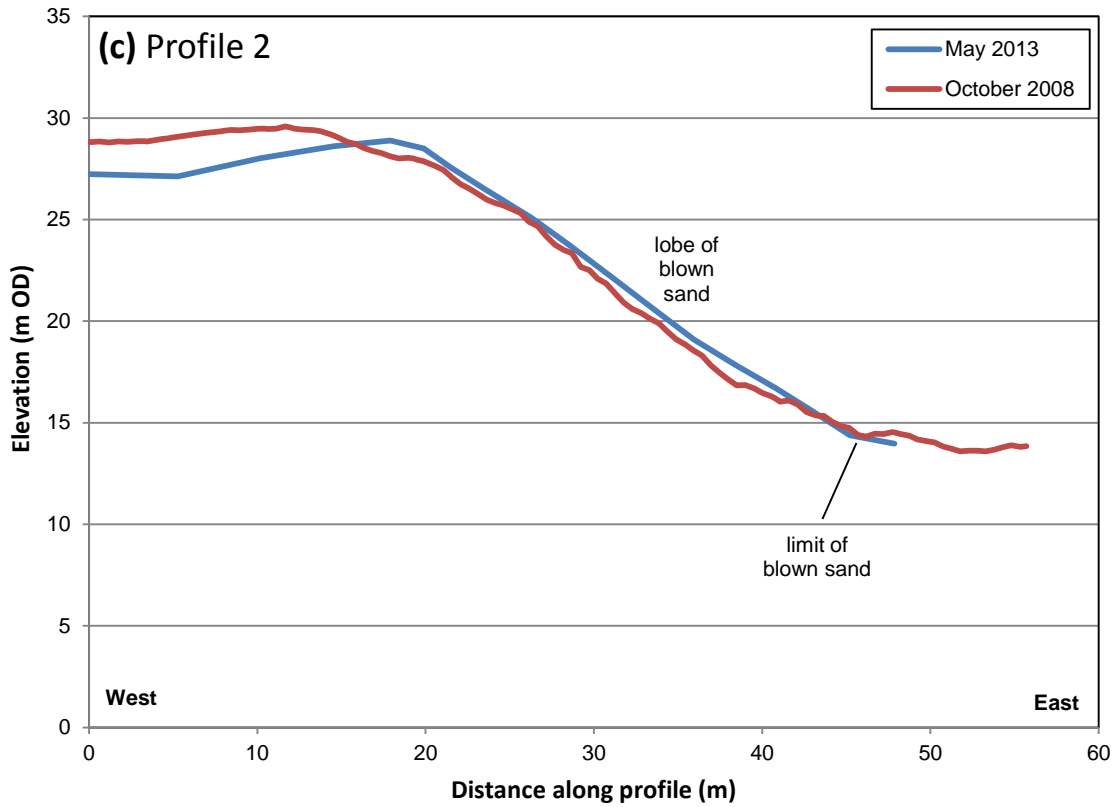




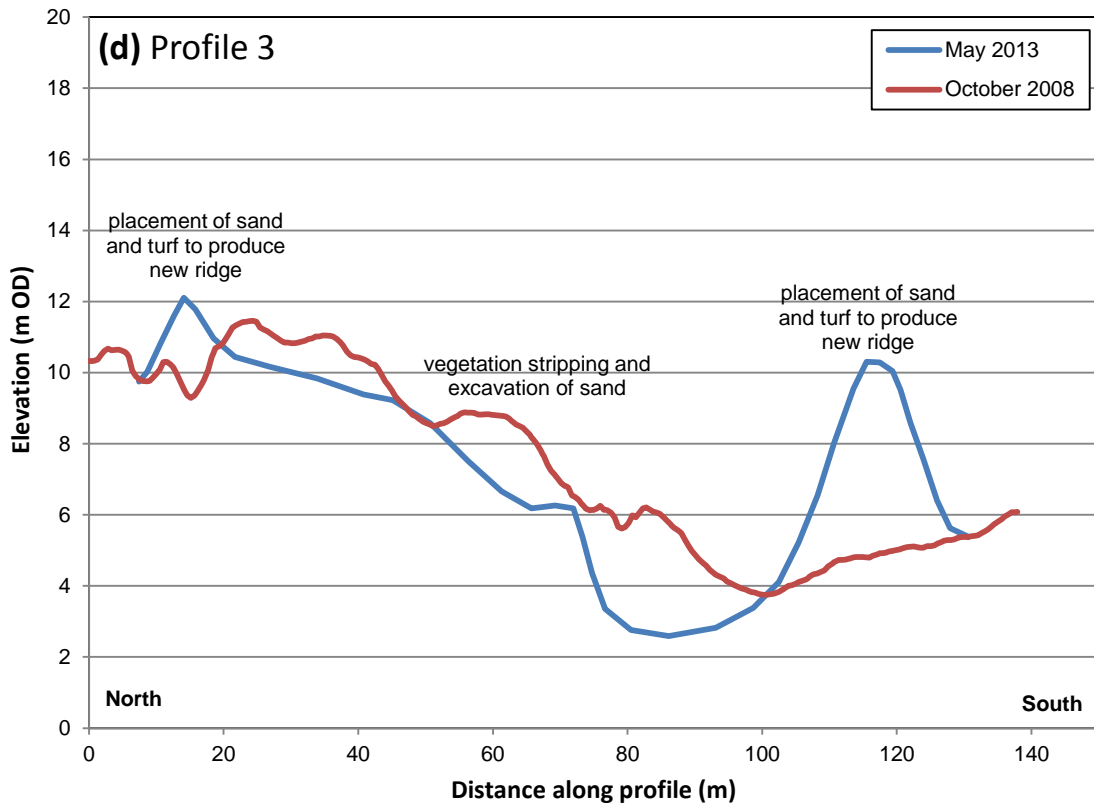
**Figure 2.** Cross-profiles, at the locations indicated in Figure 1, measured from the ground survey on 14 May 2013, and LiDAR aerial survey in October 2008. Note that the horizontal and linear scales vary considerably.



**Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013**



**Figure 2.** continued.



## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013

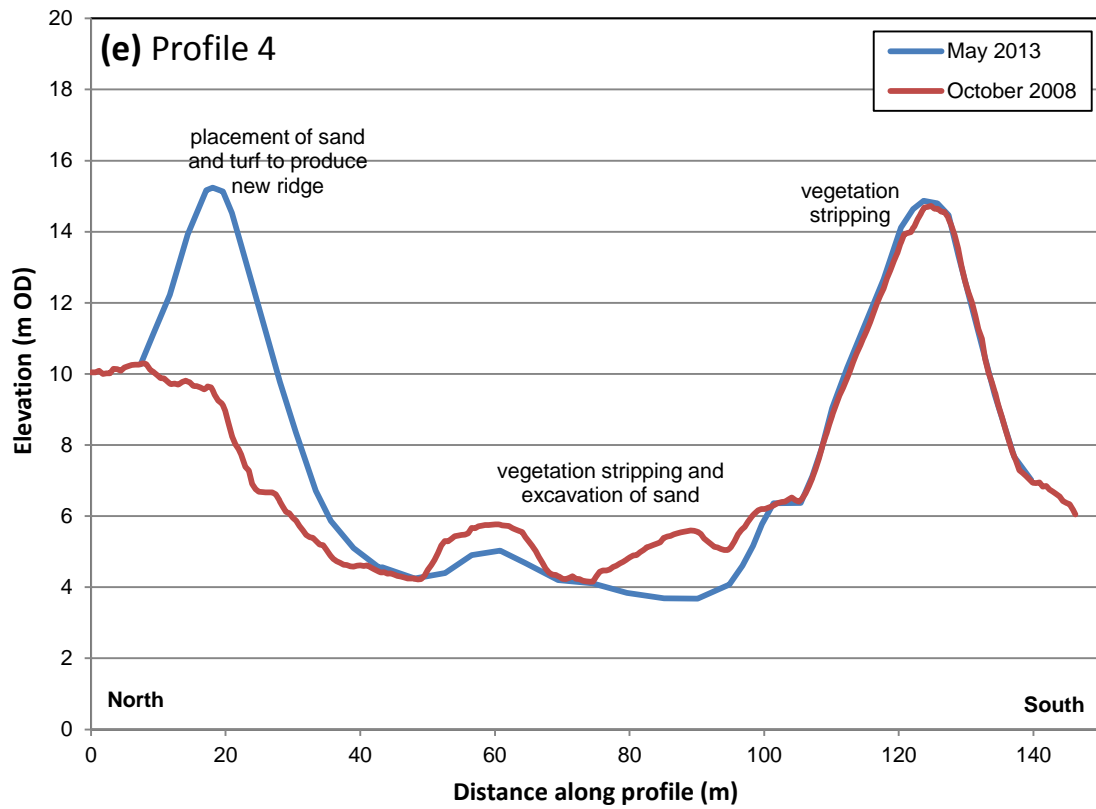
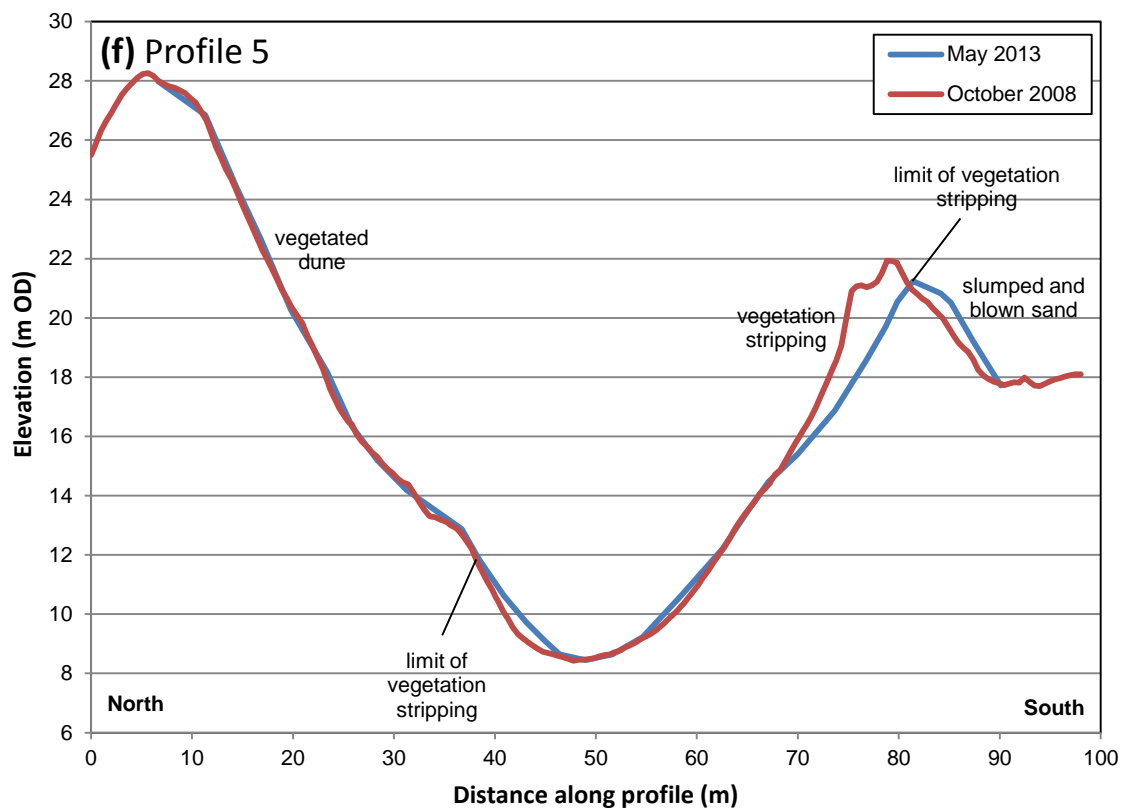


Figure 2. continued.



# Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013

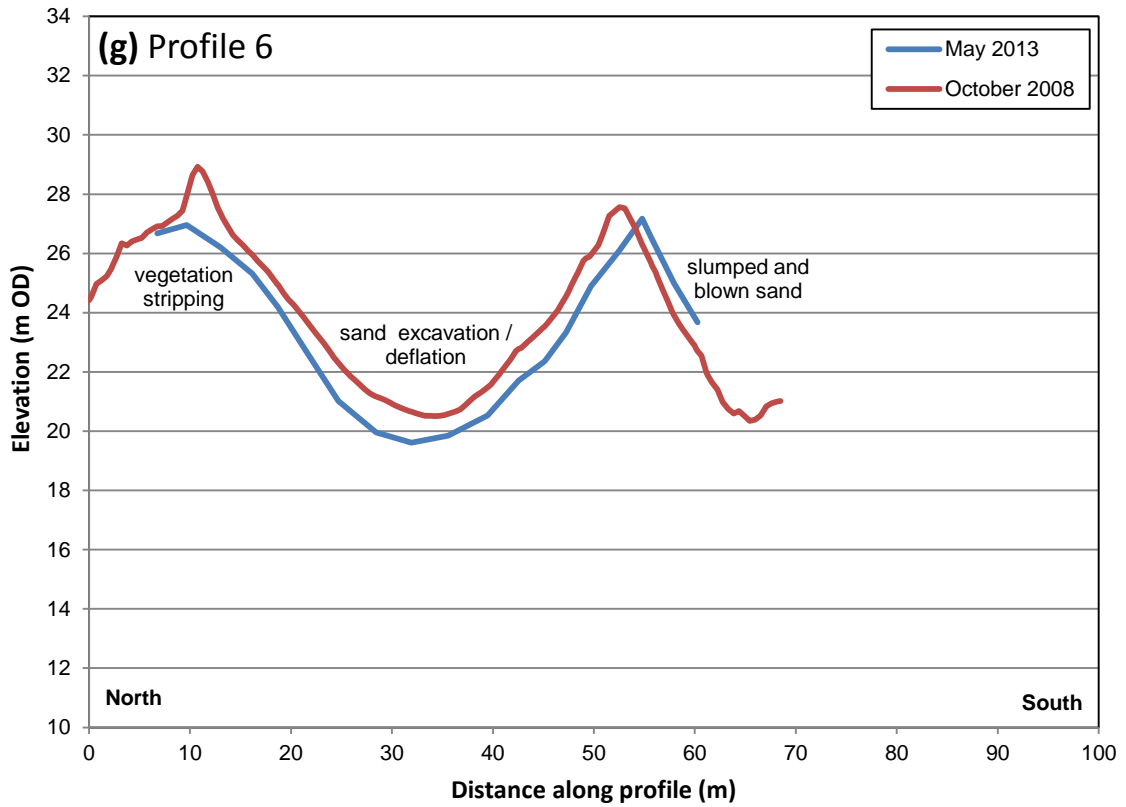
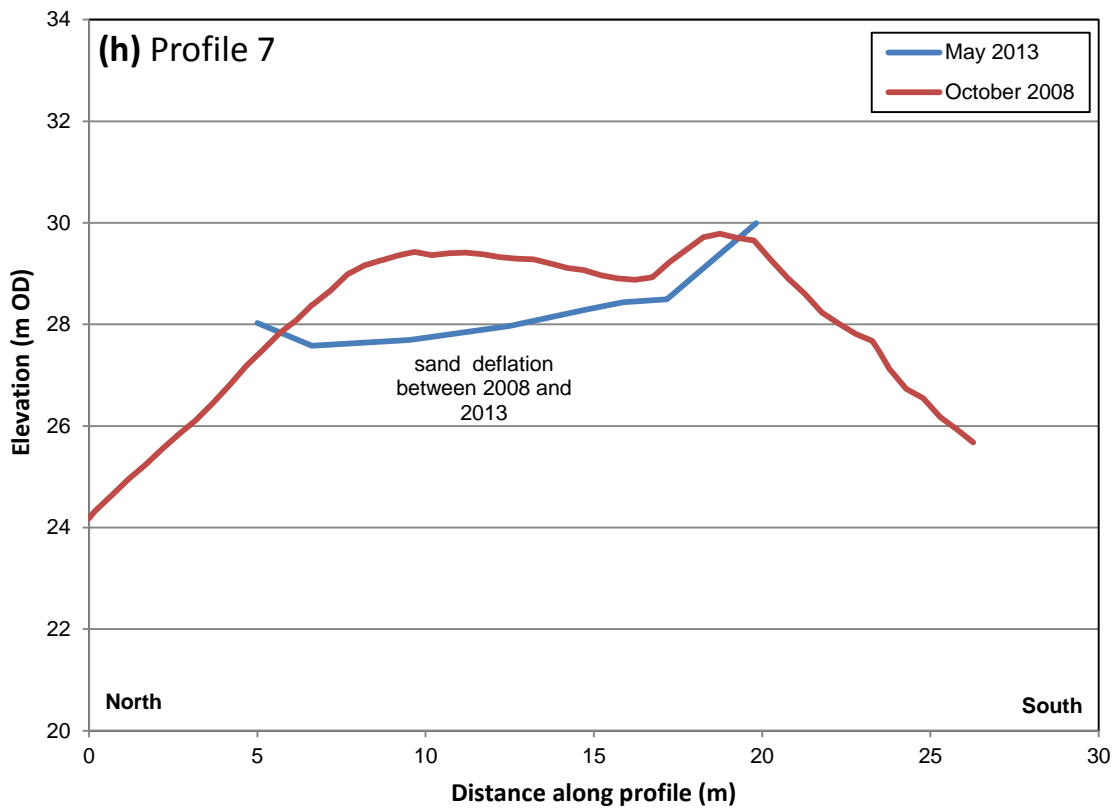


Figure 2. continued.



Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013

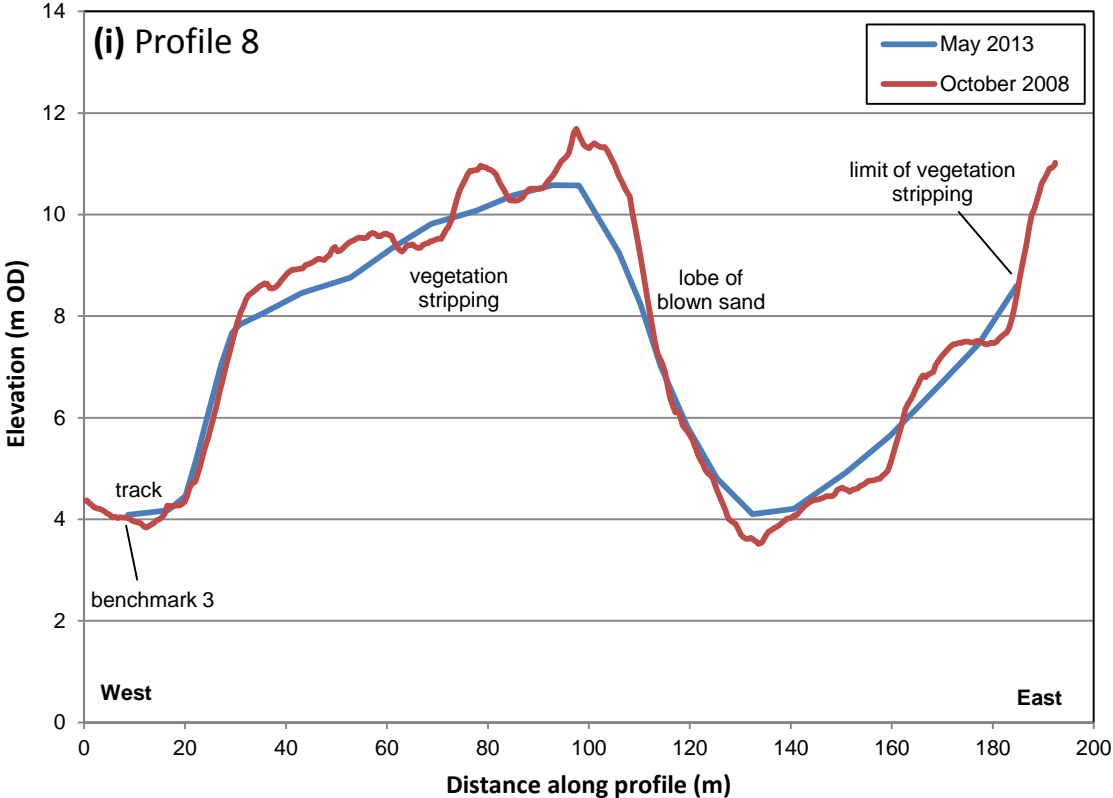
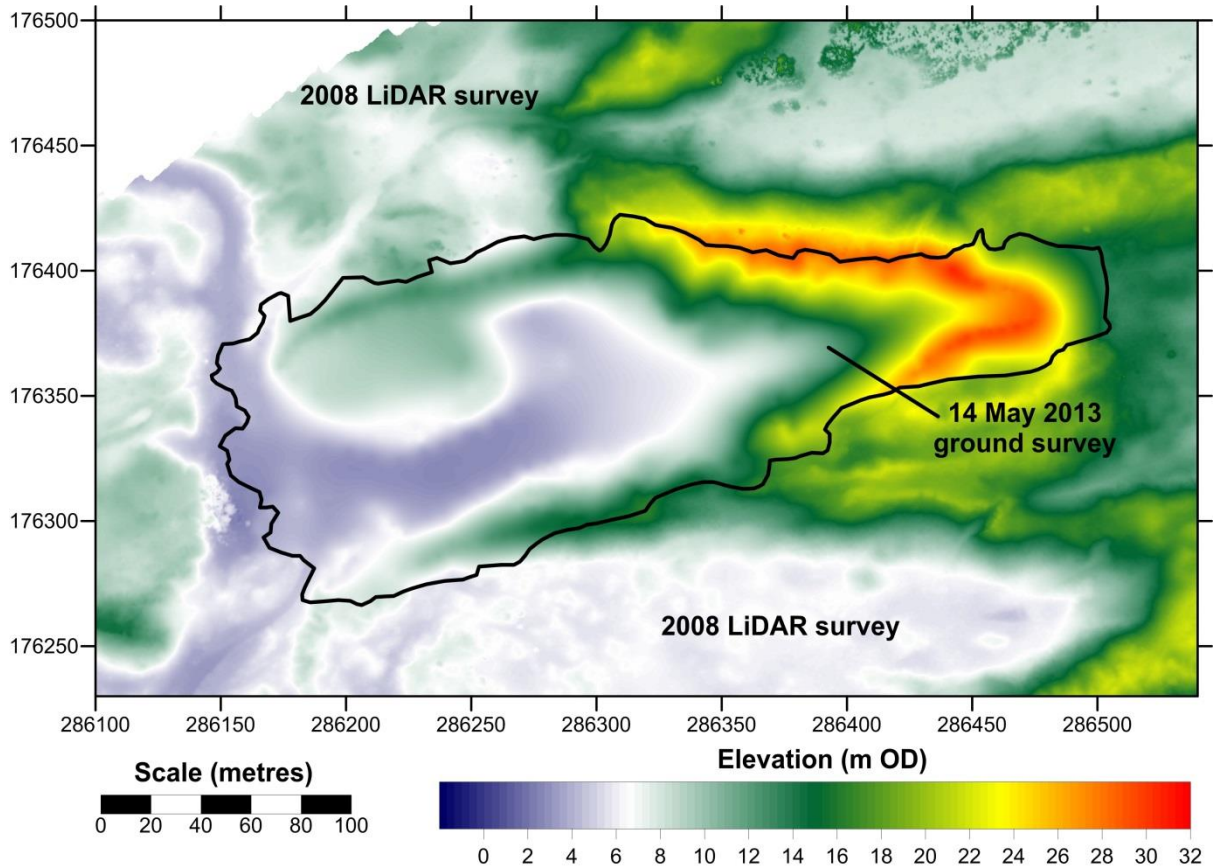


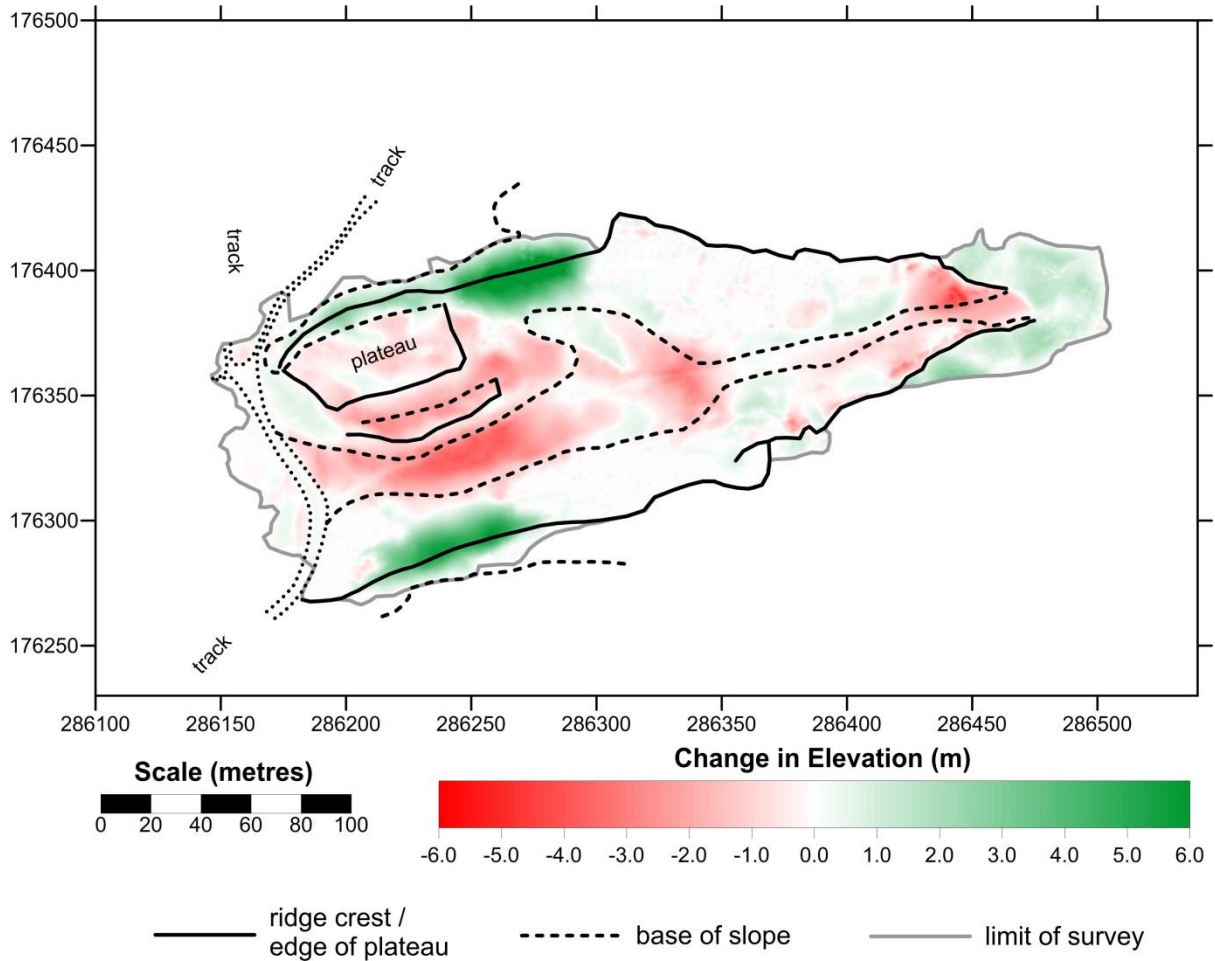
Figure 2. continued.

## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013



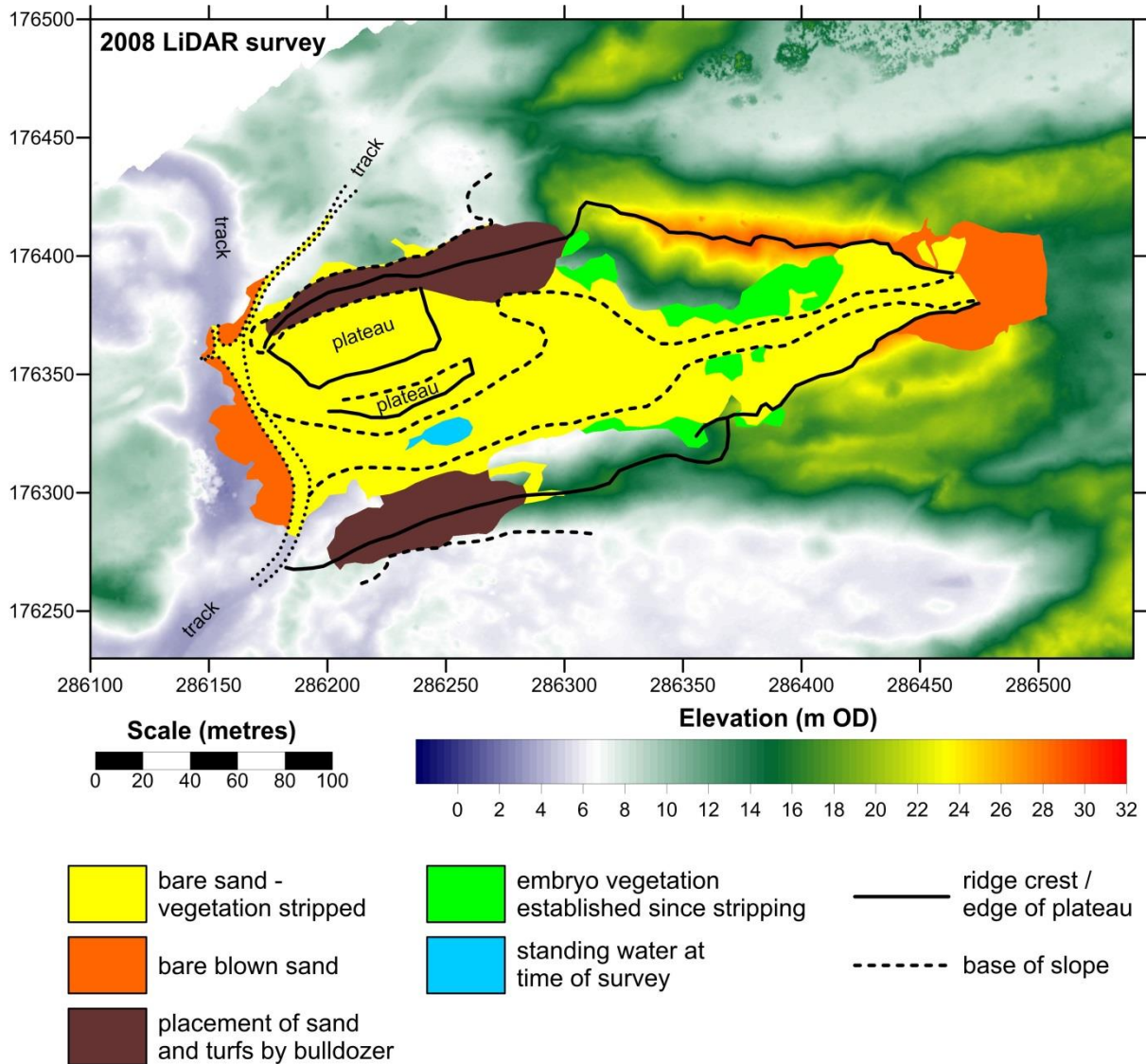
**Figure 3.** Digital elevation model of the restoration works site surveyed on 14 May 2013, with the black line indicating the limit of the survey. The areas outside the black line are taken from the LiDAR survey flown in October 2008.

## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013



**Figure 4.** Change in elevation between the LiDAR survey flown in October 2008, and the ground survey of the restoration works site on 13 May 2013.

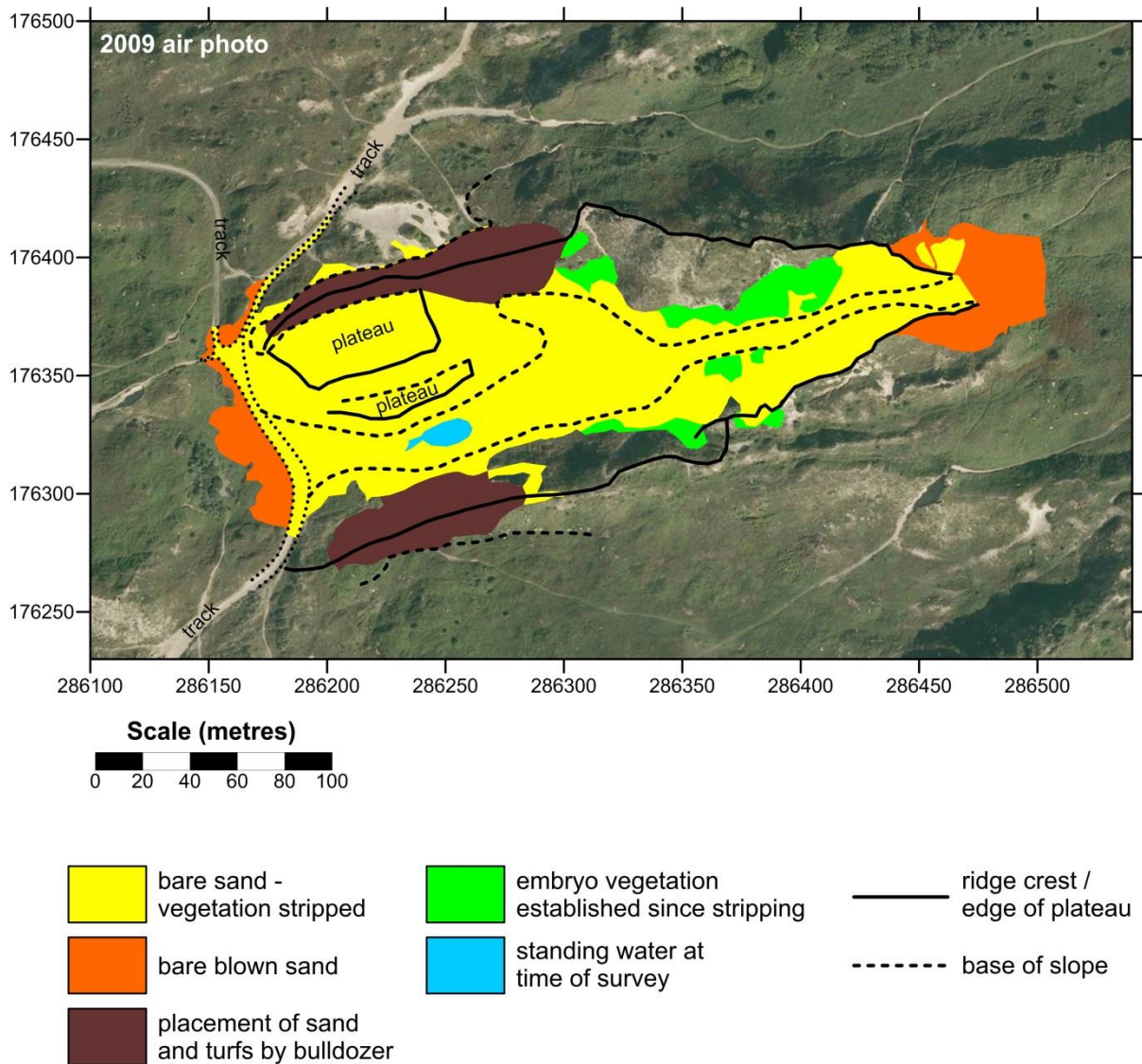
## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013



**Figure 5.** Features mapped in the field, overlaid on LiDAR DEM flown in October 2008, showing areas of bare sand (either through vegetation stripping or wind-blown), areas where significant quantities of sand and/or turf have been placed, embryo vegetation established since reactivation, and standing water at the time of the survey. Solid and dashed lines indicate the crest and base of the main slopes on the site.



## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013



**Figure 6.** Features mapped in the field, overlaid on air photographs flown in September 2009, showing areas of bare sand (either through vegetation stripping or wind-blown), areas where significant quantities of sand and/or turf have been placed, embryo vegetation established since reactivation, and standing water at the time of the survey. Solid and dashed lines indicate the crest and base of the main slopes on the site.

## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013

**Table 4.** Particle size characteristics of dune samples collected at the Merthyr Mawr Warren restoration works site on 14 May 2013. Statistics are calculated using GRADISTAT software (Blott & Pye, 2001), mean and sorting using the formulae of Folk & Ward (1957).

ID	Mean ( $\mu\text{m}$ & class)	D50 ( $\mu\text{m}$ )	Mode ( $\mu\text{m}$ )	Mean (phi)	Sorting (phi & description)	Gravel (%)	Sand (%)	Mud (%)
MM1	1103 VCS	298	275	-0.14	2.96 VPS	28.1	71.8	0.1
MM2	359 MS	325	196	1.48	0.99 MS	0.0	100.0	0.0
MM3	278 MS	228	196	1.85	0.89 MS	0.0	99.9	0.1
MM4	306 MS	267	231	1.71	0.88 MS	0.0	100.0	0.0
MM5	231 FS	227	196	2.12	0.39 WS	0.0	100.0	0.0
MM6	257 MS	212	196	1.96	0.90 MS	0.4	99.6	0.1
MM7	213 FS	205	196	2.23	0.51 MWS	0.0	100.0	0.0
MM8	249 FS	226	196	2.01	0.79 MS	0.0	100.0	0.0
MM9	1480 VCS	326	275	-0.57	3.11 VPS	37.0	63.0	0.0
MM10	1406 VCS	292	275	-0.49	3.21 VPS	29.0	70.9	0.1
MM11	209 FS	205	196	2.26	0.50 WS	0.0	100.0	0.0
MM12	319 MS	215	165	1.65	1.28 PS	1.1	98.9	0.0

#### Mean Size Classification:

VCS (very coarse sand)  
 CS (coarse sand)  
 MS (medium sand)  
 FS (fine sand)  
 VFS (very fine sand)

#### Sorting Descriptions:

VWS (very well sorted)  
 WS (well sorted)  
 MWS (moderately well sorted)  
 MS (moderately sorted)  
 PS (poorly sorted)  
 VPS (very poorly sorted)

Blott, S.J. and Pye, K. (2001) GRADISTAT: a grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms*, 26, 1237-1248.

Folk, R.L. and Ward, W.C. (1957) Brazos River bar: a study in the significance of grain size parameters. *Journal of Sedimentary Petrology*, 27, 3-26.

**Table 5.** Sediment textural classifications, according to Folk (1954) and Blott and Pye (2012), from the samples collected on 14 May 2013.

ID	Folk (1954)	Blott and Pye (2012)
MM1	Gravelly sand	Gravelly sand
MM2	Sand	Sand
MM3	Sand	Sand
MM4	Sand	Sand
MM5	Sand	Sand
MM6	Slightly gravelly sand	Sand
MM7	Sand	Sand
MM8	Sand	Sand
MM9	Sandy gravel	Gravelly Sand
MM10	Gravelly sand	Gravelly Sand
MM11	Sand	Sand
MM12	Slightly gravelly sand	Very slightly gravelly sand

Folk, R.L. (1954) The distinction between grain size and mineral composition in sedimentary-rock nomenclature. *Journal of Geology*, 62, 344-359.

Blott, S.J. & Pye, K. (2012) Particle size scales and classification of sediment types based on particle size distributions: review and recommended procedures. *Sedimentology*, 59, 2071-2096.

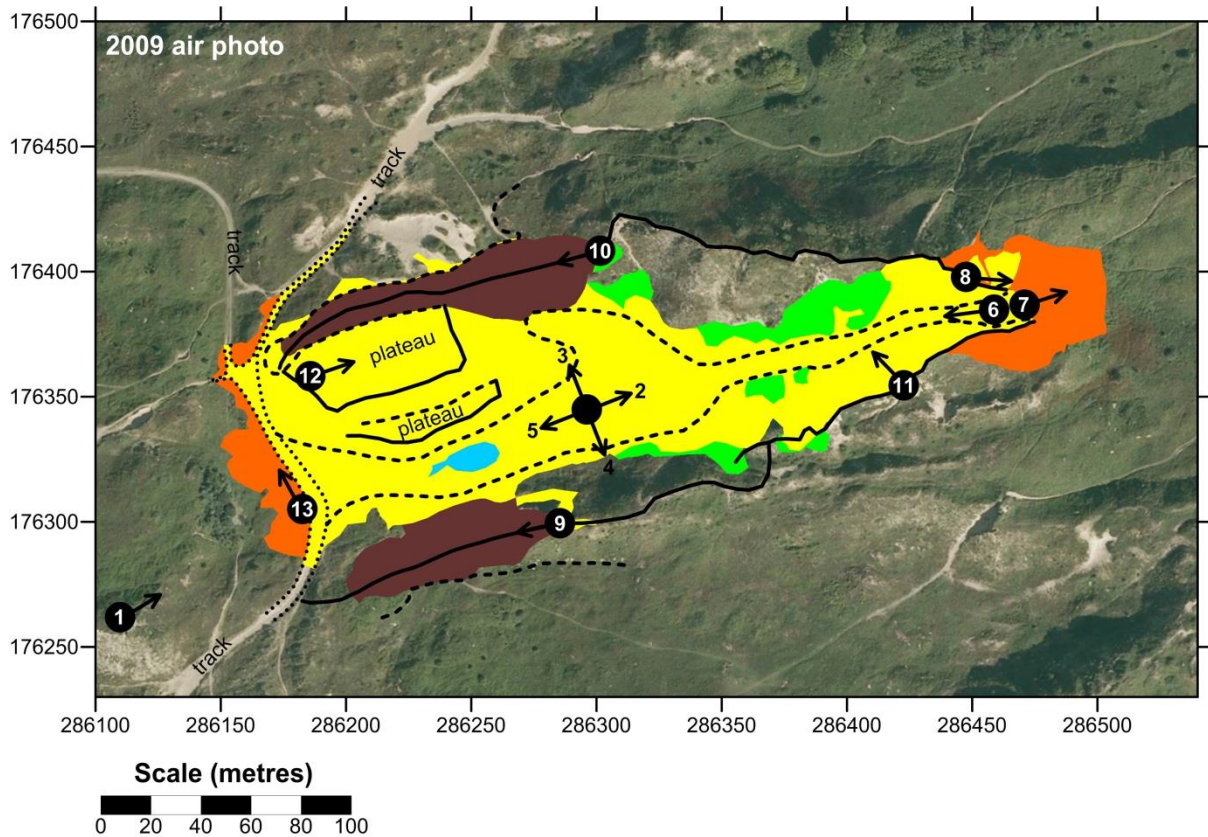
## Merthyr Mawr Dune Rejuvenation Works: Topographic Survey, May 2013

**Table 6.** Particle size distribution of samples collected on 14 May 2013: percentage dry weight retained on sieves spaced at notional 'half phi' intervals.

Size (µm)	Sediment retained on sieve (%)											
	MM1	MM2	MM3	MM4	MM5	MM6	MM7	MM8	MM9	MM10	MM11	MM12
63000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45000	165.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	281.1	285.0	0.0	0.0
31500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	141.2	52.2	0.0	0.0
22400	101.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162.2	16.6	0.0	0.0
16000	40.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.6	35.1	0.0	0.0
11200	39.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	9.8	0.0	0.0
8000	39.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	14.1	0.0	0.0
5600	30.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.5	17.8	0.0	0.0
4000	26.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.7	14.7	0.0	0.0
3350	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	4.6	0.0	0.0
2800	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	4.7	0.0	0.0
2360	6.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	3.9	5.4	0.0	0.5
2000	5.2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	4.8	4.8	0.0	0.8
1700	6.7	0.0	0.0	0.0	0.0	0.2	0.0	0.0	4.4	5.5	0.0	2.2
1400	8.9	0.0	0.0	0.0	0.0	0.3	0.0	0.0	5.3	7.1	0.0	2.4
1180	8.8	0.0	0.0	0.0	0.0	2.9	0.0	0.0	5.0	7.1	0.0	8.2
1000	20.2	6.4	3.1	5.5	0.0	7.3	0.0	0.4	6.7	9.6	0.0	7.3
850	9.4	4.0	2.1	2.0	0.0	4.0	0.0	0.5	8.0	12.4	0.0	6.5
710	20.9	4.7	3.4	2.9	0.0	4.9	0.5	1.3	12.9	15.1	0.0	0.5
600	28.7	4.6	4.3	4.1	0.0	4.6	0.6	3.3	18.8	21.3	0.0	1.9
500	38.3	4.9	4.8	4.3	0.4	5.1	1.2	6.4	28.6	28.3	0.4	1.1
425	40.9	4.5	3.9	5.7	0.3	5.3	2.0	6.0	35.0	32.1	1.1	1.0
355	63.8	5.8	4.3	6.4	2.5	7.9	4.4	5.7	64.4	50.6	4.1	1.4
300	105.6	6.7	4.8	9.0	10.0	11.5	8.0	6.6	120.8	86.9	8.6	3.7
250	311.8	7.9	8.7	7.1	20.4	18.6	14.4	9.6	561.6	388.7	15.6	7.9
212	175.8	5.5	7.7	18.6	11.9	17.2	12.6	7.6	101.7	162.4	10.8	15.1
180	261.1	9.6	22.5	8.0	22.7	51.4	32.1	16.1	193.2	245.9	25.2	11.8
150	45.5	5.7	7.6	9.2	6.0	13.6	9.3	9.8	15.3	37.5	10.1	24.3
125	31.4	4.3	5.2	4.3	5.3	17.3	10.0	9.6	19.8	17.9	9.7	10.4
106	9.3	1.7	3.7	1.4	1.6	6.2	3.4	4.6	7.8	2.7	3.8	8.0
90	4.2	0.4	1.2	0.3	0.2	2.5	1.0	1.4	2.7	2.1	1.4	2.7
75	1.2	0.1	0.2	0.1	0.0	0.3	0.2	0.2	0.5	0.7	0.3	0.6
63	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.0	0.1
pan	1.8	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	1.1	0.0	0.0

## 4. Field Photographs

Taken 14 May 2013



**Figure 7.** Locations of field photographs. Numbers indicate photograph numbers, while arrows indicate the direction of the photograph



**Photo 1.** Overview of the site, from the west



**Photo 2.** Central axis of the dune, looking east



**Photo 3.** Central axis of the dune, looking north



**Photo 4.** Central axis of the dune, looking south



**Photo 5.** Central axis of the dune, looking west



**Photo 6.** Head of the main dune axis, looking west





**Photo 7.** Lobe of wind-blown sand migrating east from the head of the main dune



**Photo 8.** Side view of the lobe of wind-blown sand



**Photo 9.** Placement of sand and turfs to enlarge the southern ridge



**Photo 10.** Placement of sand and turfs to enlarge the northern ridge



**Photo 11.** New vegetation growth at the western end of the site



**Photo 12.** Vegetation and sand stripping on the north side of the site have produced a pronounced plateau. SmartRover surveying equipment in the foreground.



**Photo 13.** Survey base station, set up over Benchmark 1

## **Data Archive Appendix**

Data outputs associated with this project are archived at 'Merthyr Mawr Dune Restoration; project 419, media 1437' on server-based storage at Natural Resources Wales.

The data archive contains:

- [A] The final report in Microsoft Word and Adobe PDF formats.
- [B] An Excel file named (Merthyr Mawr Warren Dune Survey Data 14-05-2013.xls) of data points (x,y,z)
- [C] A series of GIS layers on which the maps in the report are based.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <http://libcat.naturalresources.wales/webview/> (English Version) and <http://libcat.naturalresources.wales/cnc/> (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no [115843]

**DO NOT DELETE THE SECTION BREAK BELOW**



**Cyfoeth  
Naturiol**  
Cymru  
**Natural  
Resources**  
Wales

Published by: Natural Resources Wales  
Maes y Ffynnon  
Penrhosgarnedd  
Bangor  
LL57 2DW

0300 065 3000

© Natural Resources Wales [2013]

All rights reserved. This document may be reproduced with prior permission of  
Natural Resources Wales

Further copies of this report are available from the library

Email: [library@cyfoethnaturiolcymru.gov.uk](mailto:library@cyfoethnaturiolcymru.gov.uk)