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**POND PSYM SURVEY:
PREDISTVE SYSTEM FOR MULTIMERTICS**

At

Plot 3A

Wrexham Industrial Estate
Bryn Lane
Wrexham
LL13 9UT

NGR: SJ 39340 50457

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A handwritten signature in black ink, appearing to read 'Toby Hart', is positioned below the 'Approved by:' line.

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EXECUTIVE SUMMARY

A Predictive System for Multimetrics (PSYM) survey was undertaken of three ponds at a Plot 3A, Wrexham Industrial Estate, near Wrexham, by United Environmental Services (UES) Ltd in August 2022. The development proposals are for the construction of three industrial units with associated parking and access roads.

The objectives of this survey were to assess the quality of the ponds in relation to their botanical species composition and aquatic macroinvertebrate inhabitants, in comparison to ponds nationally, the ponds were surveyed in accordance with PSYM guidelines, where possible.

All three achieved lower scores than predicted. The overall Index of Biotic Integrity as indicated through the PSYM analysis is:

- Pond 1: 61%
- Pond 2: 39%
- Pond 4: 61%

Therefore, the PSYM quality category for Ponds 1 and 4 is Moderate, whereas for Pond 2, it is Low.

None of the ponds are assessed as Priority Ponds (qualify as Good quality PSYM ponds).

Although the three ponds will be lost to facilitate the development proposals, they will be more than compensated for through the ecological enhancement proposals for the scheme, which includes the enhancement of three retained ponds, and the creation of thirteen new ponds in the eastern section of the site.

This report should be read in conjunction with Appendices 1 and 2, which provide visual representations of the survey results.

1 INTRODUCTION

1.1 Author, surveyors, qualifications and scope of study area

This report is written by Alasdair Grubb BSc ACIEEM, UES Ecologist. Alasdair holds a level 5 Botanical Society for Britain and Ireland (BSBI) field identification skills certificate (FISC), which certifies him as competent to undertake phase 1 habitat and national vegetation classification (NVC) surveys. Other surveyors include:

- Lee RFD Knight BSc MCIEEM, Freshwater biologist. Lee is a national expert in freshwater ecology and a member of the Freshwater Biological Association
- Toby Hart BSc MCIEEM PIEMA, UES Managing Director. Toby holds a level 5 Botanical Society for Britain and Ireland (BSBI) field identification skills certificate (FISC), which certifies him as competent to undertake phase 1 habitat and national vegetation classification (NVC) surveys.
- Tom Kenwright BSc MSc, UES Senior Ecologist. Tom holds a level 5 BSBI FISC, which certifies him as competent to undertake phase 1 habitat and national vegetation classification (NVC) surveys.
- Mark Halliwell MBiol, UES Ecologist. Mark holds a level 4 Botanical Society for Britain and Ireland (BSBI) field identification skills certificate (FISC), which certifies him as competent to undertake phase 1 habitat surveys.

Alasdair, Toby, Tom and Mark have been trained in aquatic invertebrate identification and conducting PSYM surveys.

The report provides an assessment of the potential impacts on aquatic invertebrates associated with the proposed development at Plot 3A, Wrexham Industrial Estate.

This report has been verified by Toby Hart BSc MCIEEM PIEMA, UES Managing Director.

1.2 Survey objectives

UES was commissioned in March 2022 to conduct site surveys which include the following activities:

- To record environmental data on pond conditions, including pH, size and shading.
- To record a detailed list of the botanical species associated with the pond.
- To sample the pond using PSYM methodology and identify any aquatic invertebrates found to family level.
- To evaluate the calculated results of the PSYM survey and provide recommendations for further surveys, mitigation or compensation if required.



1.3 Proposed development

The development proposals are for the construction of three industrial units with associated parking and access roads.

1.4 Structure of the report

This report sets out the methodology, results, recommendations and compensation measures in relation to a specific PSYM survey. Recommendations are in line with statutory legislation and planning policy objectives.

This report should be read in conjunction with Appendices 1 and 2, which provide visual representations of the survey results.

2 METHODOLOGY

2.1 Field survey

Six ponds are present within the site boundary, four of which will be directly affected by the development proposals. The locations of the ponds are shown at Appendix 1 – Site plan. The ponds were surveyed on 11th August 2022 by Lee Knight, Toby Hart, Tom Kenwright, Mark Halliwell and Alasdair Grubb.

Environmental data was collected through observation and use of a Hanna Instruments pHep4 pocket pH and temperature meter.

In accordance with PSYM guidelines, the distinct mesohabitats within the ponds were identified and characterised prior to sampling. A 3 minute hand-net sample was then taken, with the total time divided equally between the different mesohabitats present. Each mesohabitat was netted vigorously to collect macroinvertebrates, whilst habitats which require disturbance to capture macroinvertebrates were kick-sampled immediately prior to netting the disturbed area. A further 1 minute search was then carried out searching for animals which may have otherwise been missed in the 3 minute sample. Areas which might be searched include the water surface (e.g. for whirligig beetles, pond skaters etc.) and under stones and logs (for limpets, snails, leeches, flatworms etc.).

The captured invertebrates were then identified to family level for most groups and class level for oligochaetes and recorded on the PSYM survey proformas. Once completed, the proformas were sent to the Freshwater Habitats Trust for comparison to ponds nationally.

2.3 Survey limitations

The surveys were undertaken following a prolonged dry period. As a result, Ponds 3, 5 and 6 were completely dry at the time of the survey. Ponds 5 and 6 are not due to be affected by the development proposals, so were not due to be surveyed anyway. The southern lobe of Pond 4 was dry at the time of the survey, so although a full botanical species survey could be undertaken, invertebrates could only be sampled from the northern section of the pond. This is not considered to be a significant limitation, as the majority of the invertebrates will have moved to the northern lobe as the southern lobe dried up.

3 RESULTS

3.1 Botanical assessment

The surveyed ponds are located within the 23ha site, on the outskirts of the Wrexham Industrial Estate. The site was formerly used for industrial and agricultural purposes, prior to being left unmanaged for several years. The site contains large semi-improved species-rich grassland fields interspersed with ponds, small stands of woodland, hedgerows and scattered trees. Large areas of the site have succeeded into dense scrub and areas of bare ground and ephemeral / short perennial are present on previously developed land within the south-eastern section of the site. The south-western section of the site contains an area of amenity grassland and a large hardstanding compound used to store vehicles. A shallow stream runs along the northern site boundary and wet ditches are present along the western and part of the eastern site boundaries.

Six ponds are present within the site boundary, three of which will be directly affected by the development proposals. The locations of the ponds are shown at Appendix 1 – Site plan.

3.1.1 Pond 1 – Grid reference: SJ 39177 50299

This pond is located near the centre of the site directly west of the track which runs north to south in the middle of the site. The pond is a large open body of water that is believed to be a man-made fishing pond (as evidenced by the presence of a liner man-made bund, anecdotal evidence from previous surveys of the site and from talking to adjacent landowners), however the current presence of fish is uncertain. The pond was over 0.5m deep at the time of the survey and is likely over 1m deep within the centre. The pond measures approximately 2600m². No submerged vegetation was observed. The emergent vegetation present comprises common reedmace *Typha latifolia*., hard rush *Juncus inflexus*, soft rush *Juncus effusus*, Cypress sedge *Carex pseudocyperus*, water forget-me-not *Myosotis scorpioides* and great willowherb *Epilobium hirsutum*. There is also a sparse matt of a waterweed *Elodea sp.* and spiked water milfoil *Myriophyllum spicatum* present on the pond. The banks are comprised scattered broadleaved trees and scrub including pedunculate oak *Quercus robur*, grey willow *Salix cinerea* and hawthorn *Crataegus monogyna*. Within the understory dog rose *Rosa canina* and oxeye daisy *Leucanthemum vulgare* were observed.

Based on comparisons with ponds nationally as part of the PSYM assessment, the pond is predicted to contain 20.1 submerged and marginal plant species. However, the actual score of 8 species on the aquatic species list is significantly lower than the predicted score.

The TRS¹ of 9.25 for the pond is higher than the predicted score of 7.14, and it is close to the maximum score of 10; indicating that the pond offers close to eutrophic conditions.

3.1.2 Pond 2 – Grid reference: SJ 39346 50292

This pond is located within the broadleaved woodland in the centre of the site. The pond measures approximately 2050m². The water was at least 0.5m deep at the time of the survey. No submerged vegetation was observed. The emergent vegetation was minimal consisting of small amounts of common reedmace. The mature tree canopy consisted of

¹ TRS – Trophic ranking system: Plant scores in this system vary between 2.5 (dystrophic i.e. very nutrient poor conditions) and 10 (eutrophic, i.e. nutrient rich conditions).

pedunculate oak, silver birch *Betula pendula* and *Populus sp.* The scrub understory comprised dog rose, hawthorn and bramble. The diverse mix of ground flora consisted of lords-and-ladies *Arum maculatum*, cleavers *Galium aparine*, common nettle *Urtica dioica*, broadleaved dock *Rumex obtusifolius*, spurge-laurel *Daphne laureola*, cock's foot *Dactylis glomerata*, spear thistle *Cirsium vulgare*, creeping buttercup *Ranunculus repens*, self-heal *Prunella vulgaris*, common sorrel *Rumex acetosa*, common mouse-ear *Cerastium fontanum* and marsh thistle *Cirsium palustre*. Small quantities of hard rush and great willowherb were observed in the surrounding margins.

Based on comparisons with ponds nationally as part of the PSYM assessment, the pond is predicted to contain 24.5 submerged and marginal plant species. However, the actual score of 3 species on the aquatic species list is significantly lower than the predicted score.

The TRS for the pond of 8.55 is close to the predicted 8.5. This score is relatively high indicating trophic conditions within the pond are moderate to high.

3.1.3 Pond 4 – Grid reference: SJ 39362 50525

This pond is located within the northern section of the site. The pond measures approximately 1100m². This is a large field pond that is surrounded by dense goat willow *Salix caprea*, grey willow, hawthorn, bramble and dog rose scrub. As with Pond 3, this pond is in a late successional stage and is being heavily encroached by swamp vegetation. Minimal submerged vegetation was observed including common duckweed and floating sweet-grass *Glyceria fluitans*. The emergent vegetation present includes common reed, soft rush, water plantain, water horsetail, great willowherb and Cypress sedge. The northern and western banks are predominantly of *Salix sp.* scrub with a ground flora composed of *Typha sp.*, hard rush, soft rush, glaucous sedge *Carex flacca*, Cypress sedge, common hogweed *Heracleum sphondylium*, fleabane *Pulicaria dysenterica*, bramble, and clustered dock *Rumex conglomeratus*. This pond will be removed as part of the development.

Based on comparisons with ponds nationally as part of the PSYM assessment, the pond is predicted to contain 18.3 submerged and marginal plant species. The actual score of 13 species on the aquatic species list is closer than the other ponds to the predicted score, however it is still lower than expected.

The TRS for the pond of 8.97 is close to the predicted 8.47. This score is relatively high indicating trophic conditions within the pond are moderate to high.

3.2 Invertebrate assessment

For full details of the families recorded, see the survey results included at Appendix 4 of this report.

3.2.1 Pond 1

A total of 13 taxa were recorded during the survey, with a total BMWP² score of 60 and an ASPT³ score of 4.62. This included 3 Odonata / Megaloptera families and 2 Coleoptera families. The table below shows a comparison between the predicted and actual scores for these metrics.

METRIC	PREDICTED SCORE	ACTUAL SCORE	EQI ⁴
ASPT	5.11	4.62	0.90
Odonata & Megaloptera (OM) families	3.11	3.00	0.96
Coleoptera families	3.76	2.00	0.53

3.2.2 Pond 2

A total of 11 taxa were recorded during the survey, with a total BMWP score of 38 and an ASPT score of 3.91. This included a single Odonata / Megaloptera family and 1 Coleoptera family. The table below shows a comparison between the predicted and actual scores for these metrics.

METRIC	PREDICTED SCORE	ACTUAL SCORE	EQI
ASPT	5.11	3.91	0.77
Odonata & Megaloptera (OM) families	3.25	1.00	0.31
Coleoptera families	3.79	1.00	0.26

3.2.3 Pond 4

A total of 10 taxa were recorded during the survey, with a total BMWP score of 60 and an ASPT score of 4.62. This included no Odonata / Megaloptera families, but 3 Coleoptera families. The table below shows a comparison between the predicted and actual scores for these metrics.

METRIC	PREDICTED SCORE	ACTUAL SCORE	EQI
ASPT	5.10	3.80	0.74
Odonata & Megaloptera (OM) families	3.28	0.00	0.00
Coleoptera families	3.81	3.00	0.79

² BMWP – Biological Monitoring Working Party scores assigned to taxa defined by Maitland (1977), so each is allocated a value from 1 to 10 depending on its known tolerance to organic pollution, a higher score indicates lower tolerance.

³ ASPT – Average score per taxa

⁴ EQI – The ratio of the actual score against the predicted score

4 EVALUATION AND RECOMMENDATIONS

4.1 Evaluation of results

All three achieved lower scores than predicted. The overall Index of Biotic Integrity as indicated through the PSYM analysis is:

- Pond 1: 61%
- Pond 2: 39%
- Pond 4: 61%

Therefore, the PSYM quality category for Ponds 1 and 4 is Moderate, whereas for Pond 2, it is Low. None of the ponds are assessed as Priority Ponds (qualify as Good quality PSYM ponds).

4.2 Mitigation and compensation measures

To compensate for the loss of Ponds 1, 2 and 4, an additional 13 ponds of varying shape, size and depth will be created within the ecological compensation area. Newly created ponds will be designed and managed to provide a range of ecological niches, from shallow ponds that dry out on occasion to deep ponds that retain water all year round. An additional two ponds / shallow ephemeral scrapes and three swales will also be created within the open mosaic habitat within the southern section of the site. This will result in the replacement of ponds being lost on a 5:1 ratio. Given the numbers of GCNs present on site and within the local area, it is considered highly likely that the newly created ponds will support this species and will hence qualify as habitats of principal importance under the same qualifying criteria as Ponds 1, 2 and 4.

Specific pollution prevention measures will need to be implemented to ensure that the retained and any newly created ponds are protected during the consultation phase of the development. Where possible, this will include a 'no-works' buffer zone of at least 5m around each pond.



5 CONCLUSION

A PSYM survey was undertaken of three Ponds at Plot 3A, Wrexham Industrial Estate.

The survey has concluded that none of the ponds qualify as Priority Ponds and in general the ponds scored less than predicted on a number of metrics used to assess pond quality.

Although the three ponds will be lost to facilitate the development proposals, they will be more than compensated for through the ecological enhancement proposals for the scheme, which includes the enhancement of three retained ponds, and the creation of thirteen new ponds in the eastern section of the site.



6 REFERENCES

Maitland, P.S. (1977). *A coded checklist of animals occurring in fresh water in the British Isles*. Institute of Terrestrial Ecology, Edinburgh.

Pond Action (2002). *A guide to monitoring the Ecological Quality of Ponds and Canals using PSYM*. Pond Conservation 2002. .



APPENDICES

Appendix 1 – Site plan



Pond Plan

**Site: Plot 3a, Wrexham
Industrial Estate
NGR: SJ 39340 50457
Author: Alasdair Grubb
Date: 03/09/2021**



KEY:

--- Site Boundary

■ Ponds to be removed

■ Ponds to be retained

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Appendix 2 – Results

PSYM PARAMETER SUMMARY (generated from pages 1 and 2)

Site details			
Site name	Pond 1	Pond 2	Pond 4
Survey date	11th August	11th August	11th August
Grid reference (e.g. SP123456 or higher precision)	SJ 39173 50306	SJ 39340 50291	SJ 39359 50533
Plant metrics			
No. of submerged + marginal plant species (not including	8	3	13
Number of uncommon plant species	2	0	2
Trophic Ranking Score (TRS)	9.25	8.5	8.966666667
Invertebrates metrics			
ASPT	4.615384615	3.909090909	3.8
Odonata + Megaloptera (OM) families	3	1	0
Coleoptera families	2	1	3
Environmental variables			
Altitude (m)	31	29	28
Easting	3391	3393	3393
Northing	3503	3502	3505
Shade (%)	10	70	60
Inflow (0/1)	0	0	0
Grazing (%)	0	0	0
pH	7.3	7.3	7.3
Emergent plant cover (%)	10	0	60
Base clay (1-3)	3	3	2
Base sand, gravel, cobbles (1-3)	1	1	1
Base peat (1-3)	1	1	2
Base rock (1-3)	1	1	1
Area (m ²)	2600	2050	1100

Results

Submerged + marginal plant species			
Predicted (SM)	20.1	24.5	18.3
Actual (SM)	8.0	3.0	13.0
EQI (SM)	0.4	0.1	0.7
IBI (SM)	1	0	2
Uncommon plant species			
Predicted (U)	3.9	4.3	3.3
Actual (U)	2.0	0.0	2.0
EQI (U)	0.5	0.0	0.6
IBI (U)	2	0	2
Trophic Ranking Score (TRS)			
Predicted (TRS)	7.14	8.55	8.47
Actual (TRS)	9.25	8.50	8.97
EQI (TRS)	1.30	0.99	1.06
IBI (TRS)	0	3	2
ASPT			
Predicted (ASPT)	5.11	5.11	5.10
Actual (ASPT)	4.62	3.91	3.80
EQI (ASPT)	0.90	0.77	0.74
IBI (ASPT)	3	2	2
Odonata + Megaloptera (OM) families			
Predicted (OM)	3.11	3.25	3.28
Actual (OM)	3.00	1.00	0.00
EQI (OM)	0.96	0.31	0.00
IBI (OM)	3	1	0
Coleoptera families			
Predicted (CO)	3.76	3.79	3.81
Actual (CO)	2.00	1.00	3.00
EQI (CO)	0.53	0.26	0.79
IBI (CO)	2	1	3
Sum of Individual Metrics	11	7	11
Index of Biotic Integrity (%)	61%	39%	61%
PSYM quality category (IBI >75%=Good, 51-75%= Moderate, 25-50%=Poor, <25%=V Poor)	Moderate	Poor	Moderate
Is this a Priority Pond? (Good quality category)	No	No	No