

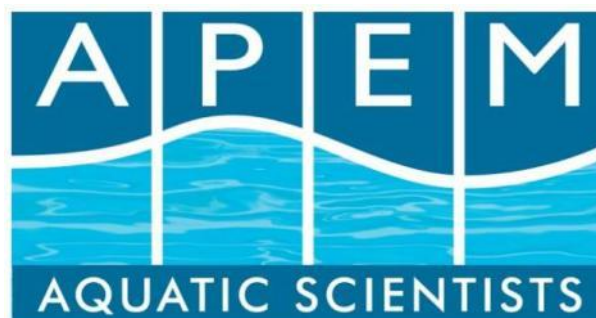
SLR CONSULTING

**Aquatic Ecology spring surveys of the
River Yealm, 2011**

Interim Data Report

June 2011

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1 INTRODUCTION

In advance of the development and operation of a new landfill and a resource recovery centre site, APEM was commissioned to conduct a suite of aquatic ecology surveys of the River Yealm. The survey programme commenced in July 2010 with the aim of establishing an ecological baseline to assess risks and potential impacts of the development on aquatic biota. Following two surveys (summer and autumn) in 2010, this report presents the data from the first (spring) of three surveys planned for 2011, conducted on 25th and 26th May 2011.

The River Yealm rises in the Dartmoor SAC and flows broadly from Northeast to Southwest, prior to discharging into Wembury Bay on the South Devon coast. The proposed development site is located at the disused New England Quarry, near Lee Mill and the A38 (NGR: SX 5952954570). The river at this point is known to support a number of UK BAP species including lamprey, Atlantic salmon, brown/sea trout and otter, with Atlantic salmon also being a qualifying feature of the Dartmoor SAC.

The initial survey design was based on six sampling sites yet due to unresolved land access restrictions, beyond APEM's influence, in 2010 the spatial scope of the survey was limited to just three sites located within the land boundaries of the development site (Figure 1). Two surveys (July 27th and September 30th) were conducted in 2010 to provide seasonal coverage of macroinvertebrates and diatoms, with the autumn survey also complimented with the collection of fisheries, macrophytes and habitat data. Following the acquisition of permissions, six sites were successfully sampled for macroinvertebrates and diatoms in spring 2011, however, following evidence of high flow scouring impacting on invertebrate and diatom abundance in September 2010, site 4 was moved 20m upstream to a less energetic reach where the resident biota was considered less vulnerable to being dispersed during floods.

2 SURVEY METHODS

2.1 Macroinvertebrates.

Macroinvertebrates were collected using the standard Environment Agency (EA) three-minute kick sampling procedure using a standard pond net (set out in '*Procedures For Collecting and Analysing Macroinvertebrate Samples*'. BT001 3.0, Third Issue; 1999). This was accompanied by a 1-minute manual search, split into 30 second components before and after the kick-sample. This method is standardised to sample all of the habitats at a site in proportion to their occurrence and to maximise the comparability of data across sites.

Macroinvertebrates were collected on 25th May 2010 and 26th May 2011; consistent with the EA's spring sampling seasons.

The samples were returned to APEM's Dorset laboratory where they were sorted and identified to species level (for all groups, where possible, except Oligochaeta, Sphaeriidae, Hydracarina Chironomidae and Simuliidae, which were not identified further. Other Diptera were identified to genus or species, where possible) following quality-assured procedures, consistent with standardised EA protocols. A suite of standard biotic indices were calculated to measure the biological quality of the sites and the effect of environmental stressors, such as

water pollution, river flow change and habitat modification: Biological Monitoring Working Party (BMWP) (Wright *et al.*, 1984) Biotic scores, Number of Taxa (NTAXA), Average Score Per Taxon (ASPT), Lotic invertebrate Index For Flow Evaluation (LIFE) (Extence *et al.*, 1991) and Community Conservation Index (CCI) (Chadd & Extence, 2004) metrics. BMWP scores, ASPT and NTAXA are all consistent with and can be used for scoring of sites based on the River Invertebrate Prediction and Classification Systems (RIVPACS).

2.2 Diatoms

Diatom sampling followed standard procedures (Kelly *et al.* 2001) by collecting diatoms from the upper surface of 5 cobbles that were randomly extracted from unshaded, riffle habitats at each sampling location. In the laboratory, slides were prepared for enumeration using the hot hydrogen peroxide method. Coverslips were mounted in Naphrax (refractive index 1.98) and at least 300 valves were enumerated per slide. Identification was to species level, using the flora of Krammer & Lange-Bertalot (1999 – 2004). Species were then converted into the checklist of TDI taxa as presented in the user's manual (Kelly *et al.*, 2001) for calculation of the index.

This approach has provided information on less common members of the assemblage and thereby increases the sensitivity of the TDI. In such cases, enumeration continued until 300 valves of taxa other than the dominant taxa were encountered. Taxonomic data and abundances have been provided in the Appendix.

3 SITE DESCRIPTIONS

The following section and table 3.1 present a summary of the physical and physicochemical attributes of each sites at the time of the surveys. Fig 3.1 illustrates the spatial extent of the survey locations.

3.1 Site 1 (SX 60217 56027)

The average channel width was approximately 8m, with cobbles accounting for 70% of the substrate composition and gravel/pebble and sand making up the remaining 20 % and 10 % respectively. Riffle dominated the flow type (80%) with glide accounting for 18% and a small area of backwater accounting for the remaining area (2%). Conductivity, pH and water temperature were recorded as $121\mu\text{s}/\text{cm}^{-1}$, 7.93 and 11.94 °C respectively. Flow velocity was recorded as category 3 (25-50m/s⁻¹).

3.2 Site 2 (SX 59832 55466)

Average channel width was 6m and the substrate predominantly composed of bedrock with a area of pebbles/gravel and some sand also present. Flow type was dominated almost exclusively by glide with some limited areas of riffle also present. Conductivity, pH and water temperature were recorded as $129\mu\text{s}/\text{cm}^{-1}$, 7.99 and 12.2 °C respectively. Flow velocity was recorded as category 2 (10-25 m/s⁻¹).

3.3 Site 3 (No GPS signal).

The average channel width was 5.5m, with approximately half of the substrate composed of a pebble/gravel, with a mix of boulders, cobbles and sand making up the remainder. The flow was dominated by glide, with some limited areas of riffle also present. Conductivity, pH and

water temperature were recorded as $154 \mu\text{s}/\text{cm}^{-1}$, 7.84 and $11.67 \text{ }^\circ\text{C}$, respectively. Flow velocity was recorded as category 2 ($10\text{-}25 \text{ m}/\text{s}^{-1}$).

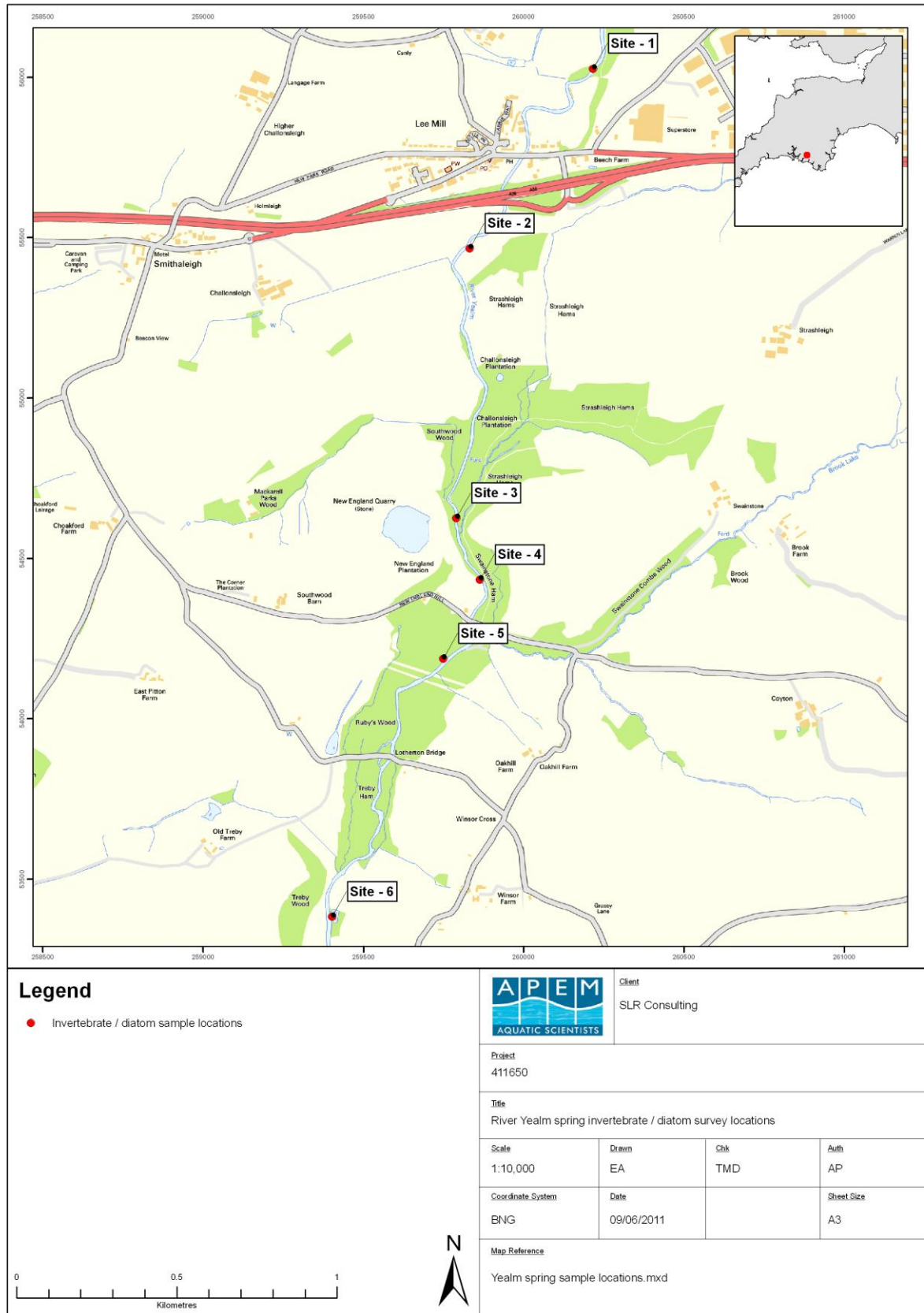


Figure 3.1. Map of the survey reach and relative location of survey sites.

3.4 Site 4 (SX 59864 54433).

The average channel width was 7.7m, with riffle dominating the flow and cobble, pebbles, gravel, boulder and sand composing the substrate. Conductivity, pH and water temperature were recorded as $162 \mu\text{s}/\text{cm}^{-1}$, 7.75 and 11.44°C respectively. Flow velocity was recorded as category 3 ($25\text{-}50\text{cm}/\text{s}^{-1}$).

3.5 Site 5 (SX 59749 54187)

Average channel width at site 5 was 7.7m. Flow type was dominated by riffle, with glide accounting for 20% of the remaining area. Substrate was dominated by cobble, although a large area of gravel/pebble was also recorded along with smaller proportions of sand and boulder. Conductivity, pH and water temperature were recorded as $162 \mu\text{s}/\text{cm}^{-1}$, 7.61 and 11.16°C respectively. Flow velocity was recorded as category 4 ($50\text{-}100 \text{m}/\text{s}^{-1}$).

3.6 Site 6 (SX 59403 53382)

The average channel width was 9m and the substrate consisted almost entirely of cobble, with only a small proportion of pebble/gravel present. Flow type was also homogeneous at Site 6 with the entire reach represented by riffle. Conductivity, pH and water temperature were recorded as $164 \mu\text{s}/\text{cm}^{-1}$, 7.73 11.48°C respectively. Flow velocity was recorded as category 4 ($50\text{-}100 \text{m}/\text{s}^{-1}$).

Table 3.1. Summary of the physical and physicochemical attributes of survey sites recorded during May 2011.

Site.	Depth (cm)	Width (m)	Main Habitat	Main Substrate	Conductivity ($\mu\text{s cm}^{-1}$)	pH	Temperature ($^\circ\text{C}$)
1	15	8	Rif/Gl	Co/Peb/Sa	121	7.93	11.94
2	25	6	Gl/Rif	Pav/Peb	129	7.99	12.22
3	25	4.5	Gl/Rif	Peb/Bo/Co/Sa	154	7.84	11.67
4	12	5.2	Rif	Co/Peb/Bo/Sa	162	7.75	11.44
5	12	7.8	Rif/Gl	Co/Peb/Sa	162	7.61	11.16
6	12	9	Rif	Co/Peb	164	7.73	11.48

4 RESULTS

4.1 Macroinvertebrates

While a summary of the calculated metric results have been presented in Table 4.1, a detailed species list will be presented within the appendices in the autumn end of year report. The macroinvertebrate communities were relatively diverse and typical of clean, fast flowing, stony rivers in the UK. BMWP scores and ASPT were above the thresholds that indicate any effects of water pollution (100 and 5.00, respectively; Hellawell, 1986). LIFE scores indicate that current velocity at all sites was typical of stony streams with adequate flows to support a diverse community, comprising species which are sensitive to the effects of low flows (Extence *et al.* 1999). Site 4 had the lowest BMWP metrics of the six sites, while the lowest

LIFE scores were found at site 2. The low BMWP and CCI scores at site 4 indicate the potential for a minor potential water quality issue. However, its impact is not serious.

Table 4.1. Summary of benthic macroinvertebrate scores and metrics July 2010

Site.	Biotic Score	ASPT	NTAXA	LIFE	CCI
1	192	6.62	29	8.47	15.87
2	184	6.57	28	8.25	13.79
3	165	6.6	25	8.32	14.72
4	124	6.2	20	8.91	8.5
5	165	6.6	25	8.57	14
6	169	6.5	26	8.66	13.53

4.2 Diatoms

Trophic Diatom index (TDI) was highest at Site 3 (TDI = 38.5), closely followed by Site 2. Site 4 had the lowest score at 32.4. Scores for all sites are presented in Table 4.2.

Table 4.2. Summary of diatomaceous algae from the three sites on the Yealm in July

Site.	TDI	% Motile Valves	Taxa > 50%
2	38.50	28.66	-
3	39.86	36.28	-
4	32.40	15.11	-

5 DISCUSSION

Interpretation of these results and comparison with other seasons in 2011 as well as comparison with results from 2010 will be presented in the final 2011 report.

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