Gravelling the Elan System (GES) Project
End of 1st year Report

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Dŵr Cymru Welsh Water

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The Wye & Usk Foundation
ACTION FOR FISHERIES
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1. Introduction and Aims of the Project

In 1932, JA Hutton noted that salmon no longer spawned right below the Caban Coch dam as they had once and were now only spawning in downstream reaches. This was because since 1904 the gravel in which they create their redds had been washing downstream while the supply of fresh gravel from upstream had ceased. This negative trend has continued since then, only punctuated by some work carried out in an early partnership between an embryonic WUF and the NRA to loosen the compacted gravel in a section below Dolafallen. The situation today is that the Elan has no suitable spawning gravels, save in the lowest sections and these need de-compacting. This situation impacts negatively on both the invertebrate and fish populations.

Figure 1 The Elan prior to the project, its riverbed characterised by large boulders with no gravel or fine sediments in between

The requirements of the WFD and Habitats Directive are for action to take place to correct this and it should be noted that the date for completion of these actions for SAC rivers was the 22nd December 2015. In 2016, NRW produced a paper (Sediment Report Elan) within which they identified possible interventions to restore the “diversity of flow types and depositional features”, many of which were included in the original bid document for this project.

The objectives of the project are the restoration of the ecological status of the Elan (in so far as this is practical without dam removal) as required by the WFD to reach Good Ecological Potential.

2. Project Planning, Delivery & Outputs

Although the travel and transport of gravels is well understood, as is the effect of placing a huge dam in the way of this natural process, gaining approval from the various stakeholders and regulators has been a slower than anticipated process. It had been hoped to deliver the first transportations during a previous WUF project, Sir Maesyfed Salar 2012 (SMS 12). However, that finished at the end of July 2015 with most of our budget spent in securing consent and approvals, surveys, meetings, lengthy phone calls, consultants etc.

The possible source sites identified under SMS12 (gravel deposits from the Elan upstream of the Craig Goch reservoir) were formally rejected by the Elan Valley Trust and NRW on 25th September 2014 because "….the consequences and effects of the proposed extraction works are largely unknown. The active meanders on this stretch of the river are highly valued and the possibility of negatively impacting upon them is too great for us to countenance."

Figure 2. The large gravel deposits in the Elan upstream of the dams were rejected as a potential source for this project

Under the GES project we initially envisaged taking gravel from the inlet of Caban-coch reservoir at Dolymynach and re-introducing it to a section of the Elan below the gauging dam, some 400m below Caban Coch. However, it was unclear whether permission would be granted by Elan Valley Trust, DCWW and NRW to use this source site because of potential disturbance from the operation to habitats of the Welsh Clearwing moth, *Elatine hexandra* and "a nice bed of marsh cinquefoil".

WUF staff widened the search for other source sites with similar geology to the Elan catchment and in June 2016 identified two suitable gravel deposits in the main Wye upstream of Llangurig (Site 1

and Site 2 below). Sourcing gravel from this area would increase the transportation distance considerably but with other sites being discounted or questioned, these provided a viable alternative. WUF began the process of obtaining permission from the land/riparian owner and of securing Section 28 and Flood Defence consents from NRW and Powys CC respectively.

Ultimately, we settled on attempting to consent two extraction sites (Site 2: upper Wye and Site 3: Dolymynach) and 2 introduction sites, to increase the chances of the project happening. Although consent was eventually given for Site 3 (limited to 600-800 tonnes due to the biodiversity concerns), we decided not to use it due to a rise in water levels in Dolymynach reservoir at the end of September, which flooded most of the deposit, the challenging access and the burgeoning costs.

Initially, two introduction sites were planned, both downstream of the Elan Valley Visitor Centre. The further downstream of the two (Site 5) was eventually discounted because of anticipated problems of accessing with heavy plant across the land in the damp conditions of late September. Site 4 was therefore selected as the sole introduction point.

Creating designated salmonid spawning sites at several locations had previously been considered. However, to ensure that Good Ecological Potential was achieved, it was decided that it was better to introduce the gravel into the channel and let natural processes sort it into geomorphological features. These include lateral and point bars in addition to replenishing the gravel, sand and silt fraction of the river bed.

In early September, WUF staff carried out a macro-invertebrate survey at 3 locations and an electrofishing survey at 8 locations to establish baseline data for invertebrates, juvenile salmonids and other fish species. They also carried out a baseline gravel survey so that the movement of that introduced could be monitored (Section 3).

All necessary consents were in place by Friday 23rd September and on Monday 26th September we began to take gravel from Ty-Mawr (Site 2) and reintroduce it to Site 4 (Elan Village). Over the next five days 2,000 tonnes were transported, tipped and spread out over Site 4. This was 500 tonnes less than was planned originally due to the higher than anticipated transportation times/costs, the requirement to improve roads and tracks and making good Site 4 (new fence and gate).

At site 4 the gravel was tipped out of the trailers and down the bank, then spread by a Hymac. Most of the loads on the first and second days were used to create a stable platform in amongst the boulders from which we could spread the remaining gravel further out into the river channel. The plan was that the Elan's winter flows would then naturally sort and distribute the gravel (including that which had been used to create the platform) to form geomorphological features downstream. A video that includes time lapse photography and drone filming of the gravel introduction work at Site 4 can be found here: https://www.youtube.com/watch?v=3Y6Q1-RJ9yU&t=60s

Unfortunately, the dry autumn and early winter meant that Caban Coch did not over-top until 22nd Feb 2017 with the gravel remaining in situ up to then. After this date, prolonged high water occurred with our monitoring team only able to return to make the first assessment of gravel redistribution on 21st March 2017.

Figure 3: Sites 1 & 2 on the upper Wye (extraction)

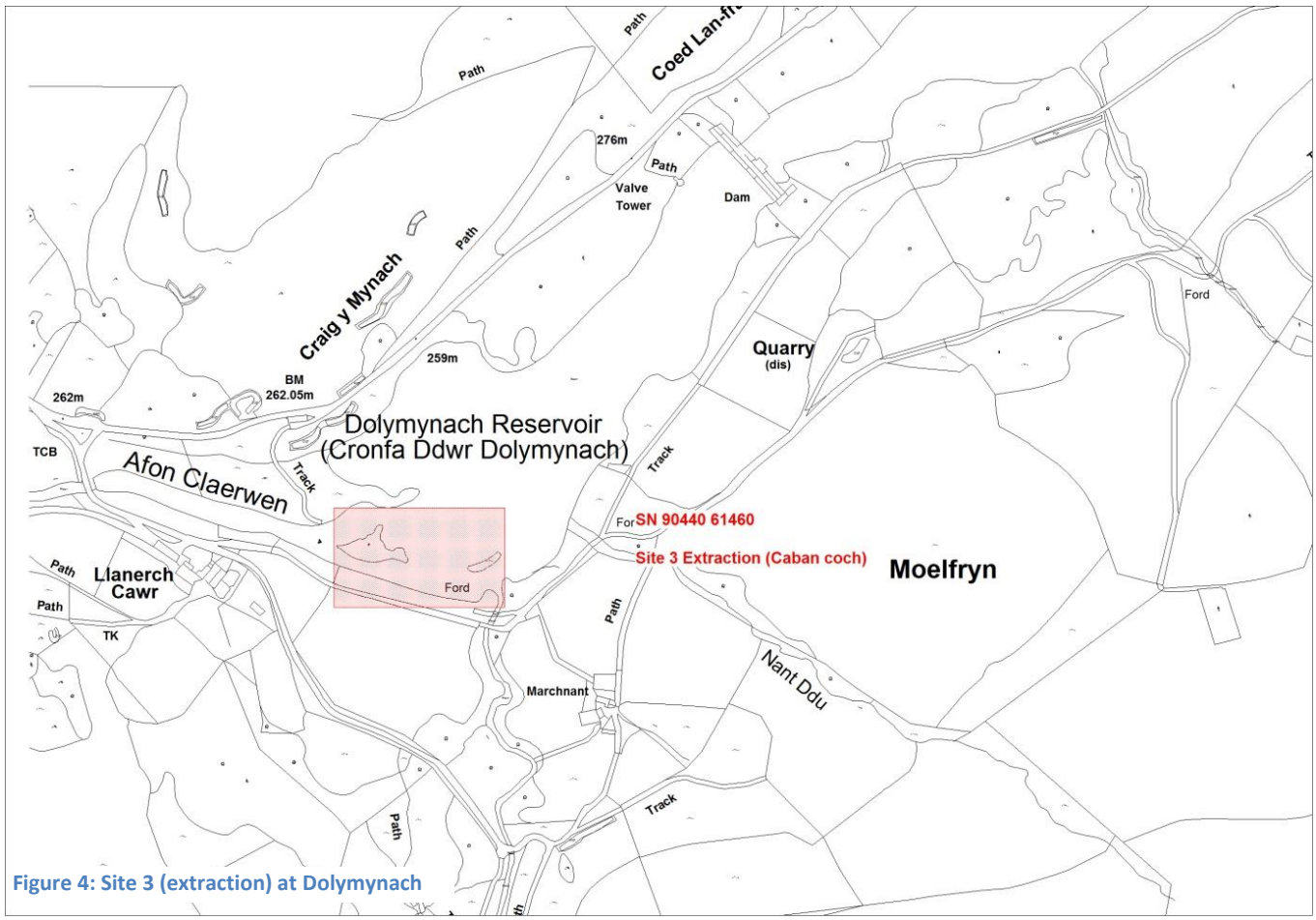

Figure 4: Site 3 (extraction) at Dolymynach

Figure 5: Introduction sites 4 & 5

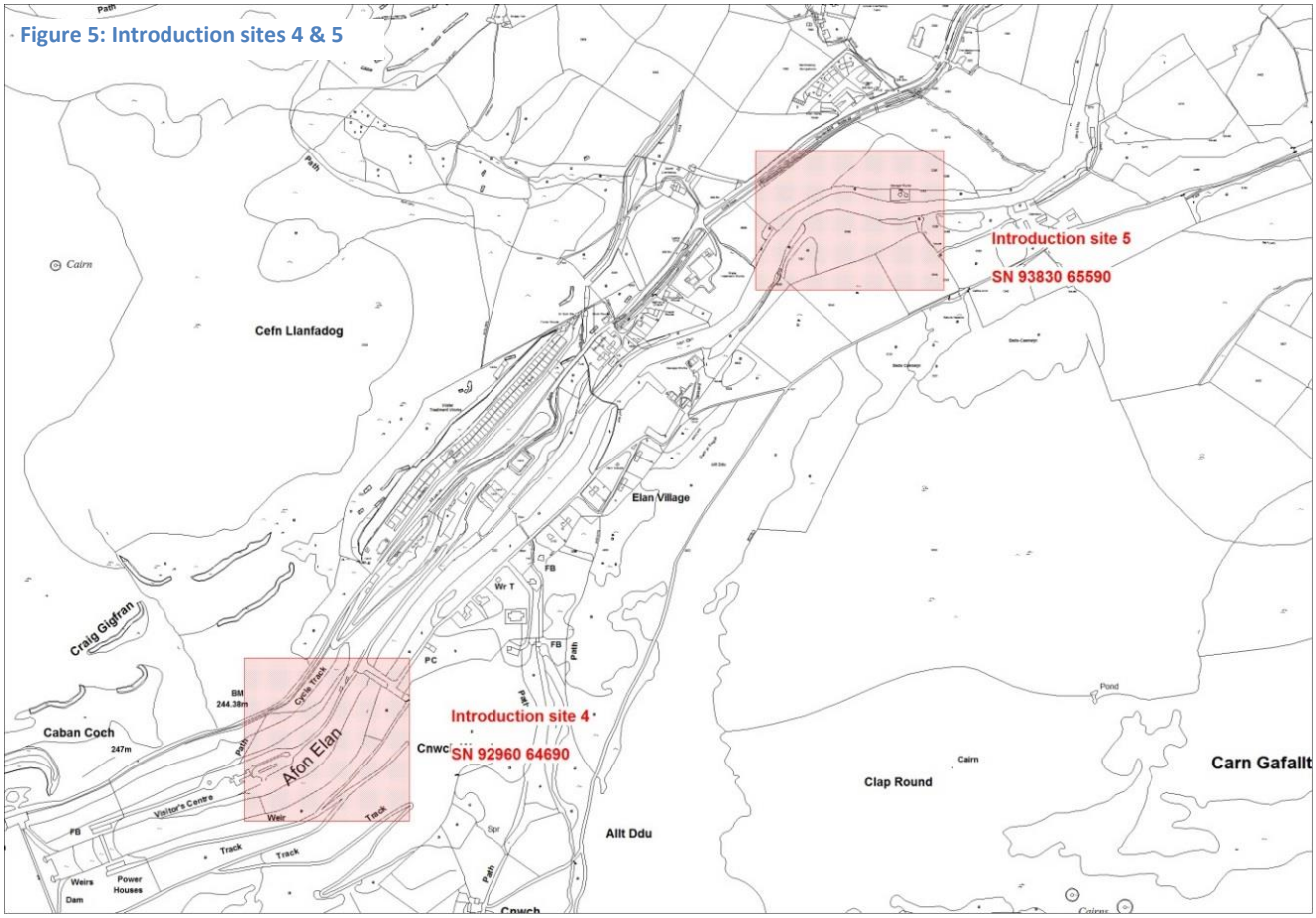

Figure 6: Overall map of the various sites that featured in the project.

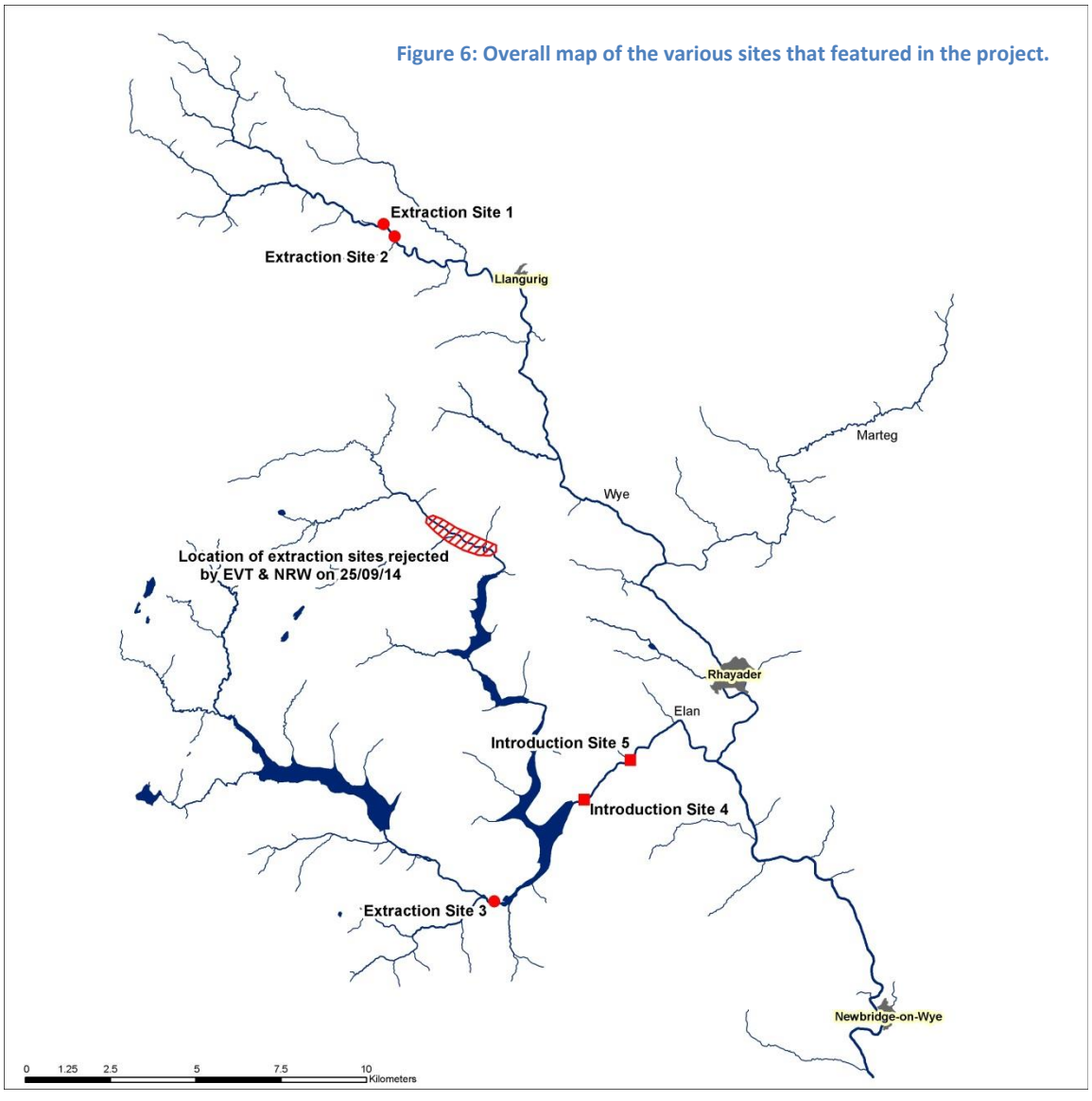

Figure 7: Extraction of the gravel from Site 2.

Figure 8: At Site 4 a platform was created with the first loads of gravel from which the remaining loads could be placed into the river channel

Figure 9: Introduction of the gravel at Site 4 from above (Elan Village)

Project Timeline & outputs

Original Date	Original Target	Date	Outcome
April/May 2016	Project Start	May 2016	Project Start
April/May 2016	Arrange contractors/farmers and agree method statement with stakeholders	May to September 2016	Extensive site investigations and consultation with stakeholders, including negotiations with land/riparian owners, hydrology/geomorphology reports, S28 consents, FDC consents
May/June 2016	Move 2,500 tonnes of gravel from top end of Caban Coch to 2 sites below dam and spread, Gravel de-compaction downstream	Late September 2016	2,000 tonnes of gravel moved from upper Wye to 1 site below dam and spread. No gravel de-compaction downstream
June 2016	Removal of obstruction advised by NRW	July 2017	NRW change opinion and weir to be retained
August 2016	Baseline surveys	Early September 2016	Electrofishing & gravel deposition survey completed
Nov/ Dec 2016	Redd count of Elan	Nov 2016	Redd count completed
Spring 2017	2nd gravel deposition survey	March 2017	2nd gravel deposition survey completed
March 2017	1st year of project ends	March 2017	1st year of project ends

3. Initial Monitoring Results

Electro-fishing

In early September 6 sites on the main stem of the Elan between the introduction site and the junction with the Wye were semi-quantitatively electro-fished to establish a baseline. The results of this can be seen in the table below.

Site Name	Grid Reference	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr	Eel	Other
Gravel Introduction site	SN 929 646	0	0	0	0	0	0
Upstream weir	SN 932 650	0	0	0	1	0	0
Cae Melyn	SN 942 657	0	0	0	0	0	0
Dolafallen Bridge	SN 955 668	0	0	0	0	0	0
Upstream Glan Elan	SN 959 661	0	0	0	4	0	0
Glan Elan Bend	SN 963 661	6	0	1	0	0	8 Bullheads
400m Upstream Glyn Bridge	SN 963 658	0	0	2	3	0	0
Upstream Wye Jct	SN 966 656	3	0	6	4	0	10 Bullheads

The electro-fishing results from the Elan showed low numbers of trout and salmon fry with moderate numbers of bullheads below Dolfallen bridge. Only one adult trout was caught. Subsequent electro-fishing surveys will be carried out in August/September 2017 and 2018.

Salmon Spawning

7 salmon redds were recorded in the lowest reaches of the Elan (below Glan Elan). The limited penetration was probably due to the compensation flows in November and December following the lowering of Caban Coch in September 2016.

Redd count surveys will be continued in future winters.

Gravel survey

On 21st September 2016 our monitoring team surveyed 40 sites in the Elan, measuring the depth between the top of fixed features (large rocks/weir) and the surrounding bed.

The same exercise was carried out on 21st March 2017 to assess gravel movement following the winter floods, which moved much of the gravel from the reintroduction area.

Encouragingly, all but one of the sites that we surveyed showed a build-up of gravel which had begun to settle in the areas of the Elan that you would expect to find in a natural river. As expected, one of the main areas of build-up was just upstream of the weir at Elan Village. The results are shown in the map on the following page. Most of the gravel was still within 420m of the introduction site and very little had moved more than 620m.

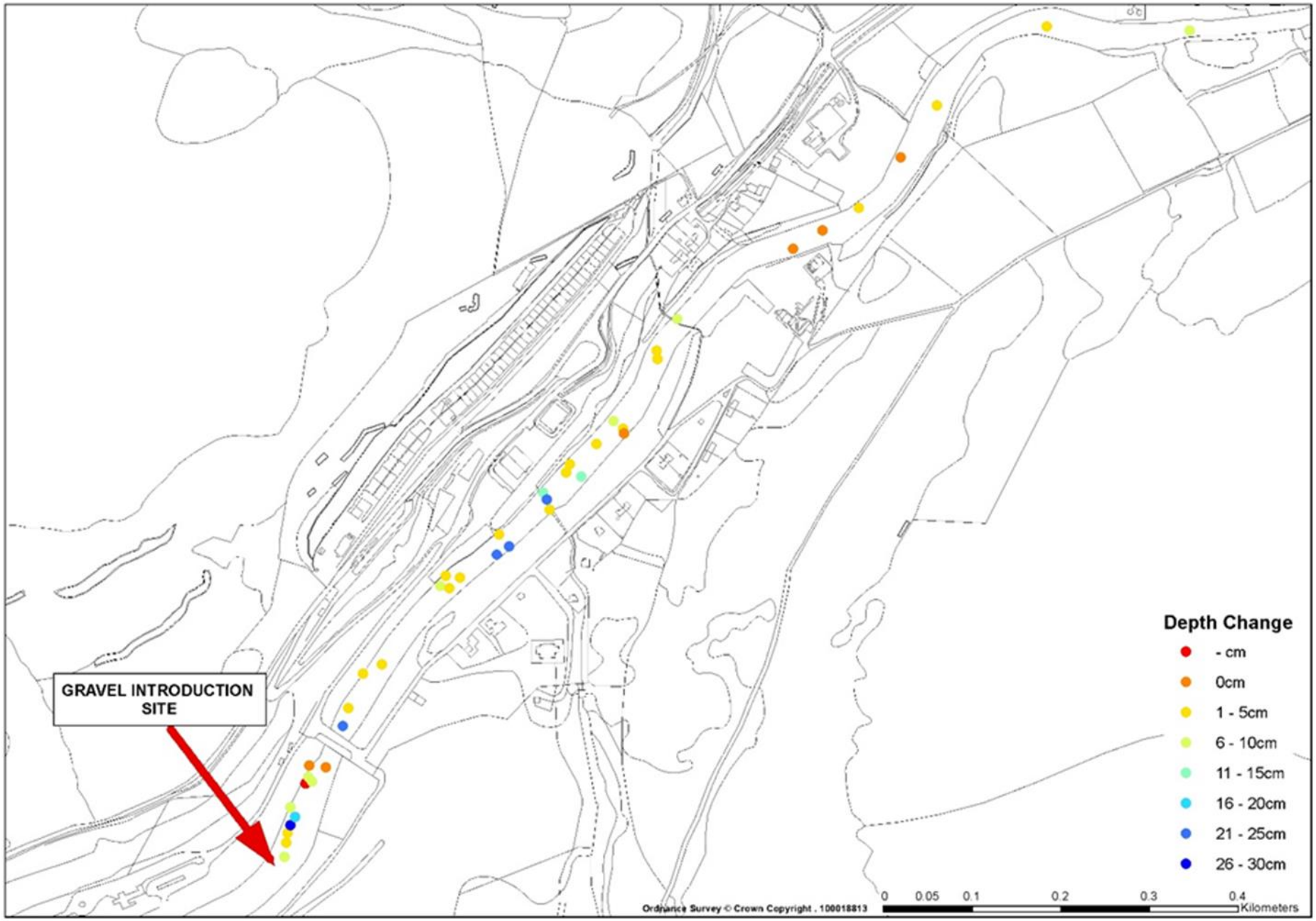

Figure 10: Map showing the movement of gravel from Introduction Site 4 measured on 21st March 2017

Figure 11: Site 4, the Introduction site after the high water of February, showing the retention of a small lateral bar with the rest of the gravel platform having been distributed downstream

Figure 12: A photo taken in March 2017 from the Elan Valley road bridge 160m downstream of the introduction site, showing a build-up of new gravel on the bed of the river.

The two photos below show a build-up of gravel on a small weir 420m downstream of the introduction site (the weir is visible in the background of Fig. 16).

Figure 13

Figure 14

Figure 15: One of the monitoring sites in March 2017.

Away from the monitoring sites, we witnessed the re-forming of geomorphological features that you would expect in a naturalised river bed. The photo below (Fig 16) shows a new gravel bar forming below the introduction site in the river opposite Elan Village.

Figure 17 shows the extraction site in October 2016, immediately after the extraction of the 2,500 tonnes. Figure 18 below was taken in April 2017 and shows the gravel bar beginning to reform. It is estimated that some 400-600 tonnes have been deposited there during the winter.

Figure 17

Figure 18

4. Project Finance

	GES income & expenditure		
	to 31.3.17	Future	Total spend
Income			
DCWW	£19,773		£19,773
NRW	£19,782		£19,782
WUF		£6,066	£6,066
Total	£39,555	£6,066	£45,621
Expenditure			
Staff costs	£14,842	£420	£15,262
Plant Hire	£19,714	£4,195	£23,909
Travel	£1,345	£200	£1,545
Monitoring	£751	£2,200	£2,951
Overheads	£1,888	£66	£1,954
Total	£38,540	£7,081	£45,621

5. Discussion

5.1 Lessons Learnt

This was the first serious attempt at restoring gravel to an impounded river in Wales and we are very grateful for DCWW's and NRW's support in what we believe to have been a successful project. As a result, we have learnt lessons that will help in any similar operations in the future, wherever they take place.

These are:

- The time it can take for protracted negotiations with land/riparian owners and statutory bodies and the problem of uncertainty leading to resistance to change.
- The value of this project in informing future works.
- Just how many stakeholders there are in such an operation. For example, river owners and angling clubs for several miles downstream (including on the main Wye) had to be kept informed of progress, dates etc.
- Sites that are unlikely to be issued consent from owners or statutory bodies and are not worth investing time in.

- The conditions on gravel movement operations set by statutory bodies.
- The relative costs of extraction and introduction from and to different sites.
- Excluding consenting, the cost of moving gravel from the upper Wye system to the Elan was £15.24/tonne.
- The cost of moving gravel within the Elan system is expected to be >£8/tonne.

All of the above will help in streamlining the process of any future projects.

More lessons will be learnt from the continued monitoring but perhaps the most important is that these sorts of operations can be done. GES should give all the parties involved the confidence to support or to carry out similar operations themselves. We hope that when they do, provided proper procedure is followed, that as a result of GES concerns over any adverse environmental impacts will be reduced.

5.2 Where Next?

We await the results of this summer's monitoring but in the meantime, we are confident that the 2,000 tonnes will make a positive difference to the Elan's ecology. However, it will take much more gravel than that to return the 7km stretch to what could be deemed a more "natural" state. Our original proposal was for a 3-year project and we will continue to seek funding to build on the start that GES has made.

To date, we have secured £4,800 for future gravelling operations in the Elan, which will move a further 314 tonnes from the upper Wye or 600 tonnes from within the Elan catchment. We would like to continue with this work by moving another 2,000 tonnes this year. We have already identified a gravel source that is much closer, thus saving on transportation costs, and will be approaching the river owner to commence initial discussions very soon. We will be submitting an application for additional funds to continue this work to DCWW and NRW shortly, who we hope will be similarly encouraged to support this work again.

The Wye & Usk Foundation
April 2017