NE/2/D

Town and Country Planning Act 1990 section 77,

Town and Country Planning (Inquiries Procedure) (England) Rules 2000

Public Inquiry into planning applications by London Ashford Airport Ltd for the construction of a runway extension and erection of a terminal building at London Ashford Airport Limited, Lydd, Romney Marsh, TN29 9QL

Rebuttal Proof of David Heaver

10 March 2011

Natural England ref: LEG01-013 005/Planning – Lydd Airport Public Inquiry

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SECTION 1: INTRODUCTION

1. On receipt of Dr. McLellan's (LAA/9/A) and Mr Mead's (LAA/13/A) Proofs, I have considered the evidence presented and have in this rebuttal proof amplified on the points made in my own Proof (NE/2/A). Whilst there are some points made with which I find common ground, I cannot accept a number of the key assertions and I find the overall mitigation package for aquatic invertebrates to be significantly lacking. My concern focuses on the quality of the underlying data and the failure of the proposed new ditch complex to achieve a comparable fauna, both as a consequence of its overall design and the time taken for such invertebrate assemblages to be reached.

SECTION 2: SURVEY WORK AND ASSESSMENT

2. Dr McLellan considers in his Proof (LAA9/A, 3.2.5) that both the general invertebrate and medicinal leech populations in the application ditches were "*comprehensively assessed*" by the applicant's survey programme. I consider that whilst the actual execution of the sampling by the invertebrate surveyor was generally good, the underlying specification (as evidenced from the content of the final invertebrate survey report), which determined the sampling framework, was flawed and fails in its purpose. It fails to assess the conservation quality of the wider application ditch network in only sampling within the redline application area. This approach demands a number of questionable assumptions :

    a. That a small sample from one part of a long ditch (in the most extreme instance) allows you to confidently assign a conservation value to the whole of that ditch.
    b. That even over a short time, the conservation value of the redline ditch sample areas remains static and is not influenced by the invertebrates living in the rest of the ditch lengths.
    c. That construction will not affect the ditch complex beyond the redline.

3. I consider that these are largely unsupportable assumptions and that it would have been sounder to have established a sampling framework that covered the complete ditch network in the area of the airport, with sub-sampling within the redline boundary at the outset. This would have :

a. Allowed conservation quality comparisons to be made between whole ditch lengths, and between those sections within the redline boundary.
b. Allowed a more robust conservation value to be formulated for whole ditches and for the redline boundary ditch sections, since the fauna within any ditch is both able to swim and/or fly to other parts of the same ditch, even with water control structures being present. The more mobile parts of the fauna could easily move *between* nearby ditches. The assumption that they do not is untenable. Whilst one has, of course, to set some benchmark, the survey should have established a better standard than it did.
c. Identified what species would be impacted from any unavoidable engineering requirements on ditch lengths beyond the redline boundary; there is currently no understanding available of this at all.

4. The limitations of the applicant’s approach is most starkly seen in relation to Ditch 7, where the redline boundary crosses only a small length of the ditch around the confluence with Ditch 5. There is no difference between the redline section and the rest of the ditch length that I could observe on site, and there is no obstruction within the channel separating these sections. The ditch is piped for a short length under a farm access track, but I have observed good water flow through it. Importantly, the whole flow along Ditch 7 is in the direction of the sample point, so that the fauna in the un-sampled reach would have a tendency, by force of current alone, to end up in the redline section, even without actively swimming or flying there which they can readily do. By not sampling the rest of that ditch length, there is an inherent assumption that one sample somehow stays independent of the rest of the ditch, which is most questionable in my opinion.

5. The range of draft planning conditions for ditch invertebrates (CD17.2, Condition 17) as indicated as necessary by Dr McLellan in his proof ((LAA9/A, at 4.3.9 & 4.3.10) does little more than track the physio-chemical parameters of the water course over time, and provide ditch invertebrate survey information, both of which are actually required before the decision on whether planning permission should be granted. Whilst the assessment of invertebrate assemblage changes over time, post-development, is of intellectual interest, it cannot in any sense be seen as safeguarding the ditch invertebrates as it tracks, rather than determines, the success or failure of the work. Similarly, the surface water drainage scheme detail and the Construction Environmental Management Plan are again set as conditions (CD17.2,

Conditions 3 and 9) that will be agreed before commencement, despite the design detail being essential in assessing the impact on ditch invertebrates. There can be no proper understanding of what the ditch parameters actually would be. So, for example, points relating to the apparent reduction in structural variation in the proposed ditch lengths, or the uncertainty of how the proposed ditch complex joins up with the remaining Application ditches when the former is founded on a deeper bed level, or how the Construction Management Plan will deal with a poorly understood medicinal leech distribution, are all beyond the scope of proper consideration at this stage.

6. Clearly, my evidence can only be based on what data are provided by the applicant and to make the best use of it, though its limitations do prevent a full and robust assessment of the true conservation value of the ditch network.

7. Dr McLellan (LAA 9/A 4.3.3) has correctly cited the original species status accounts as given in the invertebrate survey, though it would have been more accurate to have also updated them as I have done in my proof (NE/2/A). This status revision has resulted in a small drop in conservation significance in terms of the rarer components of the fauna, though this is overshadowed by the calculation of overall quality as revealed by the Species Conservation Status Scores (SCSS) in my proof. By concentrating only on 12 “rare” species (as assessed using the updated status accounts (NE2/A/20)), Dr McLellan’s assessment completely ignores the bulk of the sample data, and the bulk of the ditch species comprising the ditch assemblages, thus giving an incomplete and skewed picture of the nature conservation importance of the application ditches.

SECTION 3: ASSESSING THE INVERTEBRATE ASSEMBLAGE

8. I find it surprising that no attempt was made by the Applicant to consider the conservation value of the ditches in terms of the overall invertebrate assemblage. The use of the Species Conservation Status Score (SCSS) methodology in the Buglife ditch report was facilitated by access to the late-stage publication draft (practically identical to the final report version now published on the Buglife website) at the time of preparation of my Proof. Whilst it might not have been fully in the public domain, the project had been listed on the Buglife website since August 2007 (also

the time of the Lydd invertebrate survey), and the late-stage report was freely given when asked for. The whole project, including the companion projects, had support of the Environment Agency, Countryside Council for Wales, Natural England, the Broads Authority, and the Norfolk Biodiversity Partnership, in addition to a range of supporters sitting on the steering group such as Pondlife. As such, it can be regarded as a valuable recent addition to the core assessment toolkit.

9. The Species Quality Index (SQI) has a wide and long-term acceptance as a conservation tool for invertebrates, Williams (2000) citing its development as a concept starting in 1987. It is kindred to the SCSS and uses a comparable species scoring system, with the rarer species typically scoring 32 points and the common species 1 point, with a geometric progression in between. The SQI is the summation of those scores divided by the number of species in the sample.

10. A limitation of using an assessment other than SCSS is that some secondary decision needs to be made on which of the species in the invertebrate samples one should score. There is a risk of including non-ditch or ubiquitous aquatic species in the assessment, as well as a requirement to be vigilant for changes in conservation status across a broad suite of invertebrate families. With SCSS, the checklist of 460 species of high quality coastal or near coastal grazing marsh ditch sites is already given, is up to date with respect to species status, and is specific to grazing marsh ditches.

11. The benefit of a system such SCSS or SQI is that it considers most of the invertebrate species in the ditch samples and assigns a value to the overall assemblage, rather than focusing on a very small number of rare species. When evaluated against a number of the other likely contenders for assemblage assessment, the SCSS has obvious advantages. WETSCORE is suitable only for water beetles, and so ignores most of the species in the samples; Biological Monitoring Working Party Score (BMWP) typically requires kick sampling which is not a feasible technique in ditches. There is a wealth of literature on the use of these types of assessment tool in invertebrate conservation, with many worked examples. These issues are expounded on more fully in a report to Countryside Council for Wales (Bratton, 2002).

SECTION 4: MEDICINAL LEECH

12. The opinion on the presence of medicinal leeches in the Application ditches seems to vary in the Applicant's submissions. Despite the fact that Dr McLellan's Appendix 4 (LAA9/C, at 2.1.3) states that the ditches do not provide "suitable habitat" for medicinal leech, and the main body of the Proof at one point (LAA9/A, at 4.6.4) notes that there is "some doubt" over whether leeches occur in the ditches, the Environmental Statement (CD1.14) at 10.4.33 notes that :

    "*Medicinal leeches were also found whilst netting for amphibians and fish in two ditches to the north of the runway.*"

13. The Environmental Statement also states that medicinal leeches "are likely to use the network of ditches throughout the site" (ibid, 10.4.59). Although medicinal leeches were stated to be present in the Application ditches as a by-catch to great crested newt surveying, the question of great crested newt surveyors not being entomologists, and so mis-identifying the medicinal leech (Godfrey, 2010), is a potentially reasonable one to raise. It is answered by the observation that the surveyors discriminated their observations between medicinal and "other" leeches, suggesting that they have encountered them before. Given that medicinal leech is locally common across the Romney Marshes, and requires a protected species licence to survey (take or disturb), so demanding some surveyor diligence and attention to identification, it is not unreasonable to accept these records. The only other leech species likely to be confused with medicinal leech by size is the large Horse Leech *Haemopsis sanguisuga*, but whilst McConnell (2000 in NE/3/E Appendix 5) notes the presence of this species elsewhere within the SSSI at nearby Walland Marsh, it is not known if it occurs in the Application ditches. The Applicant made no attempt to validate or refute these observations by additional bespoke survey.

14. Dr McLellan makes no comment to explain why he considers the ditches unsuitable or sub-optimal for medicinal leech. In addition, Dr McLellan makes no comment about the Applicant's omission to undertake another, more bespoke, medicinal leech survey in the light of the discovery of medicinal leeches by the newt survey, which used different sampling techniques. A consideration of the medicinal leech issue being in the Application ditches, recently prompted the Applicant's entomologist to

note (Godfrey, 2010) that, in his professional opinion it is "*certainly probable that medicinal leech could be present in the ditch network*".

15. I consider that the original technique for surveying for medicinal leeches, though fundamentally sound and used in other situations, was clearly lacking when used on this site as it did not discover the target species, and that nocturnal torch surveys, augmented by splashing (Nixon, 1999, in NE/3/E, Appendix 5), as used for great crested newts, may well have yielded more results. Limited survey by torching and water disturbance was indicated to take place in an e-mail from Parsons Brinkerhoff to English Nature (16/02/2006) "*in the two drains*", but no further. Medicinal leeches are, it should be noted, sometimes an elusive species, and do require a level of diligence to uncover their real distribution. Dickinson and Lent (1984) noted the behavioural differences between hungry and satiated medicinal leeches, with the latter tending to crawl, seek deeper waters and position themselves under rocks, and not to swim towards ripple disturbance sources. As it stands, we have only a partial view of their occurrence across the application ditches and airport water-bodies for this protected species. I cannot see how Dr McLellan can view this species as "*comprehensively assessed*" based on the survey work presented.

16. The submitted draft planning conditions (CD17.2, at 16.2 on) make much of the post-permission survey and population monitoring of medicinal leech that will take place before construction, giving perhaps the "*comprehensive assessment*" alluded to above. However, it still does not overcome the point that this Schedule 5 protected species' distribution is still poorly understood across the Application ditch network, and that the full impacts of the destruction of the Application ditches on medicinal leech cannot be ascertained at this point. This makes a proper assessment very difficult, if not impossible.

17. Another entomological assessment of the Application ditches was carried out on the 9th December 2010 (Godfrey, 2010). The survey was confined to the LAA land and did not sample the ditch lengths on the adjoining farmland. Whilst the surveyor noted that it was cold, but with clear conditions, this rather obscures that Met Office provisional data indicate that it was the coldest December since 1910 for the UK, promoting their press release to note:

> "*In the last 100 years, the UK has experienced five colder months - January 1940, February 1947, January 1963, February 1963 and February 1986*" (Met Office online archive).

18. The November before this was similarly cold, suggesting a sustained period of adverse weather affecting ditch invertebrates. Invertebrate activity is strongly correlated with temperature, and periods of extreme and protracted cold, as was experienced across the UK in the later months of 2010, would have depressed what adult populations were remaining. That, coupled with the survey taking place in December, which lies outside of the published (Drake et al, 2007, Table 14, p72 on) optimal months for a number of the invertebrate families which we know exist in the Application ditches, gives little weight to the findings. The point in the 2010 Invertebrate Survey (p4) about the low incidence of adult capture or the difficulty in both detecting and identifying the non-adult stages, is why this time of year is usually avoided for invertebrate survey.

SECTION 5: MITIGATION

Abandoned Mitigation Ideas

19. At one time, the Applicant was proposing the creation of an additional 450m of ditch "solely for the purposes of creating wetland habitat for key species such as water vole, great crested newt, medicinal leech and a range of other aquatic and terrestrial invertebrates". An outline of this was given in LAA13/C (Annex 3 WSP Surface Water Drainage Strategy Supplementary Information, March 2009, Appendix H "Ecological Impacts of the Drainage Proposals for the Proposed New Runway Extension" CD 1.42a). This did propose a ditch bank profile from a Derbyshire water vole mitigation which, if followed, would have resulted in an enhanced aquatic invertebrate habitat.

20. As an in-principle suggestion, this extra ditch length would have had the potential to be beneficial for aquatic invertebrates. It did conform to the type of ditch cross section I would expect to be designed for a biodiversity ditch and should allow over time a good fauna to establish, as it had the potential for a range of ecological niches to develop. It would, of course, be as constrained by the same slow progress of time limiting the development of core ditch faunas as the new drainage ditch complex will be. It would have also been a warmer system than the 1300m of ditch, (ibid, 4.2.14,) noting the importance of higher water temperatures for medicinal leech.

21. There would have been significant conservation issues with the proposed location of this short ditch length, arising both from its lack of connectivity to the existing Application ditch network and its proposed position on the vegetated shingle, which would have made the particular proposal unacceptable. However, the proposal could have been refined and improved and in principle, could have provided some mitigation for what will be lost to the development.

Proposed Mitigation

22. There is a presumption by Dr McLellan (Proof of Evidence LAA9/A 4.6.4; LAA9/C Summary Of Ecological Mitigations And Enhancement Proposals S2.1.8) that the arable agriculture of the surrounding land use automatically results in a decline in water quality in the ditches, and that removal of the agricultural pressure through development is a useful mitigation. However, it is not always true that arabilisation leads to such declines, as shown by Foster *et al* (1990) on the Cross Drain SSSI in Lincolnshire, running as it did “through an arable land, planted with wheat in 1986”. Despite this running counter to the accepted understanding, as correctly stated by Dr McLellan, the Cross Drain contained 56 water beetle species, and was considered by the authors (one the National water-beetle recorder) of that paper to be “outstanding” (p.351). The fact that the Application ditches, although only partly sampled over their full length, have strong and important assemblages and species and are surrounded by arable fields, also gives exception to this generalisation.

23. Whilst removal from agriculture *would* give a reduction in ditch nutrient loading, and this is generally a desirable end point, one could also achieve a reduced nutrient input into the ditch network through the existing land owner entering into an agri-environment scheme, though this has yet to come about. In essence one could achieve the benefits of this mitigation without the attendant risks accruing from the rest of the development process.

24. It is also suggested (LAA/6/C, Appendix 2) that to maintain a bird-unfriendly tall grass sward (referred to as LGP) on the non SSSI grasslands, there would be a regime of fertiliser application. Whilst it notes (ibid, 6.1.7) that only minimum fertiliser applications would be made:

"*to maintain a bird-deterrent LGP and will only be applied as and when soil sampling and/or observations of grass growth indicate nutrient deficiencies*",

25. It is unclear how much nutrient loading there will be and how it compares with the existing fertiliser regimes arising from the existing arable cultivation. This lack of clarity questions the validity of a mitigation part-founded on a reduction in nutrients in the Application ditches, and does not offset the concerns raised in my proof about water quality declines in the Application ditches arising as a consequence of the development (NE/2/A, at 39 and on).

SECTION 6: THE RAMIFICATIONS OF THE NEW DITCH DESIGN

26. The design parameters of the new ditch complex (as shown in LAA/13/C, Annex 3, WSP Surface Water Drainage Strategy, March 2009, CD1.42a, 6.10) will result in a greater water volume below the summer retention level, an increased surface area but a reduced average width, and an increase in flood capacity than is currently found in the existing application ditch network. Given this alteration of the ditch parameters, there can be little certainty over what the eventual invertebrate assemblage will contain. Foster *et al* (1990) noted the high statistical significance of water depth and amount of submerged vegetation on water beetle assemblages, which "indicated the possible importance of flow rate". So, altering the parameters affecting flow has unknown consequences on faunal development.

27. In addition, the low level of information available on the distribution of medicinal leech offers little confidence at this stage that the construction works are able to avoid significantly affecting them, as the operation of ditch drainage, albeit over a longer time than usual (5.8.9, London Ashford Airport, Lydd (LAA), August 2008, Construction Environment Management Plan), and the placement of drain blocking stone-filled gabions (5.12.2, ibid), would take place without full assessment of the constraints. Whilst the draft planning conditions do anticipate both more leech survey and a revised Construction Environment Management Plan (CD17.2, Conditions 16 & 3) this detail is lacking at this stage and is not capable of being properly assessed.

28. The figures in Appendix F1559 to the WSP Surface Water Drainage Strategy (CD1.42a, Supplementary Information, March 2009, Volume 5) describe the parameters of both the existing and proposed ditch networks. It is assumed that the figures are in metric, though it does not say in that figure.

29. It is apparent from this that there is a wide variation in the physical nature of the Application ditches, with a range of section areas for the Application ditches being 0.844 to 6.797m^2, and the width at the summer retention level (i.e. typically the water level point when the fauna is probably most active) having a range of 3.633 to 8.366m. The water volume below the summer retention level ranges from 137 to 1728 m^3; whilst the surface area at the summer retention point ranges from 230 to 1970m^2. The existing ditch complex thus has a variation of 5.953m^2 in section area, 4.733 m in width at the summer retention level, and 1591m^3 water volume below the summer retention level, with the surface area at the summer retention level of 1740m^2. These two latter figures are greatly skewed by the Mockmill sewer which seems to operate as a major drain in this area. Excluding this ditch from the assessment gives a volume range of 523$m^{3,}$ and a surface area range of 723m^2.

30. In contrast, the proposed ditch complex unifies the ditch structure around a section area of 3.983m^2, a width at the summer retention level of 4.99m, and a volume below the summer retention level of 5178m^3. The surface area at the summer retention level is 6487m^2. Whilst it is noted that the average areas and widths are given, it is far from clear what the range distribution of these ditch parameters would actually be. Whilst both the ditch section area and the ditch width at the summer retention level do fall within the existing ditch range, both the surface area at the summer retention level and the volume of water below it do not.

31. An increased surface area at summer retention level would probably be beneficial to invertebrates; it is the layer upon which a number of beetles and water bugs operate, the surface upon which prey falls and is consumed, and is the surface for both oxygen transfer and, in part, water plant growth. However, the increase in water volume below the summer retention level would seem likely to result in an overly cooled habitat, which should be avoided not least as temperature is important for medicinal leech, as explained further below.

32. It is not clear how the new ditches will operationally relate to the remaining lengths of original ditch, given that the former will be founded on a deeper bed level than the latter, save for the Mockmill sewer itself with which it shares a common level. It is also unclear how much variation in ditch structure away from that seen and formally commented on by the Environment Agency and RMAIDB, would be allowed by those authorities so that even if the Applicant wished to improve the specification, it may be constrained by the requirements of those bodies who have already confirmed their acceptance of the broad scheme as placed before them (LAA/13/A, at 4.1.4).

33. Of perhaps even greater concern is the likelihood that the new ditch network would greatly reduce niche availability through its enforcement of structural homogeneity. The ditch network is proposed to be basically all the same (or at least the Applicant's proposals are silent on the degree of variation that is achievable) and so would not replicate the variation that currently exists in the Application ditches. It is clear from elsewhere in this rebuttal, that invertebrates are critically influenced by structure and physio-chemical parameters, and that providing a good range of conditions in these respects gives a greater chance that species will find the conditions they require. By enforcing uniformity, one reduces the options.

34. Additionally, the general unsuitability of these ditches for a range of species is noted by the Applicant. Section 4.26 of CD1.33c states that:

    "*The new drains will contribute to the drainage of the site in the same way as the existing ditches and will play a role in balancing water levels throughout the area... These ditches will be maintained as sewers and are unlikely to provide ideal habitat for species observed on site. For this reason an additional ditch will be created which will focus on enhancing the biodiversity across the site*".

35. The proposal for the additional 450m ditch has, of course, now been dropped by the Applicant.

36. It is noted (LAA13/C, Annex 3 WSP Surface Water Drainage Strategy, CD1.42a, 6.26) that the RMAIDB will continue to operate their maintenance works programme across the proposed new ditch network, presumably still utilising their conservation-grade techniques (as broadly outlined in their Biodiversity Action Plan: 22: Procedural Action Plan document). It is uncertain whether the proposed ditch system would

generate the same frequency of ditch management as at present, or demand an increased return time, since its primary function will be more towards securing runway drainage than alleviating flood risk to arable land. Since ditch management does have a strong influence on ditch faunas, as it partly re-sets the successional clock and actively removes parts of the fauna from the water course, lack of coverage of this matter in the Applicant's material remains of concern.

37. Ditch management, though vital to the maintenance of ditch faunas, does affect the assemblages found there. Scheffer *et al* (1984) suggested that vegetation pattern in Dutch fen polder ditches probably was the main factor in driving macro-invertebrate distribution within the water column. This is the very structure that is affected by dredging works. Twisk *et al* (2000), from their work on caddisflies and dragonflies in 240 ditches in Dutch dairy farmland, showed that "dredging had an impact on the presence of all larvae types". Painter (1999) further noted that "the significant correlation between site scores for macrophtyes and invertebrates suggests that macrophyte structure is likely to be an important influence on the invertebrate assemblage present on a site". A related point is made by Highler & Verdonschot (1989) who also noted that physio-chemical parameters were more important for invertebrates than the individual plant species.

38. So, if a greater frequency of ditch maintenance does arise as a consequence of the expansion of the airport, then the ditches would tend to remain more towards an early than middle successional state, with attendant impacts on the fauna.

39. Increased ditch water volumes would also influence summer water temperatures which are known to be critical for medicinal leech breeding, as it would take longer for the water to warm to the critical temperatures. Bass (1996) summarises the temperature requirements, noting 50% activity levels of leeches recorded at 19^{o}C, and 90% swimming vigorously at about 23^{o}C, citing optimal breeding temperatures between 25.5 to 27.5^{o}C, (though field data is required for a more complete picture). Reynolds *et al* (1998), from laboratory studies, confirmed the role that temperature plays on the developmental staging of late medicinal leech embryos, noting that "*development proceeds more quickly at higher temperatures*". Whilst development within the egg cocoons is typically amongst water edge marginal vegetation, and so less dependent on water temperature, egg development itself similarly *ought* to be

temperature and blood protein dependent. It is also likely that juvenile leech growth also has a temperature dependent component.

40. There is a very real risk of cooling the habitat of this heat-loving species which has not been addressed in the section of the Applicant's Proof dealing with the new ditch construction, though it was acknowledged as a design opportunity for the now abandoned 450m of biodiversity ditch (LAA, CD1.33c, Supplementary Information August 2008, Volume 6, Appendix 3, 4.2.14). Should such cooling be a feature of the proposed ditch sequence, it would lead to lowered activity levels for adult leeches, and lowered reproductive capacity.

41. The proposals for surface netting of all new ditches (LAA/6/C, Appendix 2, at 6.2.2; more fully dealt with in my colleague Mrs Dear's Proof, NE/3/D), would exclude, by design, all the larger water bird species which would otherwise use the Application ditches, removing many potential blood meal food resources for medicinal leech. Mr Deacon's proof (LAA/6/C, Appendix 2, at 6.2.3) goes on to note the possibility of varying this netting policy depending on the bird strike risk and ditch position, and such a revision across the Application ditch network would be essential.

42. Whilst medicinal leech will blood-feed on amphibians, they will also feed on nesting birds, locating themselves under nests and feeding from beneath. In some locations, their habit of feeding on nesting birds has been used as a valuable survey technique. It is also possible for medicinal leeches to feed on birds sitting at length on the water surface, since leeches are strong swimmers. Results from the 1999 blood meal survey across Romney Marsh (Nixon 1999, in NE/3/E, Appendix 5) demonstrated a comparable split of blood meals from fish and birds, with relatively little feeding on amphibians, a point re-enforced by McConnell (2000, p29, in NE/3/E, Appendix 5) who demonstrated that across the Romney grazing marshes (ditches and small pools), bird and fish blood meals accounted for about 69% of the recoverable blood samples from medicinal leeches, though amphibians were more heavily exploited in gravel pit water bodies. This presumably reflects amphibian breeding site choices, and hence enhanced prey availability for leeches.

43. As medicinal leech only feeds on blood, a reduction in avian blood meals would have an adverse impact on the population of medicinal leeches. The switch to amphibian

blood meals from mammalian blood is cited by Davies and McLoughlin (1996; in NE/3/E Appendix 5) as a possible reason why leech numbers have declined. They note (ibid, p567) that

> "*a greater reliance on amphibian hosts by H. medicinalis populations will result in lower available energy for growth (somatic and reproductive) and, hence, fecundity and fitness should decline*".

44. They cite the lower energetic value of amphibian blood and the increased feeding frequency arising from feeding on these relatively smaller blood sources (the amphibian hosts often being killed) as important factors, though they note that inconsistencies in the results in the literature on time to first breeding from previous studies, most likely arose because of experimental procedural differences (ibid,566). They consider (ibid, 567) that a mixed blood meal's (amphibian and mammalian blood) impact on reduced times for leeches to reach maturity is more about medicinal leech foraging ability and the issues around that, than some trade-offs between the differences in the relative blood meal type contributions.

45. Though the Lydd ditches currently have no livestock mammalian blood sources (running as they do largely through arable fields), they do support a range of birds (moorhen, coot, mute swan, for example), and this is likely to be important for medicinal leeches in this situation. By limiting the resource to effectively only two bird species (coot and moorhen) the netting proposal effectively reduces feeding opportunities for medicinal leech.

46. It was, at one time (CD1.33c, Supplementary Information, August 2008, Volume 6, Appendix 3, at 4.2.13, Impact on designated sites, drainage ditches, and Great Crested Newts) considered that the "main target species for the new ditches are medicinal leech". This was amended a year later (LAA13/C Annex 3 WSP Surface Water Drainage Strategy Supplementary Information, March 2009, Appendix H "Ecological Impacts of the Drainage Proposals for the Proposed New Runway Extension", at 4.2.13-4.2.15, CD1.42a) such that the ditches were to be "amenable.....to medicinal leech". Either sentiment is unfortunate given that, on the face of it, the main parameters around both the new ditch design (cool and deep) and operation (presumption of netting against large birds) all largely operate against having good medicinal leech populations.

SECTION 7: RECOLONISATION

47. Dr McLellan's Proof of Evidence (LAA9/A, 4.3.7; 4.5.4; 4.6.4; LAA9/C, 2.1.4) makes much of the rapid establishment of "similar" assemblages in the new 1300m ditch complex as to those in the current Application ditches, stating (ibid 4.3.7) that:

    "*Within 2-3 years, the ditches would contain similar plant and invertebrate communities to those recorded in the existing ditches*"

48. As set out in my Proof of Evidence (NE2A, 47), work by Drake (2008, 2009) has shown that even ditches 5 to 8 years old, though supporting a range of rare early successional colonisers, did show differences from the older ditch faunas, lacked core parts of the assemblage, and were especially dominated by beetles.

49. In my opinion, to arrive at a comparable ditch assemblage will take considerably more time than Dr McLellan suggests, even with the seeding into the ditches of old ditch substrate. This is hinted at in Dr McLellan's own authored (LAA13/C Annex 3 WSP Surface Water Drainage Strategy Supplementary Information, March 2009, Appendix H "Ecological Impacts of the Drainage Proposals for the Proposed New Runway Extension", at 3rd paragraph, CD 1.42a) when it notes that "*their value will not equate for some time to that of the ditches lost*".

50. Given that there are likely to be issues of suitability relating to those new ditches reaching the desired physio-chemical parameters required to support a broad spectrum of species, translocation of substrate into new ditches might assist success to some extent, but has few demonstrable examples in establishing viable and sustainable species populations.

51. Those parts of the fauna likely to be absent are the snails and the leeches, as they are particularly slow to colonise. Whether this is because of their physical speed of movement, or one of water quality/ habitat quality maturation, is less clear. Drake (2008) showed that, for example, the soldierfly *Odontomyia ornata* (RDB2), and the scarce water beetle *Limnoxenus niger,* were found in the RSPB's Greylake "new" ditches, but that these "new" ditches were dug in 2003-04, and sampled in 2008, so

were 4-5 years old. This is to be expected for a number of species, as they will be driven by the opportunity to colonise “re-structured” water bodies and can thrive into the later mid successional stages of ditch development. The converse can be seen in a common species such as the Blue-tailed damselfly *Ischnura elegans* which was found to be much more common in the older ditch systems.

52. It is correct for Dr McLellan to state (LAA9/C, 2.1.5) that pioneer ditch systems do support a range of rare and scarce species and for me to note in addition, as I did in my Proof (NE/2/A, 47), that the Species Conservation Status Scores from such pioneer assemblages are often very high, frequently being composed of rare and opportunistic species. But this is a relatively short lived effect and is diminished by the ditch aging processes. It is, in part, likely to be replicated by cleaning out ditches which partly resets the successional clock, and probably already happens in some form after ditch maintenance. Painter (1999, p42), working on ditch and fen complexes across Wicken Fen in Cambridgeshire, also related ditch age to quality. He noted that for Coleoptera (beetles) the Species Quality Scores (a variant of the Species Conservation Status Scores used in the Buglife reports cited in NE2A; 25) were significantly correlated with ditch age and detritus, with the oldest site, Sedge Fen Drove, having the highest SQS value and North Dyke "2-4 years old” having the lowest. Interestingly, the Cross Drain cited above was originally dug in 1801, with improvements made in 1937, and so appears to be only a little older than most of the application ditches, again re-enforcing the difference between old but managed ditches and brand new ones.

53. It is fortunate that from the wealth of UK grazing marsh ditch samples, the Buglife ditch survey (Drake et al, September 2010, Table 6.5.7) was able to explore the preferred conditions of a number of the scarce species found in such ditches. Looking at the species recorded within the Lydd Application ditches, some of the rarer species do favour the earlier successional stages in ditch development, such as the Near Threatened great silver water beetle *Hydrophilus piceus* and Nationally Scarce water beetle *Peltodytes caesus*, as well as the Red Data Book 3 ornate brigadier soldierfly *Odontomyia ornata*, though they are also found in mid successional ditches. The Nationally Scarce black colonel soldierfly, *Odontomyia tigrina* is typically confined to mid successional ditches, with the Near Threatened water scavenger beetle *Limnoxenus niger* seeming to be tolerant of a wider range of ditch successional stages. Late stage ditches support the Nationally Scarce diving

beetle *Graptodytes bilineatus* and the Near Threatened scarce emerald damselfly *Lestes dryas* and both are typically not found in any other age class.

54. So, whilst newly cut ditches or those recently heavily managed, do support part of the fauna, other components of the fauna are typically not found in such ditch lengths and only arrive after the considerable passage of time.

55. Whilst we do not have a long time series of investigations of a single ditch system from the day of its creation in the past to the present, there is a study which suggests a likely colonisation path for the proposed 1300m ditch length. The Environment Agency (2007) records the detail of the large scale coastal re-alignment scheme on the Humber Estuary at Paull Holme Strays. Part of this project involved the re-establishment of three soke dykes and a pond behind the new Humber Bank in 2003 as a replacement for a borrow pit which would be lost to the sea by coastal re-alignment. Vegetation was transferred between the old and new water bodies (July 2003), with a baseline survey and subsequent faunal surveys for five years afterwards (April 2004, May 2006, May 2007, May 2008).

56. In summary, this work demonstrated an early flush of water beetle species, some being opportunistic colonisers of new sites, resulting in the site having an elevated conservation status score. The beetle community moved into a more maturing phase and by its 5th year there were signs of communities of leech and snail species developing within the soke dyke network. However it is likely that the site by that time had still had not fulfilled its conservation potential.

57. It is worth considering the detail of this scheme, as it has some parallels with the potential ditch creation at Lydd. Within the first season in the new soke dykes two Nationally Scarce opportunistic water beetle colonists of raw ponds such as *Hygrotus nigrolineatus* and *Scarodytes halensis* quickly moved in, with the Nationally Scarce coastal / brackish water specialist water beetles *Haliplus apicalis, Agabus conspersus* and *Enochrus bicolor* also being present. Unsurprisingly, these species have not been recorded in the Application ditches. In April 2004, 63% of the water beetles (26 out of the 41 species recorded in the original borrow pit) were recorded in the new soke dyke complex, with 3 of the original 8 Nationally Scarce species (at the time) recorded in the original borrow pit (by then lost to the sea) being found in the

new soke dykes and borrow pit. The author notes the difficulty in separating successful species implants from natural colonisation, and the caution of regarding singleton recording as a proxy for population establishment. As noted (Environment Agency, 2004), the Species Quality Index (SQI) of the April 2004 water beetle fauna was comparable to that of the original borrow pit (2.67 to 2.66) after the passage of just one year. It is unfortunate, however, that the baseline data for the original was not fully included, and more widely used as a metric by which to judge success at the new soke dyke complex, as it would have been instructive to track assemblage development, in addition to deriving the SQI. This could mean that although there is SQI score parity in the first year, this does not necessarily reflect parity in species assemblage composition, and that the score is elevated by the pioneer species noted above. Other species groups in 2004 had varying representation, with *Limnephilus* caddis flies being represented by about two species, the only mollusc by the ubiquitous wandering snail (*Lymnaea peregra*), and the common leech *Glossiphonia complanata* by only a single individual. The latter species is found in low numbers in half of the Application ditch samples.

58. In 2006, further survey was carried out (Environment Agency, 2006), with 66% of the 50 beetle species recorded in 2004 still being present across all four sample points. Again one needs to be mindful of the influence of singleton recording underpinning this point. The mayfly *Cloeon dipterum* was recorded in one of the new soke dykes SP3 (the species also occurs in several of the Application ditches), whilst the same soke dyke held “44 core taxa including four scarce beetle species and a Nationally Scarce soldier fly.”

59. The conservation position of some of the new soke dykes and borrow pit pool was then complicated by saline influence altering the trajectory of some of the assemblages away from freshwater, it later moving back to a less saline influence, leaving the SP3 soke dyke (with a slight brackish influence) being the richest part of this new system. Overall, analysis showed that by 2008, 58% of the 55 water beetle species cumulatively recorded from April 2004 onwards were found during re-survey. Species turn-over aside, Hammond considered that the species richness of the fauna appeared to be “stable at present”, a point re-iterated for the water bugs (Hammond, 2008). By the 5th year, the number of mollusc species had risen to five species, and the common Horse Leech (*Haemopis sanguisuga*) was found in soke dyke SP3. At this point, the survey programme ended.

60. Neither the soke dykes, the Application ditches, or the RSPB sites surveyed by Drake (as cited in my proof, NE/3/D/47) can be seen as one ecological continuum, though it is instructive to compare the cumulative species list from 2004 to 2007 for the Paull Holmes soke dykes (Hammond, 2007), with the Buglife Species Conservation Status Score table (NE/2/A, 24). Within the “core taxa” considered by Hammond (even though that is a limited species pool), only three beetles and one true bug are not coded by the methodology. This points to the soke dykes being coastal grazing marsh ditches and so of the same general type as those at Lydd. It is thus reasonable to look at them to indicate where ditch faunal succession might lead.

61. Looking at the original species list of rare and notable species in the Application ditches (LAA/ CD1.23g), and comparing it with the running species list between April 2004 and May 2007 for the Paull Holmes soke dykes (Hammond, 2007), one only finds three of the “rarer” species in common (2 water beetles and 1 soldierfly). This is not to disregard the conservation importance of the Paull Holmes soke dykes which, at that time, did hold 6 Nationally Scarce water beetles. However, the passage of four years still only allowed the establishment of part of the interest which might be expected to occur on a more established site. It is worth noting that in terms of UK distribution, seven of the species found in the Application ditches (3 water beetles, 1 ground beetle, 2 soldierflies, and 1 damselfly) currently do not reach as far north as the Humber and so are unlikely to enable parity of the soke dykes with Lydd, range extension through climate change accepting. Scarce Emerald damselfly was lost to the Humber area by the 1960’s, and seems now too remote in its current range to easily get back.

62. One must be mindful of the role and influence of saline incursion in a number of those soke dykes, and their low connectivity, both influencing their faunal development, although clearly neither were strong enough factors to deter species such as horse leech from colonising. There is, of course, no certainty that the assemblages in the soke dykes would ever equate with those in the Application ditch, being on different sites, with different water chemistries, and with different histories, but the start of the development of a more mature fauna, with building leech and mollusc diversity in the fifth year of soke dyke development, is instructive.

63. Whether the passage of more time has allowed these and other invertebrates to colonise the soke ditches requires additional survey. However, in combination with the studies on the RSPB reserves (NE/3/D/47), and the Buglife analysis of species preferences cited above, these timeline data do suggest that the stated 2-3 year time frame for the proposed 1300m of Application ditch to reach conservation parity with the current Application ditches is, at best, extremely optimistic. It is notable that the colonisation process in the Paull Holmes soke dykes example was assisted by the transplantation of vegetation from the old to new water bodies, as is proposed at Lydd, yet it still took a number of years to reach a position which looks below its likely potential. An important point underpinning both the new soke dykes and the RSPB ditches was also that they had conservation as their principal purpose, and not one secondary to airfield drainage as is seen in the proposed 1300m of ditch at Lydd.

64. Dr McLellan's Proof (LAA9/C, Appendix 3 Part 3, 1.3.29) reads as if medicinal leech translocations have a high number of successful case examples underpinning the assertion. Whilst there is no locus under the Wildlife and Countryside Act to issue development licenses for medicinal leeches, and so translocations cannot be specifically identified through this route, Natural England has only issued some 50 licenses for medicinal leech for all purposes over the past 10 years or so, and the bulk of those are probably for either survey or to take for educational display purposes. Our licensing department, which I have consulted, considers that the number of medicinal leech translocations have been very limited in number, in part, of course, a direct reflection of the national rarity of the species. Though medicinal leeches are raised commercially for the medical industry, these are in controlled laboratory conditions and it is unclear how such techniques would be transferred to field situations, or what the metrics of success might look like given the difficulties encountered in finding them on this site. I consider medicinal leech translocation as a mitigation technique to be both experimental and untested.

SECTION 8: CONCLUSION

65. The Application ditches within the SSSI maintain a level of invertebrate interest, both in terms of overall assemblage and rare species, which makes them highly significant. Despite the Applicant stating that the invertebrate biodiversity in this

section of the SSSI will not be affected by the destruction of lengths of existing ditches, it is clear that this is not so.

66. The replacement drainage ditches are not designed to enhance biodiversity, being more uniform, deeper and colder than is currently the case, and lacking the variation currently found in the Application ditches as we find them today.

67. The assertion that the ditch assemblages will reach conservation parity with the Application ditches in 2 – 3 years is not supported by the colonisation data from a number of other grazing marsh ditch sites, which suggests that a minimum of somewhere of around the eight year mark would be needed. In addition, the conflict inherent in the proposed ditches attempting to serve both as airport surface drainage and high quality biodiversity uses at the same time and in the same place, further lead me to believe that the latter timeline, rather than the former, will be the real case. What species do take up residence in the short term, though of undoubted conservation value, will not be comparable to the fauna of the existing ditches because of the proposed ditch design, its overall uniformity, and the necessary aging of the system not being reached, even with recourse to the transplantation of ditch vegetation.

68. In summary, we are faced with the loss of part of a SSSI grazing marsh ditch system which, at the very least, equates with the conservation value of other good quality SSSI grazing marsh ditches across the UK. Its real conservation value, however, remains hidden, as the invertebrate surveys only sampled part of the ditch lengths, leaving us with an incomplete picture. The medicinal leech stands as a prime example of an important species whose distribution remains obscure, despite several years of opportunity to survey for it. The replacement ditches, although longer in extent than those lost, would offer up less. How much variation in their design is achievable given their imperative to ensure runway drainage is similarly obscured, leaving that critical detail beyond current scrutiny, but highlighting the fact that they attempt to serve the two masters of runway drainage and ditch invertebrate conservation. The timeline for those ditches to match a comparable ditch assemblage of conservation quality to that lost, as an indicator of mitigation success, seems unattainable, both from the perspective of the passage of too few years, and

from allowing an understatement of the full value of what is lost, so accepting a lowered quality threshold.

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