Vale of White Horse District Council	**Local Plan 2031 Part 2** Publication Version Representation Form	**Ref:** **(For official use only)**

Name of the Local Plan to which this representation relates: Vale of White Horse Local Plan 2031 Part 2

Please return by 5pm on Wednesday 22 November 2017 to: Planning Policy, Vale of White Horse District Council, 135 Eastern Avenue, Milton Park, Milton, Abingdon, OX14 4SB or email planning.policy@whitehorsedc.gov.uk

This form has two parts:
Part A – Personal Details
Part B – Your representation(s). Please fill in a separate sheet for each representation you wish to make.

Part A

1. Personal Details* *If an agent is appointed, please complete only the Title, Name and Organisation boxes below but complete the full contact details of the agent in 2.		2. Agent's Details (if applicable)
Title		Mr
First Name		Nathan
Last Name		McLoughlin
Job Title (where relevant)		Director
Organisation representing (where relevant)	Webbpaton	
Address Line 1		McLoughlin Planning
Address Line 2		North Warehouse
Address Line 3		Gloucester Docks
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Telephone Number		0773 682 1475
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Sharing your details: please see page 3

Part B – Please use a separate sheet for each representation

Name or organisation: McLoughlin Planning (on behalf of Webbpaton)

3. To which part of the Local Plan does this representation relate?					
Paragraph		Policy		Policies Map	

4. Do you consider the Local Plan is: (*Please tick as appropriate)*				
4. (1) Legally compliant	Yes		No	
4. (2) Sound	Yes		No	
4. (3) Compiles with the Duty to Cooperate	Yes		No	

5. Please provide details of why you consider the Local Plan is not legally compliant or is unsound or fails to comply with the Duty to Cooperate. Please be as precise as possible. If you wish to support the legal compliance or soundness of the Local Plan or its compliance with the Duty to Cooperate, please also use this box to set out your comments.
Please see attached documents. (Continue on page 4 /expand box if necessary)

6. Please set out what modification(s) you consider necessary to make the Local Plan legally compliant or sound, having regard to the matter you have identified at 5 above. (NB Please note that any non-compliance with the duty to cooperate is incapable of modification at examination). You will need to say why this modification will make the Local Plan legally compliant or sound. It will be helpful if you are able to put forward your suggested revised wording of any policy or text. Please be as precise as possible.
Please see attached documents. (Continue on page 4 /expand box if necessary)

Please note your representation should cover succinctly all the information, evidence and supporting information necessary to support/justify the representation and the suggested modification, as there will not normally be a subsequent opportunity to make further representations based on the original representation at publication stage.
After this stage, further submissions will be only at the request of the Inspector, based on the matters and issues he/she identifies for examination.

7. If your representation is seeking a modification, do you consider it necessary to participate at the oral part of the examination?			
	No, I do not wish to participate at the oral examination	x	**Yes**, I wish to participate at the oral examination

8. If you wish to participate at the oral part of the examination, please outline why you consider this to be necessary:
Please see attached documents.
Please note *the Inspector will determine the most appropriate procedure to hear those who have indicated that they wish to participate at the oral part of the examination.*

Signature: | Date: 22/11/2017

Sharing your personal details

Please be aware that, due to the process of having an Independent Examination, a name and means of contact is required for your representation to be considered. Respondent details and representations will be forwarded to the Inspector carrying out the examination of the Local Plan after the Publicity Period has ended. This data will be managed by a Programme Officer who acts as the point of contact between the council and the Inspector and respondents and the Inspector.

Representations cannot be treated as confidential and will be published on our website alongside your name. If you are responding as an individual rather than a company or organisation, we will not publish your contact details (email / postal address and telephone numbers) or signatures online, however the original representations are available for public viewing at our council office by prior appointment. All representations and related documents will be held by Vale of White Horse District Council for a period of 6 months after the Local Plan is adopted.

Would you like to hear from us in the future?

I would like to be kept informed about the progress of the Local Plan	x
I would like to be added to the database to receive general planning updates	x
Please do not contact me again	

Further comment: Please use this space to provide further comment on the relevant questions in this form. **You must state which question your comment relates to.**

Alternative formats of this form are available on request. Please contact our customer service team on 01235 422600 (Text phone users add 18001 before you dial) or email planning.policy@whitehorsedc.gov.uk

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McLOUGHLIN
PLANNING

REPRESENTATIONS STATEMENT

In respect of:
Vale of White Horse Local Plan Part 2 – Publication Version
At:
Land South of Hanney Road, Steventon
On behalf of:
Webbpaton

Contents Page

1.0 Introduction

1.1. McLoughlin Planning is instructed by Webbpaton to make submissions on the Vale of White Horse Local Plan Part 2 (Publication Version) in respect of its land and development interests at Land South of Haney Road, Steventon. Webbpaton's aim is to have this site allocated for housing development

1.2. To support Webbpaton's submissions, appended to this Statement are the following documents:

- Red Line Site Location Plan
- Initial flood risk modelling at Steventon

1.3. This Document is structured as follows:

- Section 2 – Representations on the Local Plan Part 2
- Sections 3 – Site Allocation Statements

2.0 Representation on the Local Plan Part 2 Policies

Chapter 1 Introduction

2.1. At this stage, Webbpaton considers that there is greater need for clarity in the Plan as to its relationship between Part 2 and the Adopted Part 1. In the earlier stages of the Part 1 process, it was clear that the Council's approach was to have Part 2 as a supporting DPD to Part 1. Therefore, in terms of a chain of conformity, there was a need for Part 2 to comply with the provisions of Part 1.

2.2. In these earlier stages, Part 2 was anticipated to be a small site allocations DPD, dealing with non-strategic (i.e. sub 200 dwelling) development sites in village locations. However, it is clear from the EiP and subsequent Inspector's Report that this original aspiration has been distorted by the need for Part 2 to now address the issue of Oxford's unmet need and the duty on Vale to co-operate with Oxford in meeting this need. Webbpaton considers the approach and allocations made contrary to the original purpose of Part 2.

Chapter 2 Additional Sites and Sub-Area Strategies

2.3. Webbpaton has concerns about the approach of the Plan. There is a requirement for the Plan to be prepared in accordance with the Local Development Scheme; with PAS guidance on the matter identifying a need that the Plan's listing and description in the LDS matches the document concerned (PAS self assessment checklist – stage 5 submission).

2.4. In terms of the LDS for Part 2, the most recent version of the document is the September 2016 version, available on the Council's website. It should be noted that at the time of the consultation exercise on Part 2, there is no more up-to-date version of the LDS available. Page 4 of the LDS sets out the role and subject of Part 2. Aside from setting out how the Council proposes to meet Oxford's Unmet Need, it goes onto state that:

"This document will also contain policies for the part of Didcot Garden Town that lies within the Vale of White Horse District and detailed development management policies to complement the Local Plan Part 1, replacing the saved policies of the Local Plan 2011, and allocating smaller development sites for housing and other uses"

2.5. Reference is clearly made in the document to "smaller development sites".

2.6. Against this backdrop, it is necessary to consider the relationship between Part 1 and Part 2. Paragraph 2.3 of Part 2 sets out the three main strands to the spatial strategy set out in Part 1. In the respondents case, its land at Steventon should be seen in the context of the third strand:

"Promoting thriving villages and rural communities whilst safeguarding the countryside and village character"

2.7. Whilst not referenced in Part 2, Figure 4.1 of Part 1 expands on this key strand by stating that the above objective will be met by, inter alia:

*"**Identifying appropriate housing requirements for the rural areas to inform neighbourhood plans or the Local Plan 2031 Part 2**"*

2.8. This sets out a clear commitment for the Part 2 process to review the housing requirements for the rural area. There then follows a pledge to focus development at larger villages to help maintain their vitality and sustainability. Webbpaton's position is that Part 2 simply does not perform this task and as a result is not consistent with the Part 1 document. The need for consistency between Part 1 and Part 2 is critical to the Plan's soundness in that Part 1 sets the overall development strategy and a portfolio of strategic development sites to meet the Vale's Objectively Assessed Needs and Part 2 has a limited brief in providing sites for Oxford's Unmet need (as set out in Part 1) and providing sites for the balance of the Vale's housing requirement not allocated in Part 1. In this respect, Part 2 is a daughter document to Part 1. The respondents position is that Part 2 only seeks to make a handful of allocations at a handful of locations and at a level which is more reflective with the strategic approach adopted in Part 1. It is the respondent's position that the Plan is unsound in its approach in that it is not consistent with Part 1 and fails the test of being consistent with the Local Development Scheme (September 2016).

Paragraphs 2.12 to 2.32

2.9. Webbpaton wishes to make the following observations about the unmet need for Oxford.

2.10. To start, Part 2 is a plan, which has been prepared to clearly meet the unmet needs of Oxford. This places an additional requirement on the Council to make allocations for 2,200 dwellings specifically for this requirement. In terms of the location of those dwellings Webbpaton is supportive of the efforts made in Part 2 to locate housing as close to Oxford as possible in the Abingdon on Thames sub area. Webbpaton considers that further explanation of the matter with reference to Part 1 allocations is unhelpful and clouds the issue. This is especially the case with Table 2.1 with "allocations that are close to and accessible to Oxford". For ease of reference it is

recommended that the table is removed and simply replaced with a schedule of sites in Part 2, which are specifically to address the unmet need for Oxford.

2.11. To address Webbpaton's concern about soundness and the LDS, a new paragraph should be inserted into the document (suggested at 2.8) to read:

- *"This Part 2 plan will support the above objective by making a range of housing allocations to meet Oxford's Unmet need as well as the requirements for "smaller development sites" arising from Part 1. This includes housing at green belt village locations."*

Core Policy 4a

2.12. In general terms Webbpaton supports the need for Part 2 to make additional housing allocations to meet Oxford's unmet need. However it objects to the approach of the Plan in amalgamating the 1,000 dwellings reserved in Part 1 for Part 2 allocations into the Oxford unmet need figure. The concern here is that this draws no distinction between what is required to address the Council's remaining requirement (as per Part 1) and what is required to specifically address the unmet need of Oxford (the 2,200).

2.13. Whilst Webbpaton supports the need for Part 2 to make additional housing allocations, there is a worrying lack of clarity in respect of the housing figures expressed in Core Policy 4 of Part 1 and Core Policy 4a of Part 2 as well as little clarity on the distribution of the housing figure across the District's sub-areas.

2.14. With regards to the Councils need to maintain a 5-year housing land supply, it is noted from the Council's annual 5-year housing land supply statement (paragraph 4.5) that all allocations from Part 2 are discounted because they are yet to demonstrate that they are deliverable. By the same token, it is noted that there are a number of Part 2 allocations assumed to commence delivery within 5 years. Webbpaton questions the apparent conflict between the two approaches.

Changes Sought

2.15. In order to address the soundness issue, it is suggested that the following is inserted into the Policy.

- *"This policy looks to provide housing to meet Oxford's unmet needs as well as the residual requirement identified in Part 1 to be allocated in Part 2. This will be secured by a series of allocations at a strategic and non-strategic level in green belt and non-green belt locations."*

- In addition, specific to Webbpaton's interest at Steventon, the Abingdon on Thames and Oxford Fringe sub-area table is amended to reflect an allocation at Steventon.

Housing Target

2.16. Webbpaton wishes to raise the following concerns about the soundness of the housing table on page 26 of Part 2.

2.17. To start, Core Policy 4 of Part 1 sets out a housing target for the District for at least 20,560 homes to be delivered in the plan period between 2011 and 2031. This figure is made up of:

- 12,495 dwellings will be delivered through strategic allocations.
- 1,000 dwellings remain to be identified through the Local Plan 2031 Part 2 or Neighbourhood Development Plans.
- 840 windfalls.

2.18. The table in Policy 4a identifies a target of 22,760. This equates to the 12,495 + 2,200 (Oxford's unmet need). Whilst a supply of housing over and above the housing target for the District is welcomed, Webbpaton is concerned about how the 1,000 dwellings in Part 1 Core Policy 4 will be accommodated in Part 2. In conjunction with other representations, there is a need to set out how the 1,000 dwellings from Part 1 are being accommodated and how these are providing for the original objective of meeting the requirement set out in Figure 4.1 of Part 1.

Core Policy 8a: Additional Site Allocations for Abingdon-on-Thames and Oxford Fringe Sub-Area

2.19. Webbpaton objects to policy 8a given that the approach taken to allocations in Part 2 is unsound and is not consistent with national policy. This is because there are concerns about the Sustainability Appraisal and Topic Paper, which underpins the decisions made about housing allocations made in this Sub-Area. It therefore fails the tests of being "justified" and "consistent with national policy".

Is the Plan "Justified"?

2.20. Paragraph 182 of the Framework states:

"The plan should be the most appropriate strategy when considered against the reasonable alternatives, based on proportionate evidence."

2.21. Webbpaton objects to the policy on the basis that the assessment of reasonable alternatives, as set out in the Sustainability Appraisal Site Section Topic Paper, was flawed.

Reasonable Alternatives

2.22. The Sections 6.3 and 6.4 of the Sustainability Appraisal deal with larger and smaller site options and 6.4 makes it clear that the threshold for small sites. In terms of 50 dwellings being chosen as the threshold, there is no evidence in the Sustainability Appraisal to support the limit, but reference is made the Council's Site Selection Topic Paper where sub-50 dwellings is considered to be a neighbourhood planning level. No evidence supports this position.

2.23. Paragraph 6.5.4 sets out the pre-conditions to assessing small sites, in so doing; Dalton Barracks was seen as a constant across "all reasonable alternatives". Given concerns expressed elsewhere in these representations, the Sustainability Appraisal should have considered the implications of not having Dalton Barracks in the Plan.

2.24. The Sustainability Appraisal also fails in its approach to assessing locations for smaller sites in that East of Kingston Bagpuize and Southmoor were seen as the first "port of call" (paragraph 6.5.6) for allocations, which were treated as a constant. These allocations, combined with the Dalton Barracks allocation start to seriously limit the level of development available to be allocated elsewhere. This use of "constants" across the Sustainability Appraisal underlines the process as it fails to justify why these should be maintained in the first instance.

2.25. With regards to the treatment of Webbpaton's land interest, as set out in more detail further in this representation, land south of Hanney Road in Steventon (STEV02) was 'sifted out' of the site selection process at an early stage, as it is partially located within Flood Zone 2 as defined on the Environment Agency's flood maps. Whilst additional compelling evidence was submitted to demonstrate that the flooding constraints could be overcome, the Council stated, "*no evidence was submitted which sufficiently demonstrated that flooding issues could be overcome.*" Webbpaton considered that this conclusion was not sufficiently substantiated and the site was effectively dismissed without proper assessment. It is considered that the site should have progressed to at least stage 3 in the site selection process and featured within the options for the Plan.

2.26. A further concern is the decision making process by which the Sustainability Appraisal determines whether the Plan allocates larger sites (Option 1), three small sites (Option 2) or six smaller sites (Option 3), set out in Section 7 of the SA. The

approach was flawed in that Option 3 was handicapped by the relative weaknesses of individual sites, which made up the option against the assessment criteria.

Housing Allocations Strategy

2.27. The approach adopted in Part 2 looks to provide an additional 2,020 dwellings in the Abingdon-on-Thames sub-area. This approach is limited to providing housing at a total of six sites, spread across four separate villages; namely East Hanney, Kingston Bagpuize with Southmoor, Marcham and Shippon. Webbpaton considers the approach as focusing new development on a handful of locations in this part of the District and is clearly contrary to the "key strand" set out in Figure 4.1 of Part 1 in providing housing in rural areas.

2.28. This undermines the ability of Larger Villages not identified for additional housing within the Plan to accommodate modest levels of growth to support the vitality of settlements in accordance with paragraph 55 of the Framework. As such Webbpaton considers the approach unsound.

The Contribution from Dalton Barracks

2.29. Since the summer 2017 consultation, further information has been provided to support the Council's position that Dalton Barracks is a deliverable site within the Plan Period. This goes some way to address previous comments. However, it is not clear from the document as to when the site will be formally released and the timing of any planning application. Whilst the Council's Topic Paper on Housing Trajectory makes it clear that there is a start on site in 2023/24 (five years from now) it is not known what form of commitment the MOD has given that the actual site will be vacated in time and whether the delivery programme works with the MOD drawdown from the site. Any delay in this happening could result in housing land supply difficulties for the Council.

Changes sought

2.30. Webbpaton's land at Steventon is allocated for development

2.31. Consequential amendments are made to Figure 2.2, showing Webbpaton's land allocated for development.

Core Policy 8b Dalton Barracks

2.32. Webbpaton considers the allocation of the site to be unsound as it fails to be effective in that it will not deliver housing to the levels anticipated by the Plan, during the Plan period.

2.33. In terms of the deliverability of the site, whilst further information has been provided about the delivery rates from the site, of the site assuming that it is successfully

allocated, questions have to be raised in respect of its deliverability within the Plan period and therefore the soundness of the Plan in that:

- It makes no account of the timetable to adopt the Local Plan or subsequent SPD.
- It does not take into account the time to prepare and submit a planning application, along with the time required to determine the application and any subsequent judicial review period.
- It is understood that the MoD will vacate the site in 2029. However, there is no information about how the site is phased to ensure that development can commence notwithstanding a military presence in the intervening period.
- No data is provided about the deliverability of the site, in that is it owned by a developer or a land promoter who will need to sell the site to a developer. If it is the latter, what assumptions are made about the timetable for running such a sales exercise? Experience of the MoD Ashchurch Site in Tewkesbury Borough has highlighted the sometimes 'fickle' nature of the MoD where long-standing redevelopment proposals are rendered redundant because of the MoD's desire to maintain a site for operational purposes.
- Time taken to prepare and submit reserved matters application by the house builder concerned. Based on industry research, it is understood that a site of this size would not start delivering housing until 4 to 5 years after the point that outline planning permission is granted.
- The need for infrastructure and the timetable of that delivery. It is clear from the Appendix site template that there area number of significant highways, ecology and other environmental issues which need to be assessed in any application, along with setting out exactly the level of infrastructure required to support the site's development.
- The evidence supporting the allocation is weakened by the Policy's requirements for a series of technical studies to support any planning application. Part 2's supporting "Topic Papers" do not provide sufficient evidence that the true nature and extent of the level of infrastructure required to support the development has been yet properly considered. The County Council response on p 161 of the consultation statement is notable in that it considers "site delivery is overoptimistic". As a major partner in seeing the site come forward, the OCC response raises serious question marks about the timing of delivery.

2.34. As a result of the above, whilst the site may make an important contribution to housing numbers, given the above, it cannot be seen as making any meaningful contribution to housing land supply.

Changes Sought

2.35. Deletion of Dalton Barracks policy and consequential amendments to Figure 2.2 and other related planning policies.

3.0 Site Allocation Statement

3.1. Webbpaton's position is that the purpose of this statement is to set out the case for the development of its land at Land South of Hanney Road, Steventon. The red line site location plan is attached, as **Appendix A**. Webbpaton's aim is to have the site allocated for housing development. In seeking the allocation of this site for housing, this part of the statement covers the following:

- The need for housing in Steventon.
- The technical merits of the site.

3.2. Each is addressed in turn below.

The need for housing in Steventon

3.3. As set out previously, there are serious questions regarding Dalton Barracks' ability to deliver housing in an appropriate timeframe and therefore may not make any meaningful contribution to housing land supply within the Plan period. If this is the case, additional allocations will be required.

3.4. In this scenario, given the housing strategy set out in Part 1 of the Plan, the only option would be to direct this balance to the larger villages given that there are no other potential sites which could yield in excess of 200 houses. Given that 80% of Oxford's unmet need is to be accommodated within the Abingdon-on-Thames and Oxford Fringe Sub-Area, the larger villages which could accommodate this balance within this sub-area are potentially Cumnor, Drayton, East Hanney, Kennington, Kingston Bagpuize with Southmoor, Marcham, Radley, Steventon and Wotton.

3.5. Within the larger villages within the Abingdon-on-Thames and Oxford Fringe Sub-Area, Part 1 of the Local Plan already allocates 280 dwellings at Kingston Bagpuize with Southmoor and 510 dwellings at Radley. In addition to this, Part 2 of the Local Plan now proposes a further 600 dwellings at Kingston Bagpuize with Southmoor, 130 dwellings at East Hanney (across 2 sites) and 90 dwellings at Marcham.

3.6. Steventon is in a fairly unique position in that it falls within both the Abingdon-on-Thames and Oxford Fringe Sub-Area and the South East Vale Sub-Area. It is therefore ideally placed to meet some of the unmet housing need of Oxford; especially given its convenient access to the A34, which provides a direct link to Abingdon and Oxford, as well as the A4130, which provides direct access to Didcot.

3.7. A modest allocation at Steventon would also relieve some of the pressures on the other larger villages within the sub-area, some of which would be subject to

significant allocations akin to larger strategic allocations, such as at Kingston Bagpuize with Southmoor (880 dwellings) for example. Furthermore, it is noted that Green Belt and Area of Outstanding Natural Beauty designations present significant constraints to further development at Radley, Kennington and East Hanney.

3.8. As well as being able to meet some of Oxford's unmet needs, Steventon also falls partly within the Science Vale Area which is at the heart of the Council's strategy. Steventon is conveniently located close to the Enterprise Zone site at Milton Park and also has good direct access to the Enterprise Zone site at Harwell Campus via the A34. A modest allocation at Steventon would therefore help to ensure that jobs, homes and infrastructure are provided together as well as contributing to the ring-fenced housing requirement within the Science Vale

Technical merits of the site

3.9. Land South of Haney Road, Steventon was originally submitted to the Council as part of their 'call for sites' in respect of Part 1 of the Local Plan. However, the site was deemed to be undeliverable on the grounds of flooding and due to a pylon on site.

3.10. During the consultation on the Preferred Options version of Plan, Topic Paper 2 (Site Selection) set out how the Council selected development sites for inclusion. With regards to constraints, it stated that a standard range of constraints would be considered, drawing on available evidence and professional judgement, to inform a decision on which sites to shortlist. One such constraint was flooding - having regard to the particular characteristics of each site where flooding remains an issue. Using these criteria, the site at Steventon was 'sifted out' of the site selection process at an early stage, as it is partially located within Flood Zone 2 as defined on the Environment Agency's flood maps.

3.11. The October 2017 version of Topic Paper 2 (Site Selection) summarises the site selection methodology. It describes the identification and initial assessment of sites and states that *"those sites that have absolute constraints reflecting national or local designations are excluded from further assessment".* This includes, inter alia, where a site lies wholly or mostly within Flood Zone 2.

3.12. The latest version of Topic Paper 2 identifies the site as STEV02 – Land south of Hanney Road. It states that the site is unsuitable due to significant levels of Flood Zones 2 and 3. However, it goes on to state *"that the site was considered again in light of representations through the Preferred Options consultation, however no evidence was submitted which sufficiently demonstrated that flooding issues could be overcome."*

3.13. Webbpaton considered that this conclusion has not been sufficiently substantiated and is unreasonable. The evidence submitted to the Council included a modelling exercise carried out on the watercourse that runs along the site's eastern boundary to define the flood zones that are within the site using a topographical survey and HEC-RAS modelling method. This is an accurate method accepted by the Environment Agency. This evidence was presented to the Council during the consultation on the Preferred Options version of the Plan.

3.14. The topographical survey identified all culverts and crossings of the watercourse and provided their dimensions. Of particular note was the culvert that has been installed within the watercourse to provide access from Hanney Road into the site to the east. This modelling demonstrated that the culvert is not of a sufficient size to accommodate a 1 in 1000-year flood event with water spilling out of the channel and onto the site producing a Flood Zone 2 area. Further modelling has identified that if the culvert were to be replaced with a larger diameter culvert (i.e. 450mm diameter), the water from the 1 in 1000-year flood event would be contained within the channel of the watercourse. Consequently, it is likely that the site would then be reclassified as being entirely within Flood Zone 1 and would therefore be at a low risk of flooding. This would also provide betterment to the wider area. A copy the modelling is attached as **Appendix B**.

3.15. Contrary to the conclusions of the site selection assessment, it is considered that this evidence is sufficient to demonstrate that flooding issues can be overcome. Moreover, the site is not located 'wholly or mostly within Flood Zone 2' as the Environment Agency Flood Maps only indicate Flood Zone 2 at the centre of the site. Moreover, it is clear from the adjacent site off Hanney Road (P15/V2016/FUL) that the presence of Flood Zone 2 has not prevented housing development at this location. Consequently, in light of the available evidence, it is considered that the site should have progressed to at least stage 3 in the site selection process.

3.16. With regards to the pylon on site, the associated overhead power lines run close to the eastern boundary of the site and close to the access road permitted under application Ref: P15/V2016/FUL (Erection of 18 affordable and 26 open market dwellings, with associated access road, landscaping and public open space). Given that any development of the site would share the same access road as this consented development, the layout of the site could easily accommodate the overhead power lines and the requisite buffer zones. For example, the area below the power lines could form an area of landscaped open space or SuDS feature, which could run alongside the permitted access road. Even when taking into account the constraints of the overhead power lines, the remainder of the site would still be of a

sufficient size to accommodate a meaningful quantum of development in an acceptable manner.

3.17. Any development of the site would form a natural extension to the existing residential development to the edge of Steventon, as well as the recently permitted development off Hanney Road (P15/V2016/FUL). It is located away from the Conservation Area and within easy walking distance of a wide range of services and facilities available in the village, such as schools, playing fields, shops, restaurants and community facilities for example. In this respect, the development will *'be adjacent, or well related, to the existing built area of the settlement'* as required by Core Policy 4 of the Local Plan Part 1.

Conclusions

3.18. The purpose of this Section has been to set out Webbpaton's position and in accordance with the evidence base; Webbpaton's site at Steventon should be allocated for housing.

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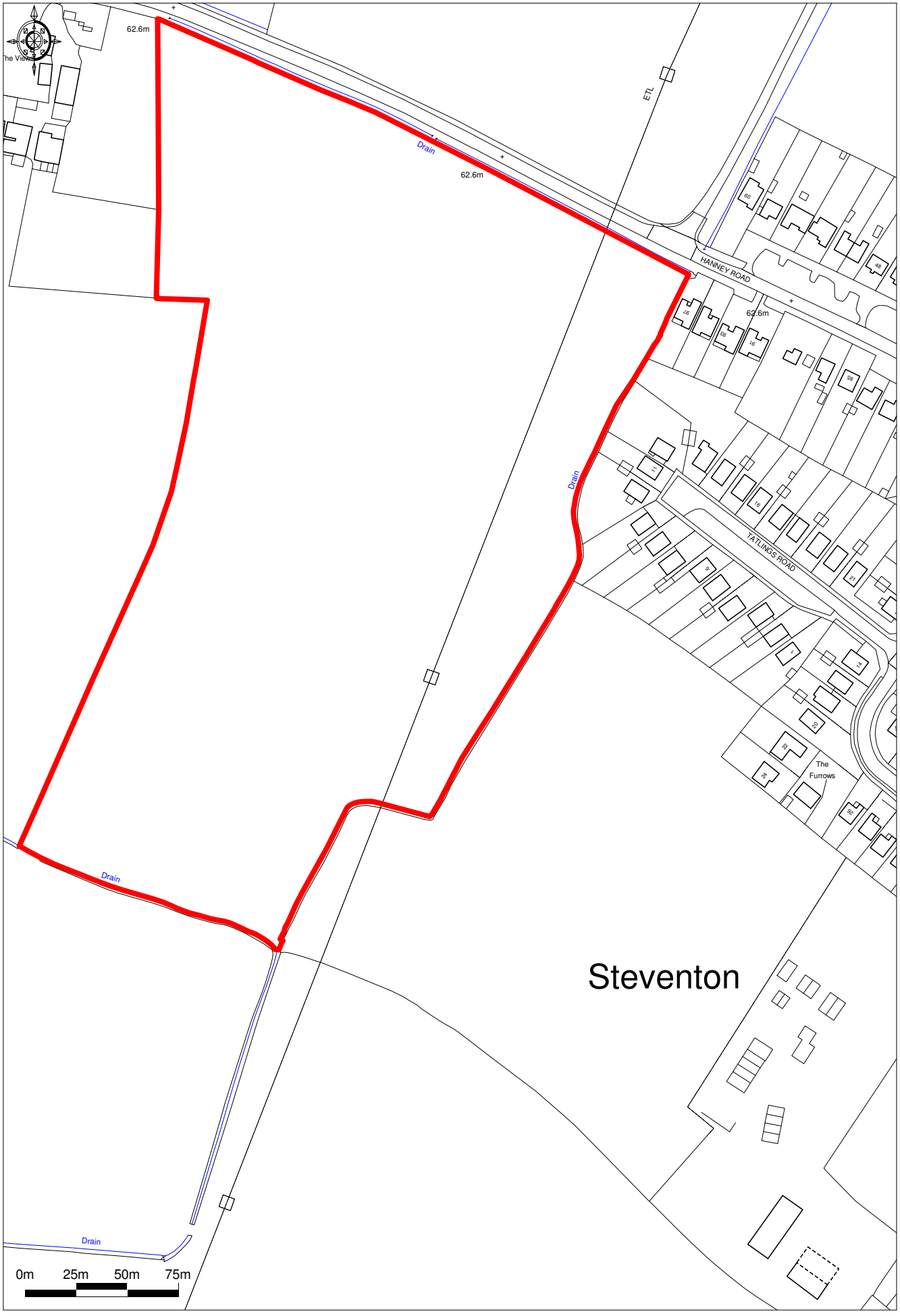
Land Ownership Hanney Road Field



INFRASTRUCTURE

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Our Ref. 2016-C-167
Date: 19th April 2017

Nathan McLoughlin
McLoughlin Planning
North Warehouse
Gloucester Docks
Gloucester
GL1 2FB

Dear Nathan

WATERCOURSE MODELLING, STEVENTON

A residential development is proposed on land to the south of Hanney Road, Steventon. A location plan is included within Appendix A.

Part of the site lies within Flood Zone 2 as identified on the Environment Agency's flood map for planning. The EA mapping is shown below.

The Environment Agency uses J flow modelling in conjunction with LIDAR data (generalised OS contours) to model the flood zones. However this is not accurate enough to give anything but generalised results. In this instance the Environment Agency modelling has identified part of the site to lie within Flood Zone 2.

A modelling exercise has been carried out on the watercourse that runs along the site's eastern boundary to define the flood zones that are within the site using a topographical survey and Hec Ras modelling method, which is an accurate method accepted by the Environment Agency.

A topographical survey has been carried out of the site and the adjacent watercourse. The survey has identified all culverts and crossings of the watercourse and provided their dimensions. Of particular note is the culvert that has been installed within the watercourse to provide access from Hanney Road into the site to the east. This culvert is of a size 230mm diameter.

The culvert downstream of this is 700mm diameter and the one upstream under Hanney Road is an arch equivalent to 775mm diameter.

The 230mm diameter culvert under the access into the site to the east is undersized. The modelling has demonstrated that it is of sufficient size for the Q100 flows to be contained within the channel of the watercourse. However for the Q1000 event, the water spills out of the channel and onto the site producing a Flood Zone 2 area. This has been plotted onto the topographical survey and is shown in Appendix B.

Further modelling of the watercourse has identified that if this 230mm diameter culvert were to be replaced with one of 450mm diameter, then the water from the Q1000 event is contained within the channel of the watercourse and an argument can be made to the Environment Agency that the whole of the development site lies within Flood Zone 1. Replacing this culvert will also provide betterment to the wider area.

The modelling is included within Appendix C.

I trust this provides the information to support the development plans. A flood risk assessment can be produced in support of a planning application if required.

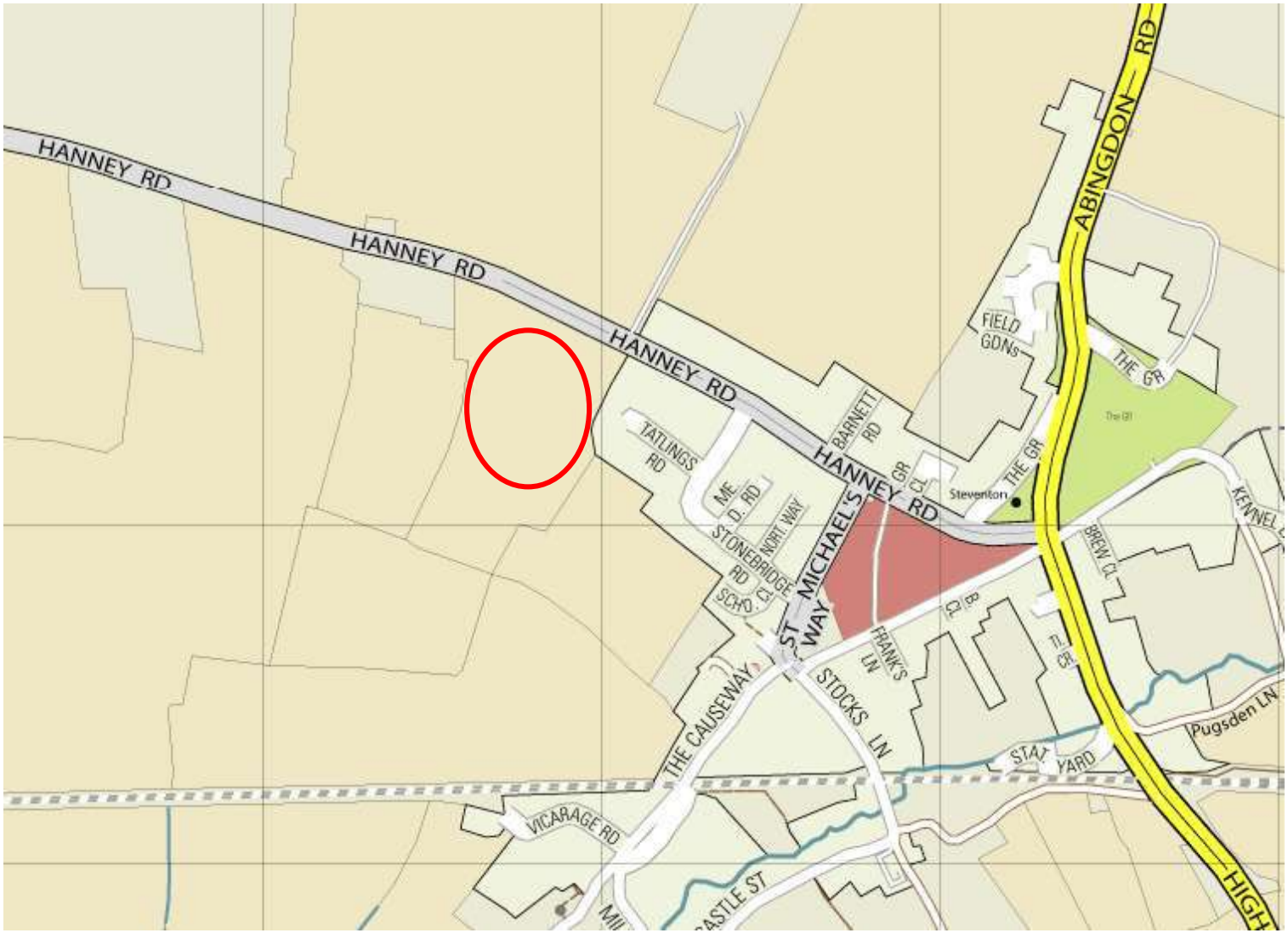
Yours sincerely

Bob Ford CEng MICE MCIHT
DIRECTOR

cTc Infrastructure

www.tonks-consulting.co.uk

APPENDIX A

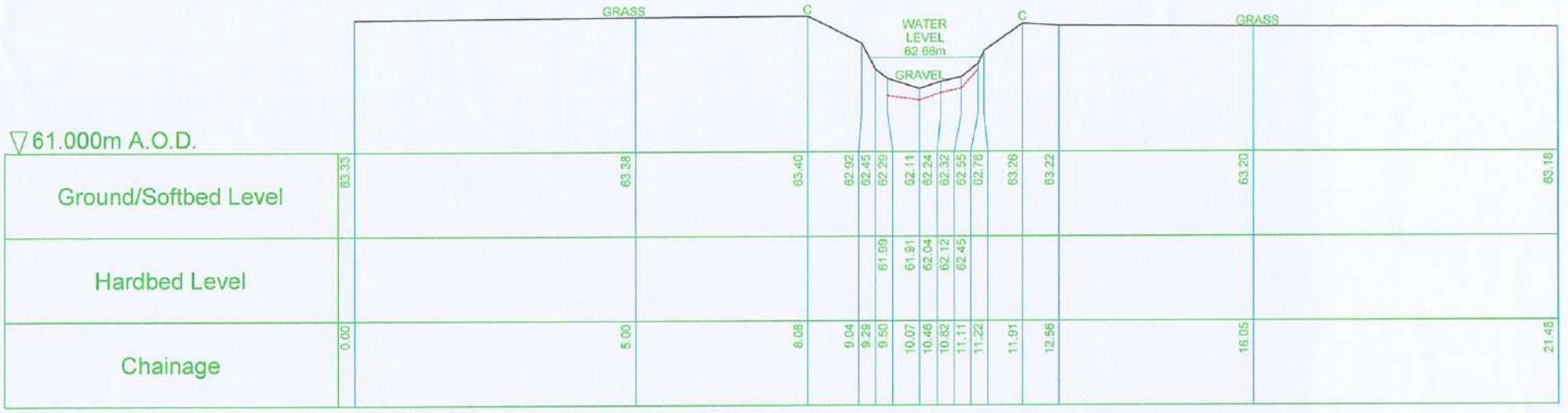


STEVENTON – LOCATION PLAN

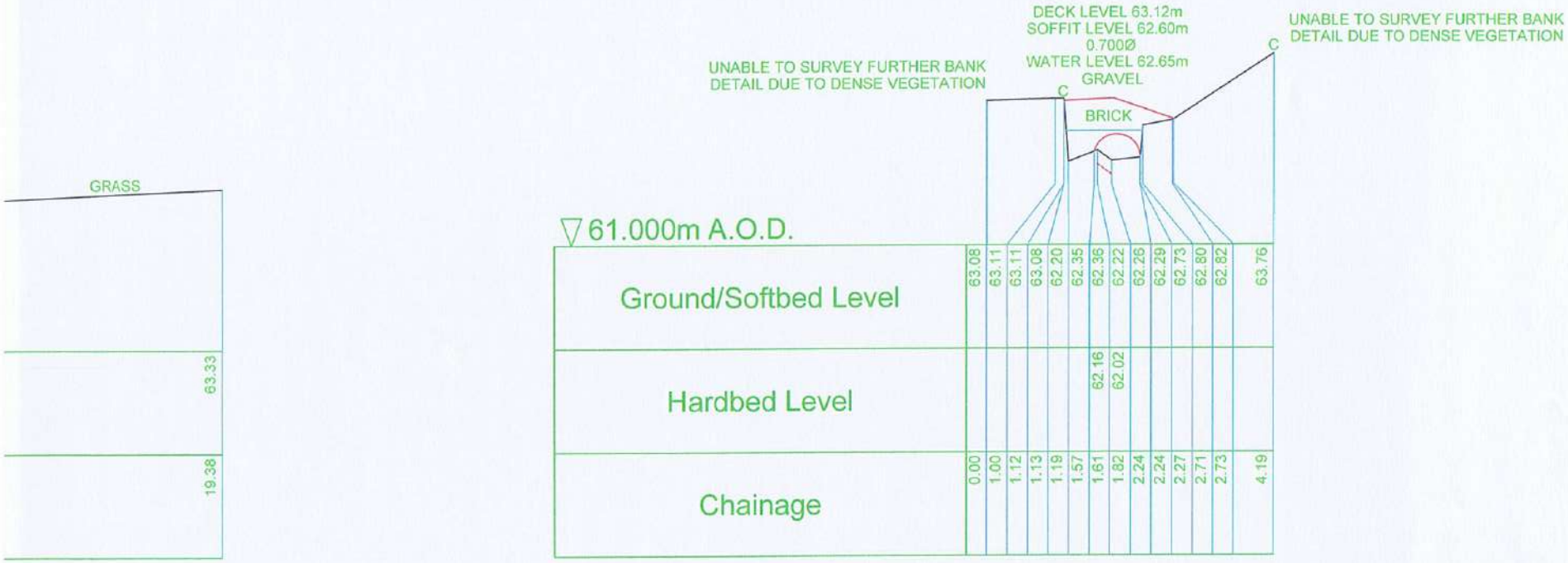
APPENDIX B

nts 18/4/17 mel steventon

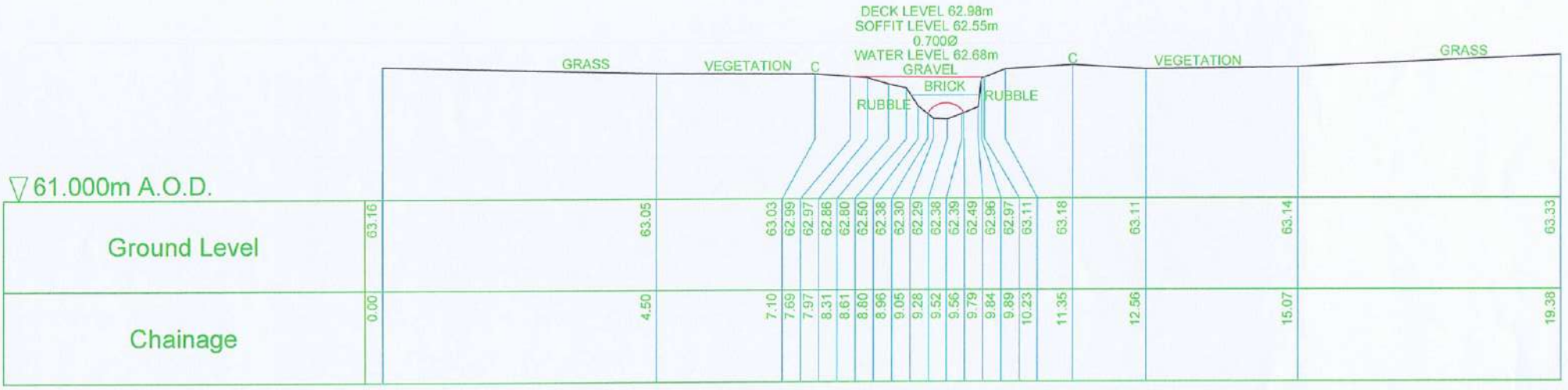
APPENDIX C



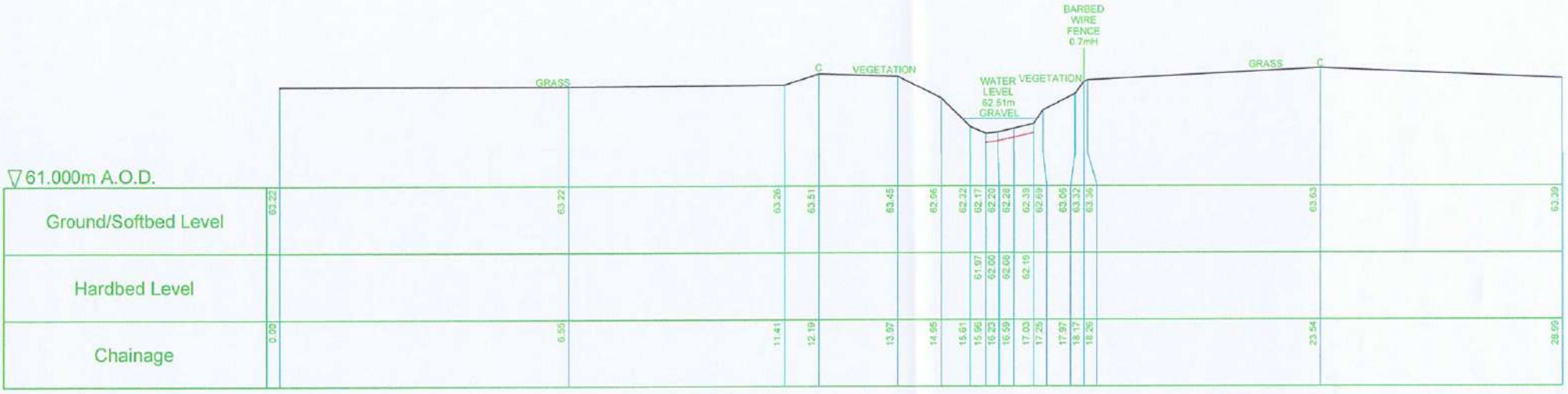
CS 16
STEV01_00847
16/02/2017



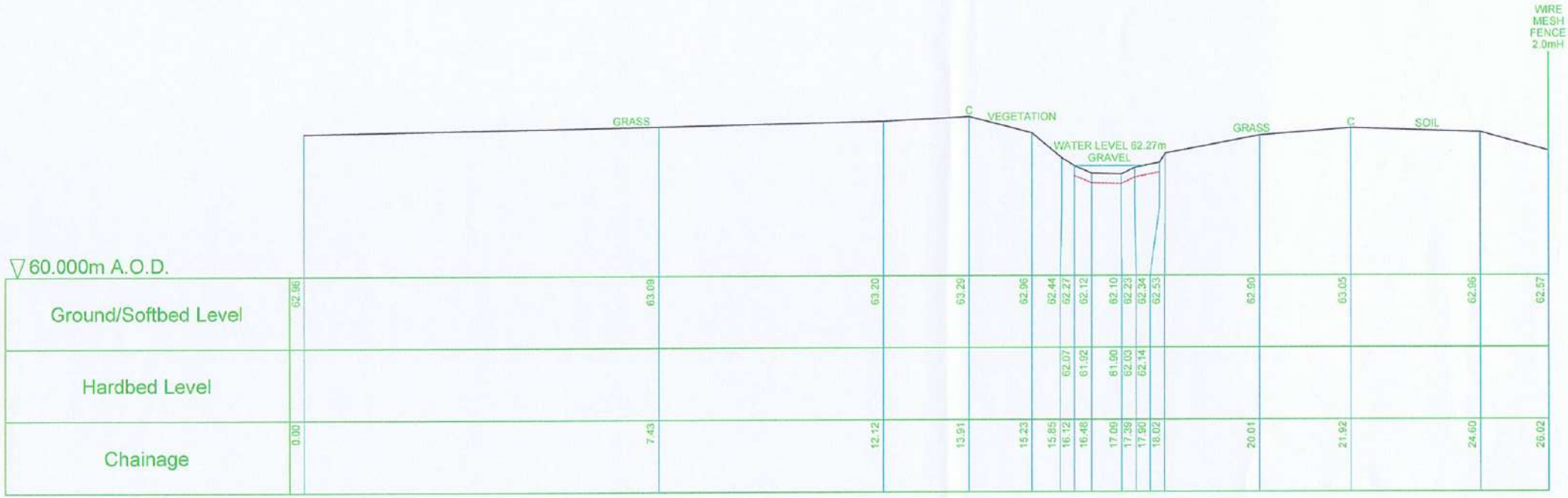
CS 15
STEV01_00801
16/02/2017



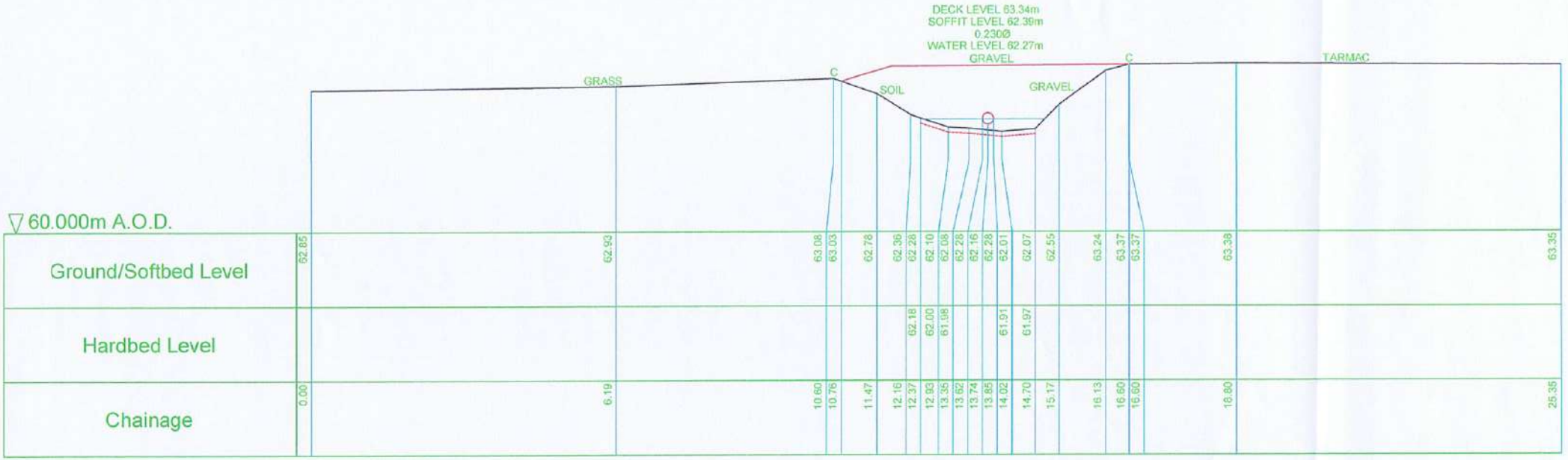
CS 14
STEV01_00796
16/02/2017



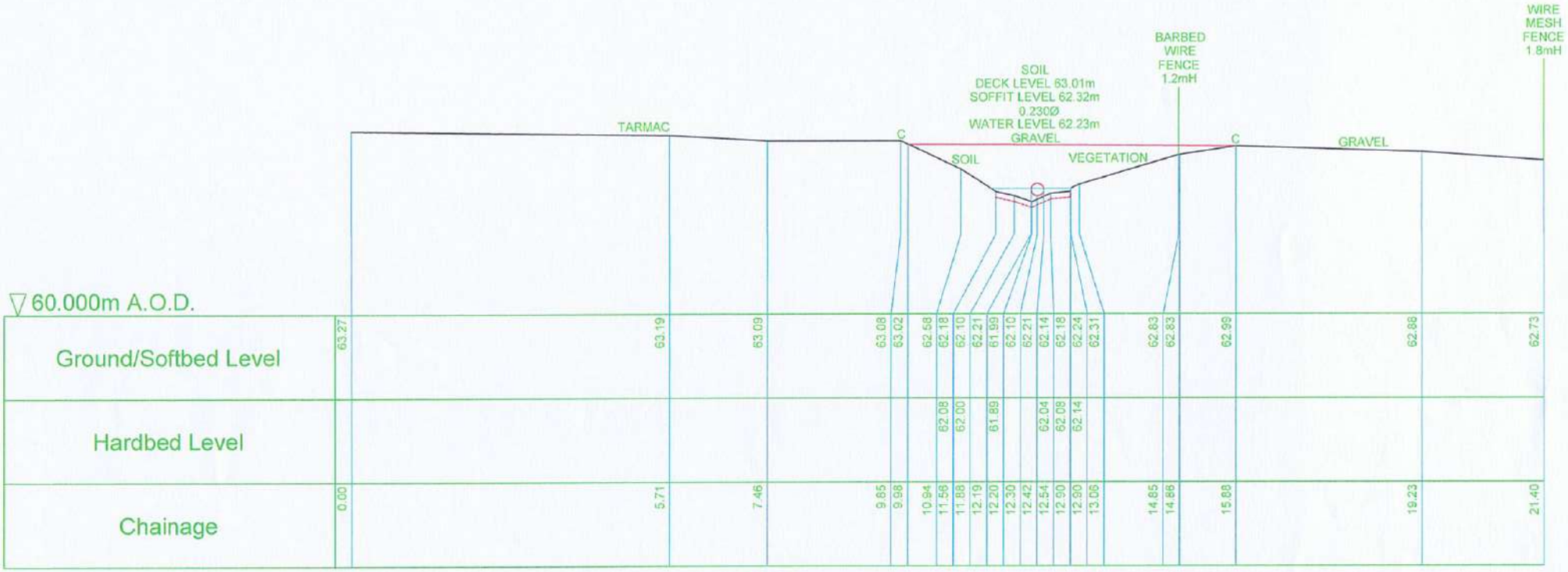
CS 13
STEV01_00726
16/02/2017



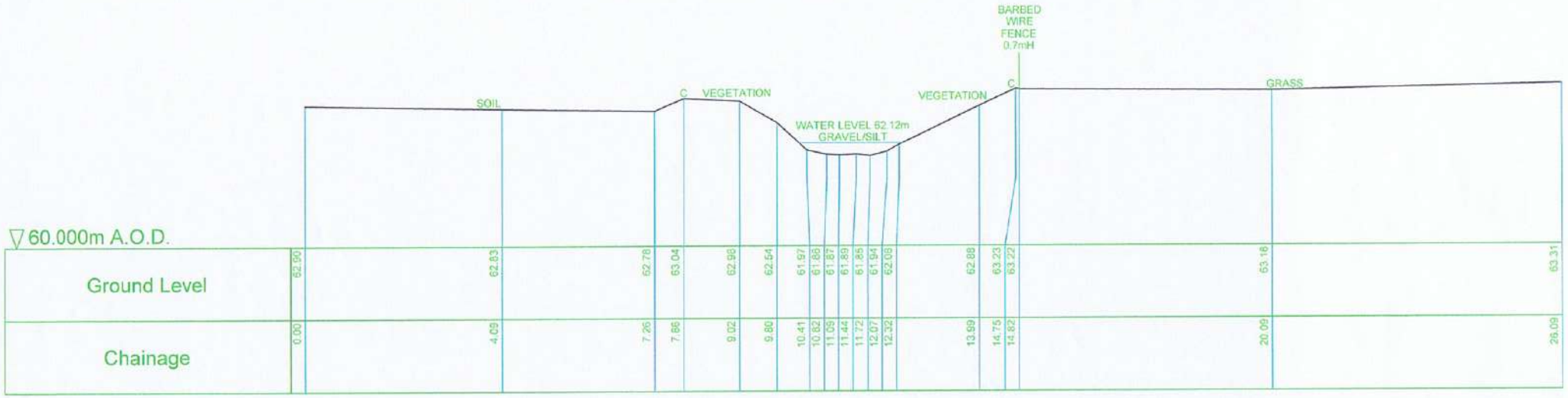
CS 12
STEV01_00677
16/02/2017



CS 11
STEV01_00618
16/02/2017

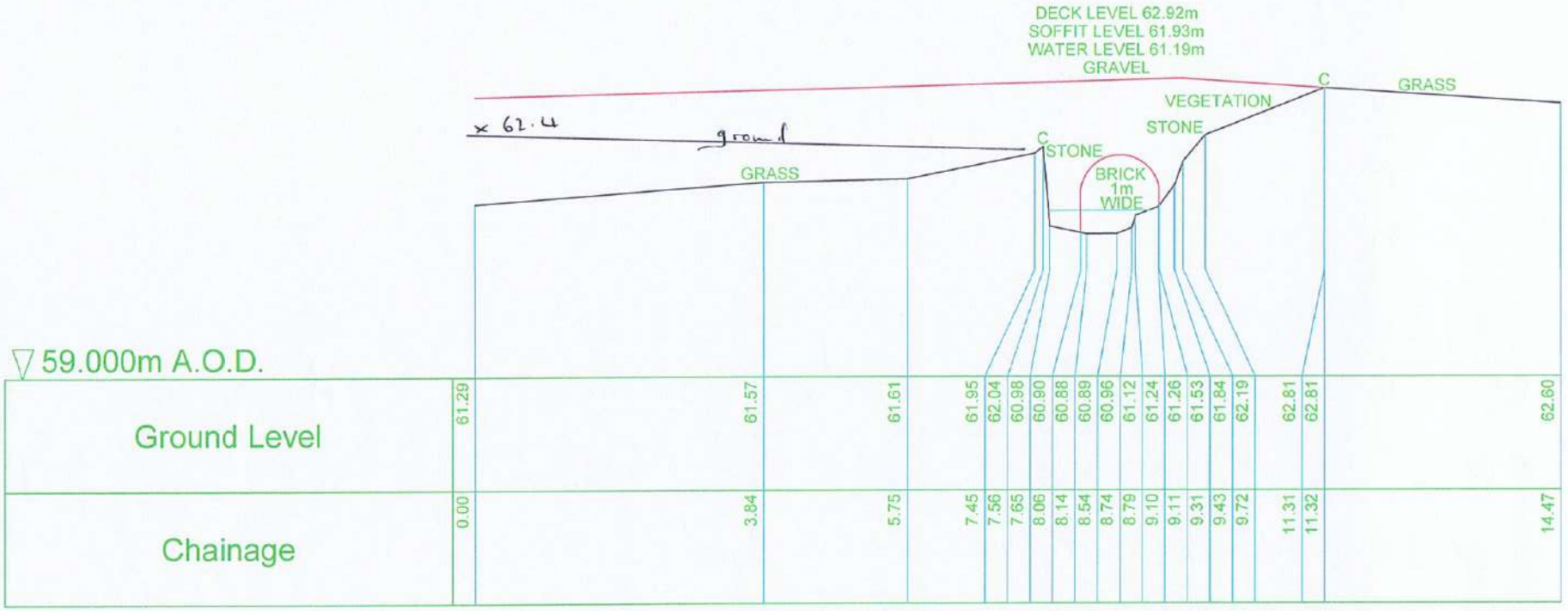


CS 10
STEV01_00605
16/02/2017

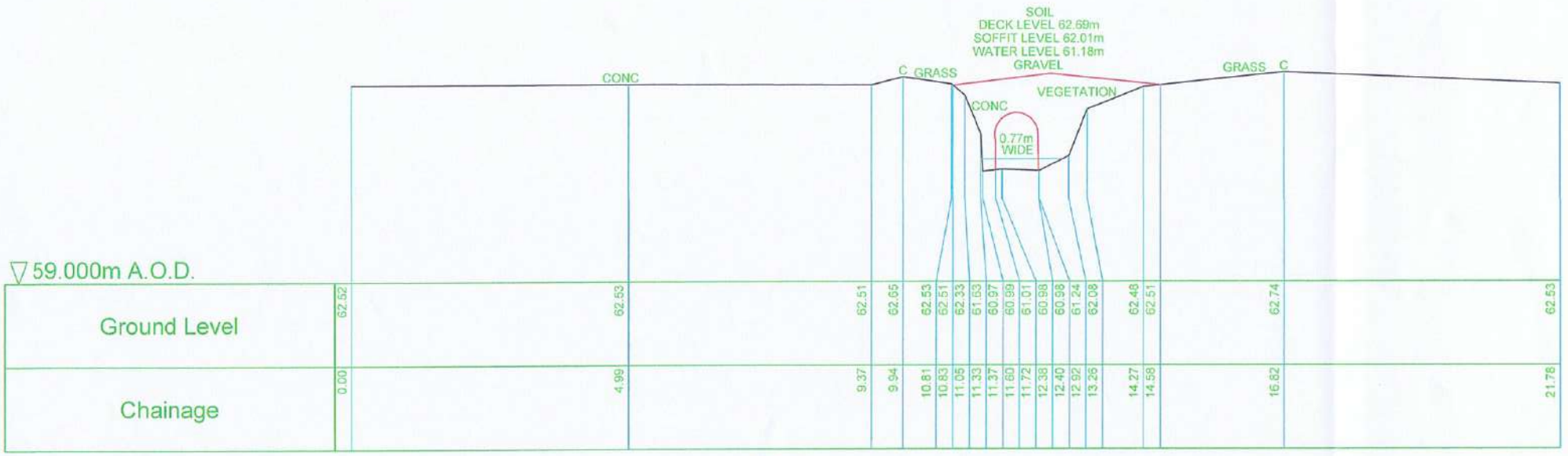


CS 9
STEV01_00554
16/02/2017

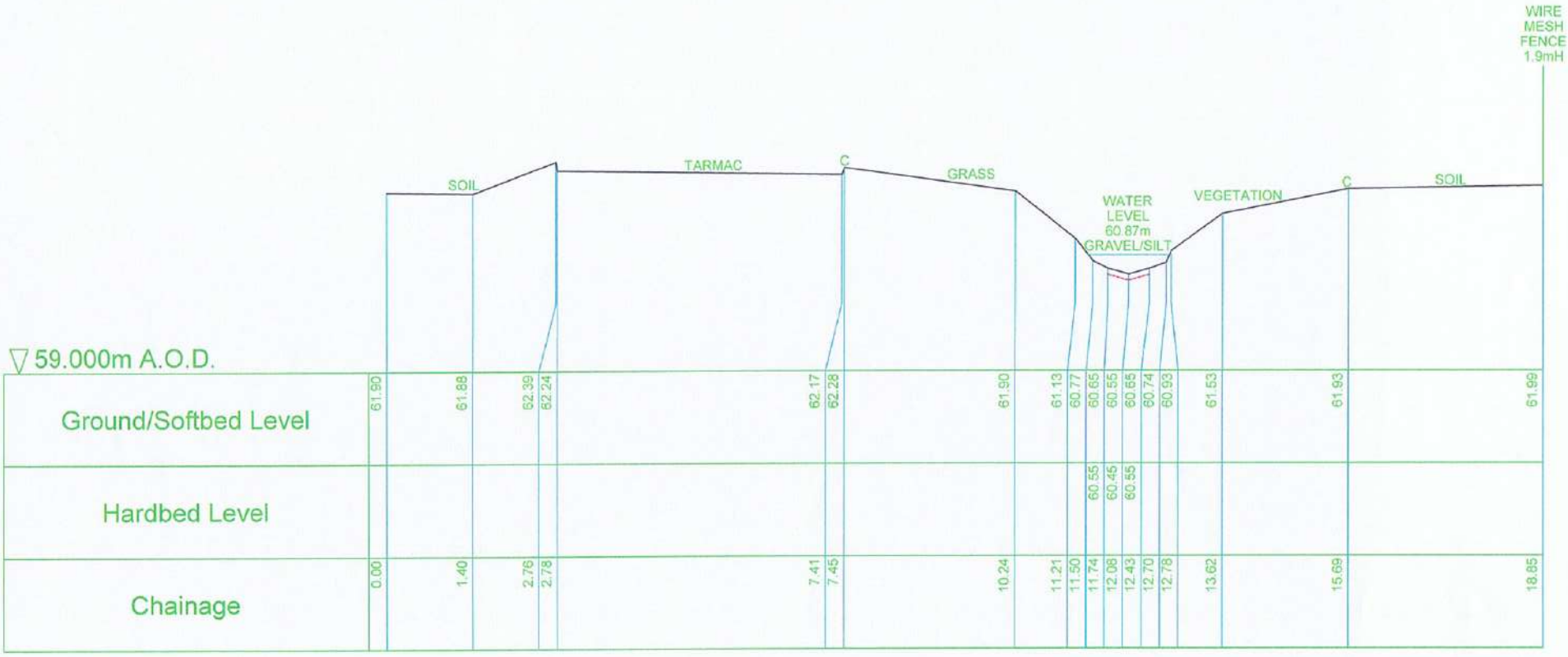
CS 8
STEV01_00416
16/02/2017



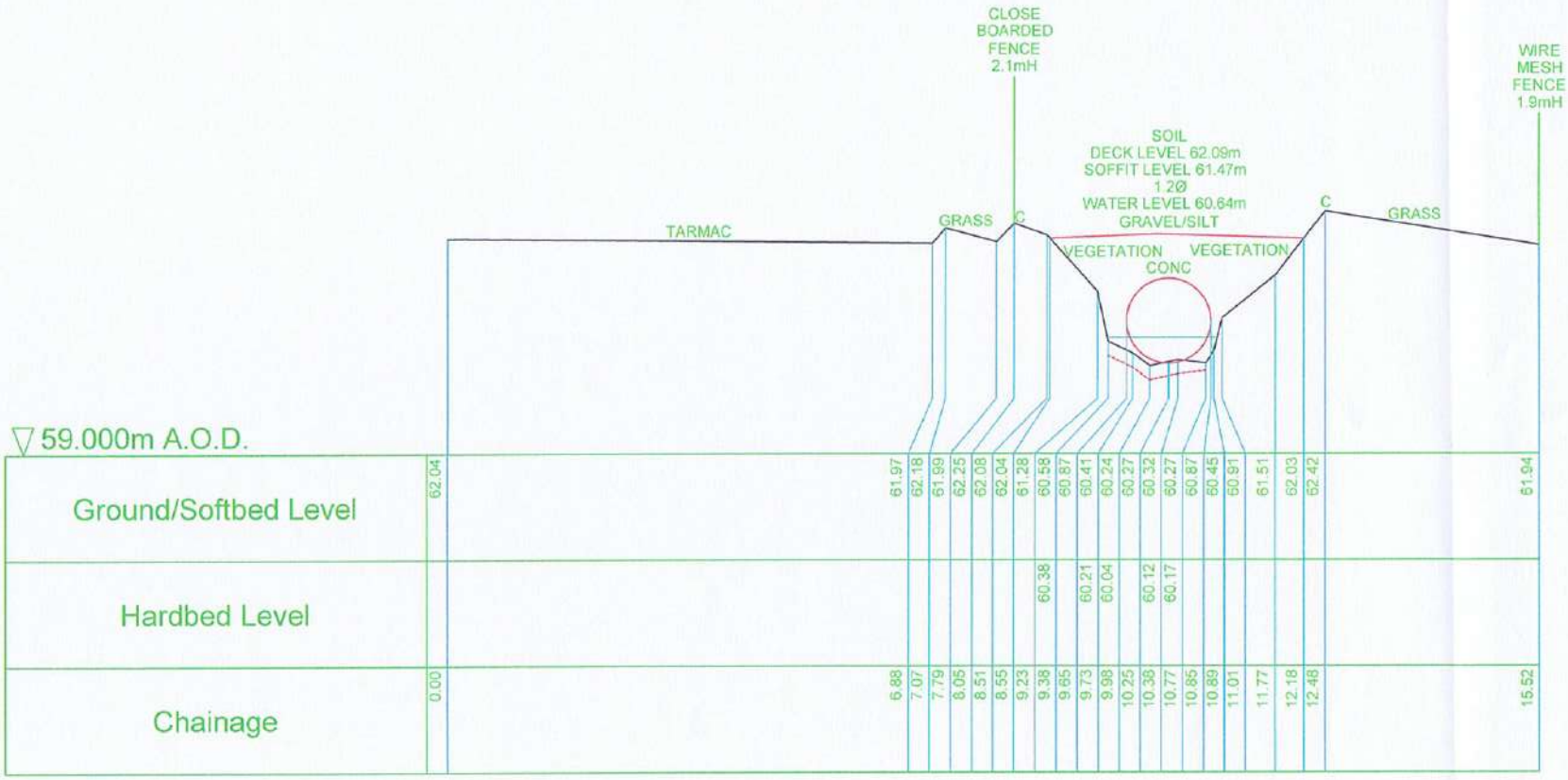
CS 7
STEV01_00381
15/02/2017



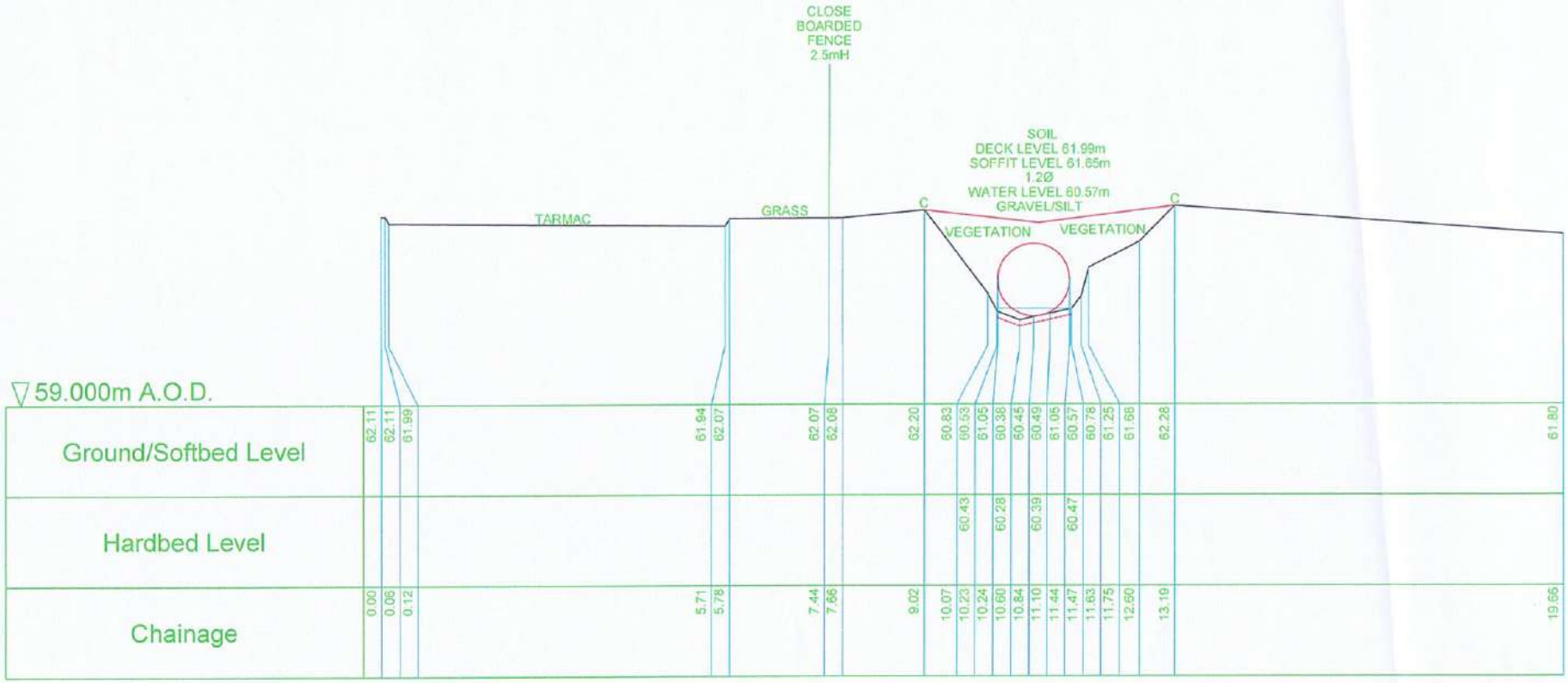
CS 6
STEV01_00369
15/02/2017



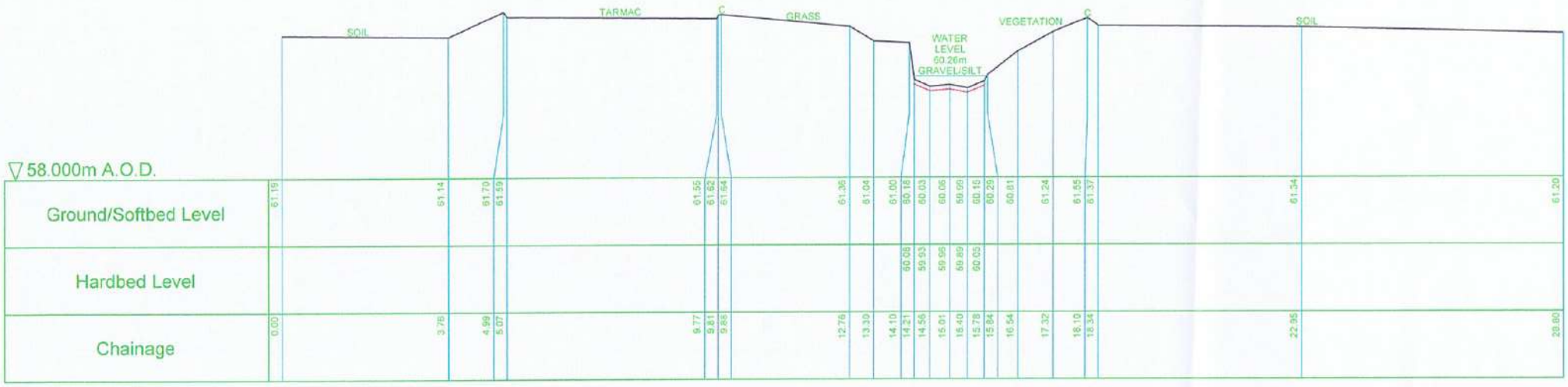
CS 5
STEV01_00293
15/02/2017



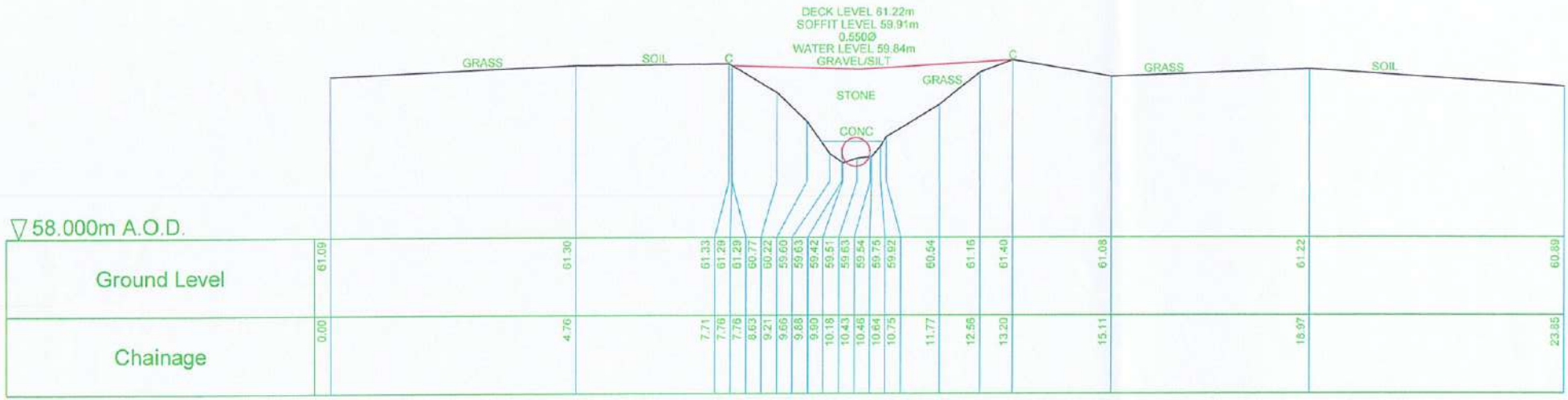
CS 4
STEV01_00247
15/02/2017



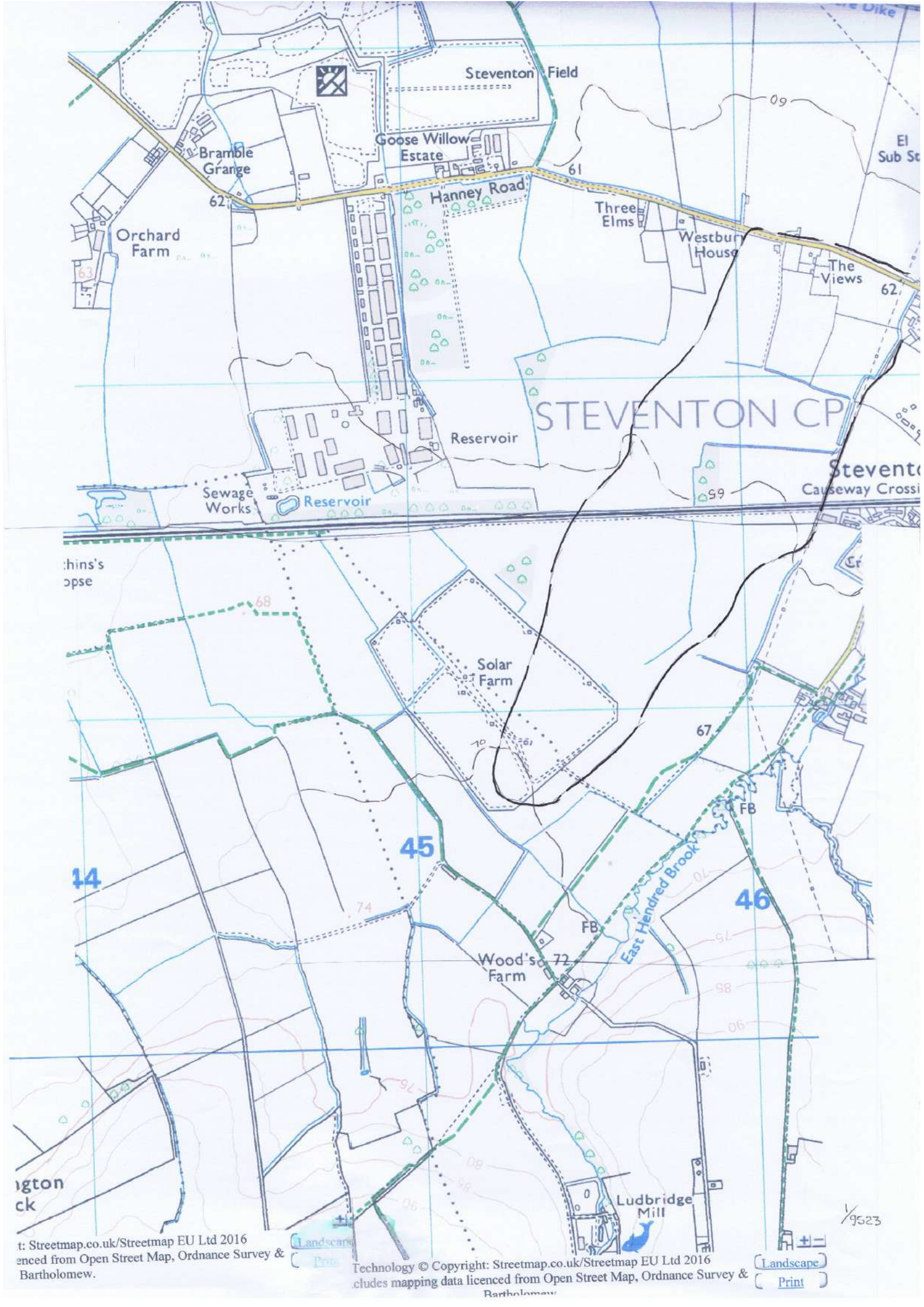
CS 3
STEV01_00234
15/02/2017



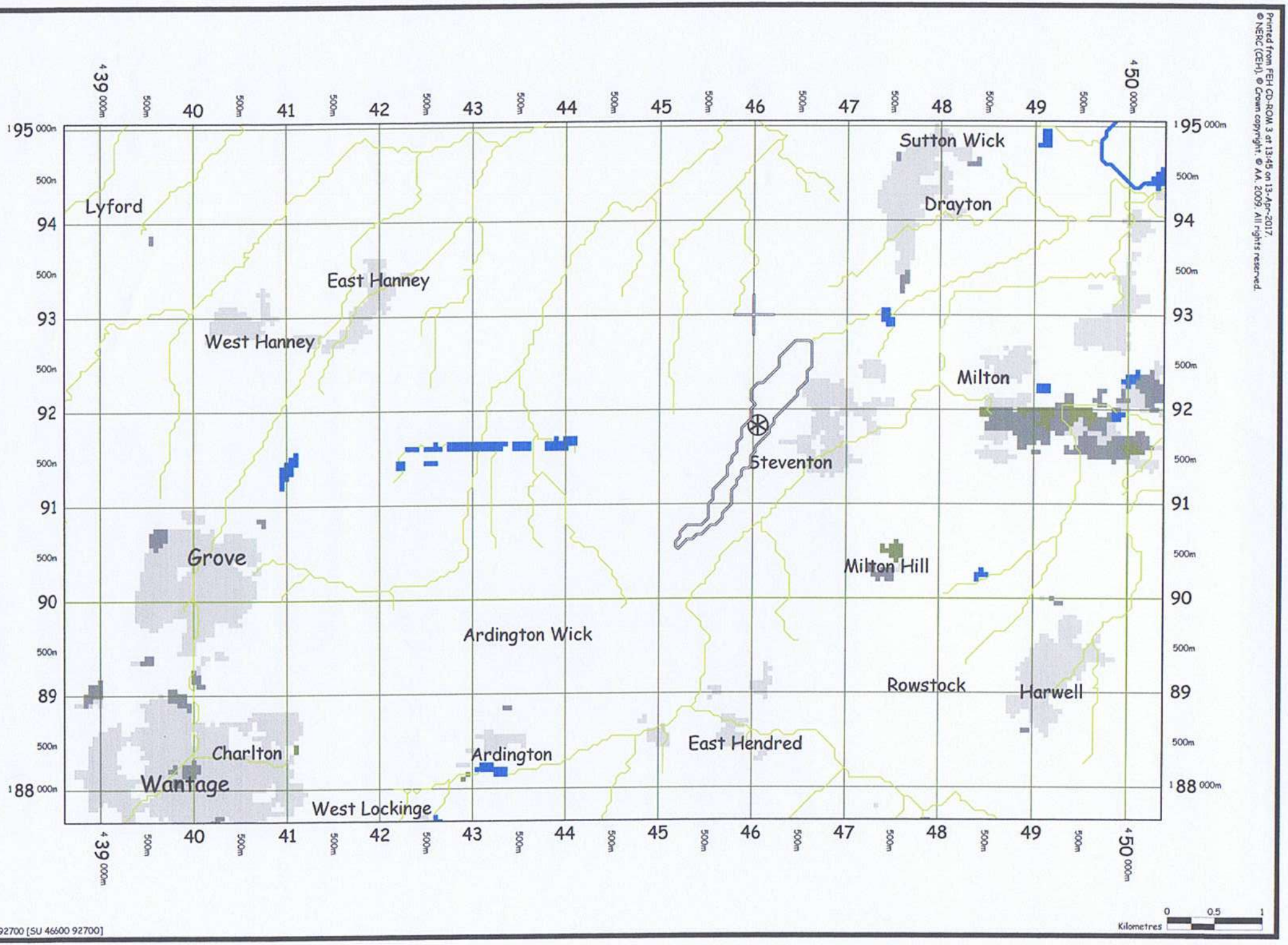
CS 2
STEV01_00122
15/02/2017



CS 1
STEV01_00000
15/02/2017



1/9523



446600 192700 [SU 46600 92700]

VERSION	FEH CD-R	Version	3	exported at	12:46:17	GMT	Thu	13-Apr-17
CATCHMENT	GB	446600	192700	SU 46600 92700				
AREA	0.58							
ALTBAR	64							
ASPBAR	24							
ASPVAR	0.8							
BFIHOST	0.509							
DPLBAR	1.22							
DPSBAR	5.5							
FARL	1							
LDP	3.03							
PROPWET	0.32							
RMED-1H	9.9							
RMED-1D	32.5							
RMED-2D	39.2							
SAAR	601							
SAAR4170	607							
SPRHOST	43.17							
URBCONC1990	-999999							
URBEXT1990	0.0022							
URBLOC1990	-999999							
URBCONC2000	-999999							
URBEXT2000	0							
URBLOC2000	-999999							
C	-0.02553							
D1	0.36021							
D2	0.28922							
D3	0.25277							
E	0.2965							
F	2.43539							
C(1 km)	-0.026							
D1(1 km)	0.356							
D2(1 km)	0.288							
D3(1 km)	0.242							
E(1 km)	0.297							
F(1 km)	2.423							
CTC				Copyright under l;icence from IoH				
catchment descriptors								
Steventon1				13/04/2017	mel			

Revitalised FSR/FEH rainfall runoff method

Spreadsheet application report

User name	mikel	**Catchment name**		**Date/time modelled**	13-Apr-2017 13:48
Company name	ctc	**Catchment easting**	446600	**Version**	1.4
Project name	steventon	**Catchment northing**	192700		
		Catchment area	0.58		

Summary of model setup

Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	100	**C_{max} (mm)**	413	**T_p (hr)**	3.76	**BL (hr)**	35.1
Duration (hr)	6.3	**C_{ini} (mm)**	123	**U_p**	0.65	**BR**	1.2
Timestep (hr)	0.3	**α factor**	0.83	**U_k**	0.8	**BF_0 (m^3/s)**	0
Season	Winter						

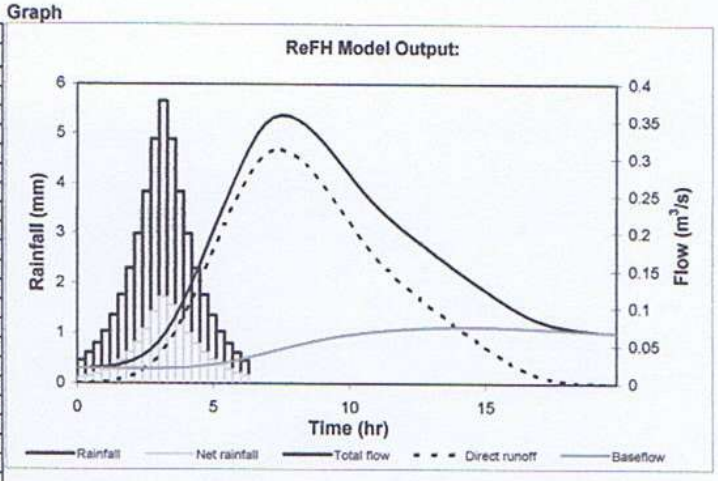
Summary of results

FEH DDF rainfall (mm)	69.8	**Peak rainfall (mm)**	5.7
Design rainfall (mm)	45.7	**Peak flow (m^3/s)**	0.4

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m^3/s	m^3/s	m^3/s
0.0	0.5	0.1	0.0	0.0	0.0
0.3	0.6	0.2	0.0	0.0	0.0
0.6	0.8	0.2	0.0	0.0	0.0
0.9	1.0	0.3	0.0	0.0	0.0
1.2	1.4	0.3	0.0	0.0	0.0
1.5	1.8	0.5	0.0	0.0	0.0
1.8	2.3	0.6	0.0	0.0	0.0
2.1	3.0	0.8	0.0	0.0	0.0
2.4	3.8	1.1	0.0	0.0	0.0
2.7	4.9	1.4	0.0	0.0	0.0
3.0	5.7	1.7	0.0	0.0	0.1
3.3	4.9	1.5	0.0	0.0	0.1
3.6	3.8	1.3	0.1	0.0	0.1
3.9	3.0	1.0	0.1	0.0	0.1
4.2	2.3	0.8	0.1	0.0	0.1
4.5	1.8	0.6	0.1	0.0	0.2
4.8	1.4	0.5	0.2	0.0	0.2
5.1	1.0	0.4	0.2	0.0	0.2
5.4	0.8	0.3	0.2	0.0	0.2
5.7	0.6	0.2	0.2	0.0	0.3
6.0	0.5	0.2	0.3	0.0	0.3
6.3	0.0	0.0	0.3	0.0	0.3
6.6	0.0	0.0	0.3	0.0	0.3
6.9	0.0	0.0	0.3	0.0	0.3
7.2	0.0	0.0	0.3	0.0	0.4
7.5	0.0	0.0	0.3	0.0	0.4
7.8	0.0	0.0	0.3	0.0	0.4
8.1	0.0	0.0	0.3	0.1	0.4
8.4	0.0	0.0	0.3	0.1	0.3
8.7	0.0	0.0	0.3	0.1	0.3
9.0	0.0	0.0	0.3	0.1	0.3
9.3	0.0	0.0	0.3	0.1	0.3
9.6	0.0	0.0	0.2	0.1	0.3
9.9	0.0	0.0	0.2	0.1	0.3
10.2	0.0	0.0	0.2	0.1	0.3
10.5	0.0	0.0	0.2	0.1	0.3
10.8	0.0	0.0	0.2	0.1	0.2
11.1	0.0	0.0	0.2	0.1	0.2
11.4	0.0	0.0	0.2	0.1	0.2
11.7	0.0	0.0	0.1	0.1	0.2
12.0	0.0	0.0	0.1	0.1	0.2
12.3	0.0	0.0	0.1	0.1	0.2
12.6	0.0	0.0	0.1	0.1	0.2
12.9	0.0	0.0	0.1	0.1	0.2
13.2	0.0	0.0	0.1	0.1	0.2
13.5	0.0	0.0	0.1	0.1	0.2
13.8	0.0	0.0	0.1	0.1	0.2
14.1	0.0	0.0	0.1	0.1	0.1
14.4	0.0	0.0	0.1	0.1	0.1
14.7	0.0	0.0	0.1	0.1	0.1
15.0	0.0	0.0	0.0	0.1	0.1
15.3	0.0	0.0	0.0	0.1	0.1
15.6	0.0	0.0	0.0	0.1	0.1
15.9	0.0	0.0	0.0	0.1	0.1
16.2	0.0	0.0	0.0	0.1	0.1
16.5	0.0	0.0	0.0	0.1	0.1
16.8	0.0	0.0	0.0	0.1	0.1
17.1	0.0	0.0	0.0	0.1	0.1
17.4	0.0	0.0	0.0	0.1	0.1
17.7	0.0	0.0	0.0	0.1	0.1
18.0	0.0	0.0	0.0	0.1	0.1
18.3	0.0	0.0	0.0	0.1	0.1
18.6	0.0	0.0	0.0	0.1	0.1
18.9	0.0	0.0	0.0	0.1	0.1
19.2	0.0	0.0	0.0	0.1	0.1
19.5	0.0	0.0	0.0	0.1	0.1
19.8	0.0	0.0	0.0	0.1	0.1
Total (mm)	**45.7**	**13.9**	**13.9**	**6.5**	**20.4**

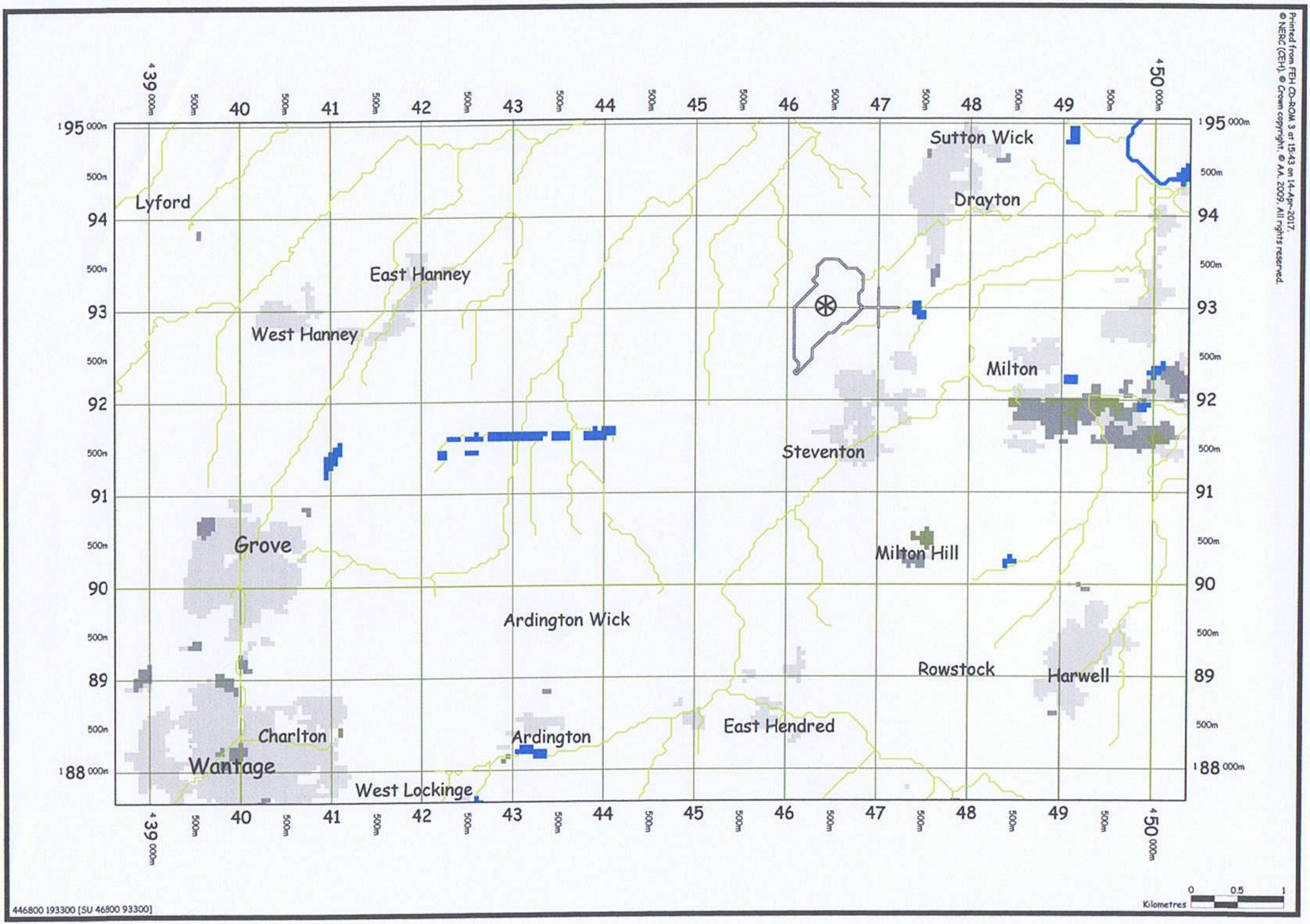
Graph



Audit comments

Model run with ReFH dll version 1.4.0005

Catchment
Catchment descriptors imported from file



446800 193300 [SU 46800 93300]

VERSION	FEH CD-R	Version	3	exported at	14:43:20	GMT	Fri	14-Apr-17
CATCHMENT	GB	446800	193300	SU 46800 93300				
AREA	0.51							
ALTBAR	59							
ASPBAR	21							
ASPVAR	0.76							
BFIHOST	0.506							
DPLBAR	0.76							
DPSBAR	4.2							
FARL	1							
LDP	1.53							
PROPWET	0.32							
RMED-1H	9.8							
RMED-1D	31.8							
RMED-2D	38.2							
SAAR	591							
SAAR4170	599							
SPRHOST	43.58							
URBCONC1990	-999999							
URBEXT1990	0							
URBLOC1990	-999999							
URBCONC2000	-999999							
URBEXT2000	0							
URBLOC2000	-999999							
C	-0.026							
D1	0.35683							
D2	0.28709							
D3	0.24661							
E	0.297							
F	2.42494							
C(1 km)	-0.026							
D1(1 km)	0.359							
D2(1 km)	0.287							
D3(1 km)	0.251							
E(1 km)	0.297							
F(1 km)	2.424							

CTC				Copyright under licence from IoH				
catchment descriptors								
Steventon small-2				13/04/2017	mel			

Revitalised FSR/FEH rainfall runoff method

Spreadsheet application report

User name	mikel	**Catchment name**		**Date/time modelled**	14-Apr-2017 15:45
Company name	CTC	**Catchment easting**	446800	**Version**	1.4
Project name	stevemntonsmall2	**Catchment northing**	193300		
		Catchment area	0.51		

Summary of model setup

Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	100	**C_{max} (mm)**	411	**T_p (hr)**	3.07	**BL (hr)**	31.9
Duration (hr)	4.75	**C_{ini} (mm)**	124	**U_p**	0.65	**BR**	1.19
Timestep (hr)	0.25	**α factor**	0.83	**U_k**	0.8	**BF_0 (m^3/s)**	0
Season	Winter						

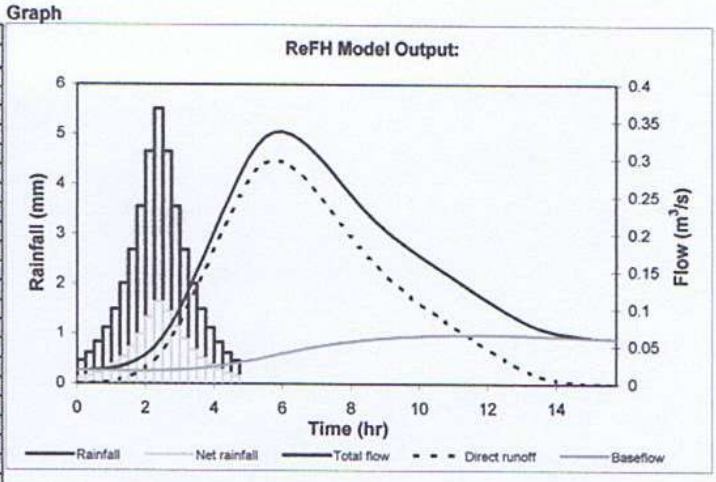
Summary of results

FEH DDF rainfall (mm)	64.1	**Peak rainfall (mm)**	5.5
Design rainfall (mm)	40.3	**Peak flow (m^3/s)**	0.3

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m^3/s	m^3/s	m^3/s
0.00	0.5	0.1	0.0	0.0	0.0
0.25	0.6	0.2	0.0	0.0	0.0
0.50	0.8	0.2	0.0	0.0	0.0
0.75	1.1	0.3	0.0	0.0	0.0
1.00	1.5	0.4	0.0	0.0	0.0
1.25	2.0	0.5	0.0	0.0	0.0
1.50	2.7	0.7	0.0	0.0	0.0
1.75	3.6	1.0	0.0	0.0	0.0
2.00	4.7	1.3	0.0	0.0	0.0
2.25	5.5	1.6	0.0	0.0	0.0
2.50	4.7	1.5	0.0	0.0	0.1
2.75	3.6	1.1	0.1	0.0	0.1
3.00	2.7	0.9	0.1	0.0	0.1
3.25	2.0	0.7	0.1	0.0	0.1
3.50	1.5	0.5	0.1	0.0	0.1
3.75	1.1	0.4	0.2	0.0	0.2
4.00	0.8	0.3	0.2	0.0	0.2
4.25	0.6	0.2	0.2	0.0	0.2
4.50	0.5	0.2	0.2	0.0	0.3
4.75	0.0	0.0	0.3	0.0	0.3
5.00	0.0	0.0	0.3	0.0	0.3
5.25	0.0	0.0	0.3	0.0	0.3
5.50	0.0	0.0	0.3	0.0	0.3
5.75	0.0	0.0	0.3	0.0	0.3
6.00	0.0	0.0	0.3	0.0	0.3
6.25	0.0	0.0	0.3	0.0	0.3
6.50	0.0	0.0	0.3	0.0	0.3
6.75	0.0	0.0	0.3	0.0	0.3
7.00	0.0	0.0	0.3	0.0	0.3
7.25	0.0	0.0	0.2	0.1	0.3
7.50	0.0	0.0	0.2	0.1	0.3
7.75	0.0	0.0	0.2	0.1	0.3
8.00	0.0	0.0	0.2	0.1	0.3
8.25	0.0	0.0	0.2	0.1	0.2
8.50	0.0	0.0	0.2	0.1	0.2
8.75	0.0	0.0	0.2	0.1	0.2
9.00	0.0	0.0	0.1	0.1	0.2
9.25	0.0	0.0	0.1	0.1	0.2
9.50	0.0	0.0	0.1	0.1	0.2
9.75	0.0	0.0	0.1	0.1	0.2
10.00	0.0	0.0	0.1	0.1	0.2
10.25	0.0	0.0	0.1	0.1	0.2
10.50	0.0	0.0	0.1	0.1	0.2
10.75	0.0	0.0	0.1	0.1	0.1
11.00	0.0	0.0	0.1	0.1	0.1
11.25	0.0	0.0	0.1	0.1	0.1
11.50	0.0	0.0	0.1	0.1	0.1
11.75	0.0	0.0	0.1	0.1	0.1
12.00	0.0	0.0	0.0	0.1	0.1
12.25	0.0	0.0	0.0	0.1	0.1
12.50	0.0	0.0	0.0	0.1	0.1
12.75	0.0	0.0	0.0	0.1	0.1
13.00	0.0	0.0	0.0	0.1	0.1
13.25	0.0	0.0	0.0	0.1	0.1
13.50	0.0	0.0	0.0	0.1	0.1
13.75	0.0	0.0	0.0	0.1	0.1
14.00	0.0	0.0	0.0	0.1	0.1
14.25	0.0	0.0	0.0	0.1	0.1
14.50	0.0	0.0	0.0	0.1	0.1
14.75	0.0	0.0	0.0	0.1	0.1
15.00	0.0	0.0	0.0	0.1	0.1
15.25	0.0	0.0	0.0	0.1	0.1
15.50	0.0	0.0	0.0	0.1	0.1
15.75	0.0	0.0	0.0	0.1	0.1
Total (mm)	**40.3**	**12.1**	**12.1**	**5.1**	**17.2**

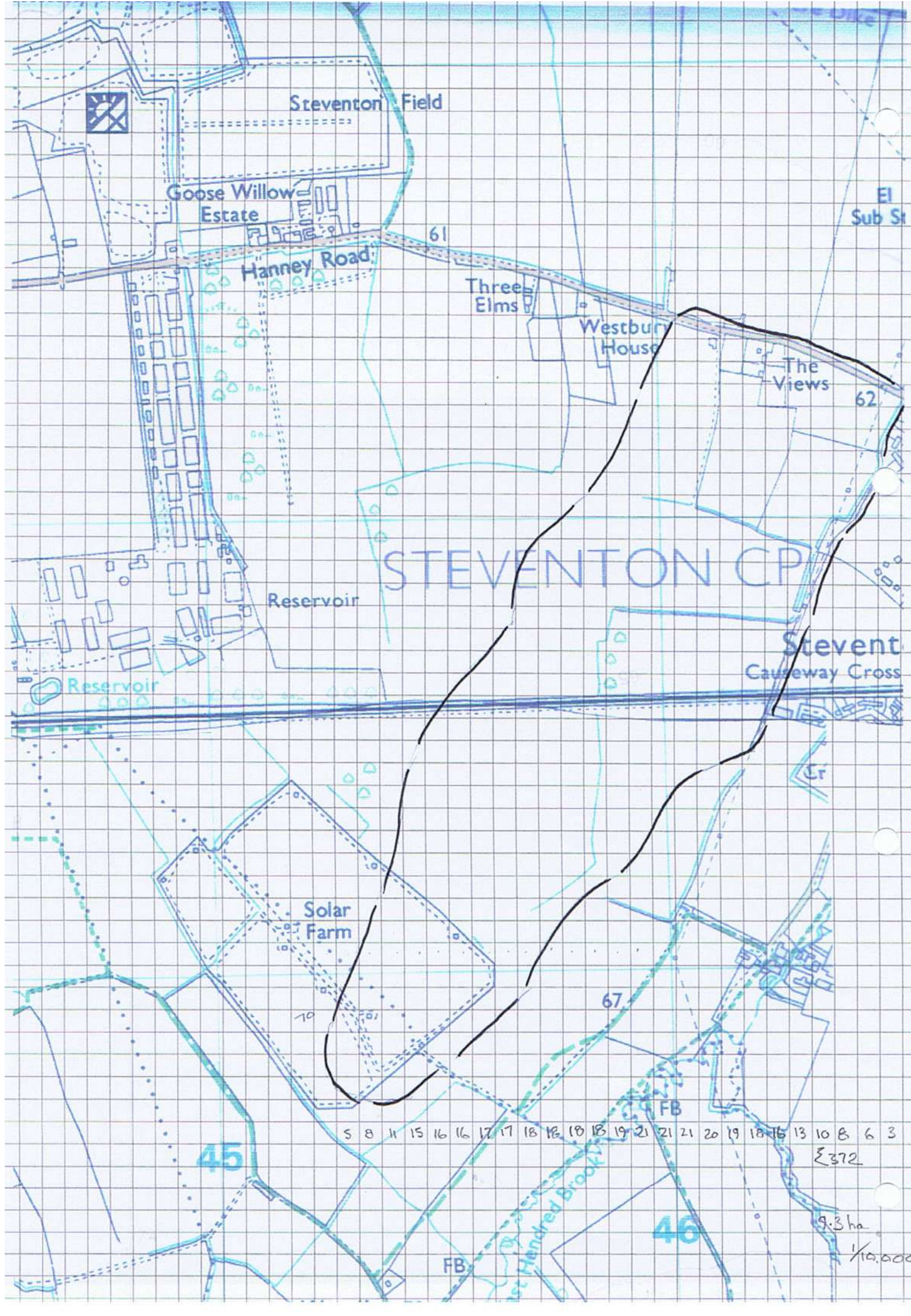
Graph



Audit comments

Model run with ReFH dll version 1.4.0005

Catchment
Catchment descriptors imported from file
Catchment descriptor file = 'stevencatch2.csv'
Catchment decriptor file exported from CD ROM version 3
Catchment descriptor file exported on 14-Apr-2017 14:43


Steventon Field
Goose Willow Estate
Hanney Road
61
Three Elms
Westbury House
The Views
62
El Sub St
STEVENTON CP
Reservoir
Reservoir
Stevent
Causeway Cross
Solar Farm
67
70
FB
5 8 11 15 16 16 17 17 18 16 18 18 19 21 21 21 20 19 18 16 13 10 8 6 3
£372
45
46
FB
9.3ha
1/10,000

A1 Design data

Table A1.1 *Roughness coefficients for natural channels*

$$Q = KS_0^{1/2} = \left(\frac{1}{n} AR^{2/3}\right) S_0^{1/2}$$

Type of channel and desctiption	Manning's *n*		
	Minimum	Normal	Maximum
Natural streams (top width at flood stage < 30 m)			
Clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
As above but more stones and weeds	0.030	0.035	0.040
Clean, winding, some pools and riffles	0.033	0.040	0.045
As above but some weeds and stones	0.035	0.045	0.050
As above but lower stages, more ineffective slopes and sections	0.040	0.048	0.055
As above but more stones	0.045	0.050	0.060
Sluggish reaches. Weedy deep pools	0.050	0.070	0.080
Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150
Mountainous streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high water levels. Bed: gravels, cobbles and few boulders	0.030	0.040	0.050
Mountainous streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high water levels. Bed: cobbles with large boulders	0.040	0.050	0.070
Minor streams (top width at flood stage > 30m)			
Regular section with no boulders or brush	0.025	-	0.060
Irregular and rough section	0.035	-	0.100
Flood plains			
Pasture, no brush			
Short grass	0.025	0.030	0.035
High grass	0.030	0.035	0.050
Cultivated areas			
No crop	0.020	0.030	0.040
Mature row crops	0.025	0.035	0.045
Mature field crops	0.030	0.040	0.050
Brush			
Scattered brush, heavy weeds	0.035	0.050	0.070
Light brush and trees in winter	0.035	0.050	0.060
Light brush and trees in summer	0.040	0.060	0.080
Medium to dense brush in winter	0.045	0.070	0.110

IMPROVING THE FEH STATISTICAL METHOD

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Key Words: Flood Estimation Handbook, flood frequency analysis, statistical method

Abstract: The FEH procedures have been adopted as standard practice, where applicable, by the Environment Agency and other bodies engaged in flood frequency estimation in the UK, and are used primarily for flood mapping studies, flood risk assessments, and the design of flood alleviation schemes. The results from the recently completed R & D project SC050050 (EA, 2008) recommend changes to the procedures contained in the flood Estimation Handbook (FEH) published by the Institute of Hydrology (1999) for use of statistical methods for flood frequency analysis in the UK.

The changes recommended arise, in part, because the HiFlows-UK project has led to the creation of a much improved database of systematically recorded flood data. Another influence on the changed procedures has been feedback from users of the FEH, both informal and formal. The changes do not deviate from the overall framework of the FEH methodology. However, most technical details of the method have been updated to improve the performance of the procedure. These updates include:

i) A new equation for estimating the median annual maximum flood (*QMED*) at ungauged catchments .
ii) An improved procedure for the use of donor catchments for estimation of *QMED* at ungauged catchments
iii) An improved procedure for the formation of pooled growth curves.

There are some cases where the analysis carried out in the science report have recommended no change to the FEH methodology these include the retention of the Generalised Logistic (GLO) distribution as default.

INTRODUCTION

The Flood Estimation Handbook (FEH) published in 1999 (Institute of Hydrology, 1999) continues to form the basis of most work on flood frequency estimation in the UK. The FEH procedures have been used for a wide range of applications such as flood mapping studies, Flood Risk Assessments, and the design of flood alleviation schemes by the Environment Agency and other bodies. It consists of five volumes describing two principal methods for conducting flood frequency analysis as well as information on electronic datasets of catchment descriptors such as catchment area and annual average rainfall. The two principal methods described in the FEH are: i) a rainfall-runoff based approach adopted largely unchanged from the original method developed in the early 1970s and published in the Flood Studies Report (FSR) by NERC (1975), and ii) a statistical method based on analysis of annual maximum series of instantaneous peak flow.

Since publication in 1999, the continuous scientific developments as well as the ongoing dialog between users of the FEH and the research team at the Centre for Ecology & Hydrology (CEH) in Wallingford have highlighted various aspects of the methods and their implementation which would benefit from further improvements. As a result, the Joint Defra/Environment Agency Flood and Coastal Management R&D program has funded a number projects aimed at improving various aspects of the two methods in the FEH. For example the "Revitalisation of the FSR/FEH rainfall-runoff method" - FD1913 (Defra, 2005) and the "Dissemination of the FSR/FEH rainfall-runoff method" - SC040029 (EA 2007) focused on improving the rainfall-runoff approach were as the recently completed project SC050050 Improving the FEH Statistical Index Flood Method and Software (EA 2008).

2008 conference

October 2002 to September 2003). This increase in record length will generally reduce the sampling uncertainties of the estimates of *QMED* and of the L-moment ratios.

Catchment Descriptors

The digital catchment descriptors used in this study were mainly extracted from the FEH CD-ROM Version 2 (CEH, 2007) for each of the 602 gauged catchments. The number of catchment descriptors potentially available is large, but only a subset of variables previously found to be useful in flood studies were considered in this study. In addition to the existing descriptors available from the FEH CD-ROM, an additional descriptor describing the extent of flood plains in a catchment (*FPEXT*) was developed as part of this study and found useful when defining pooling groups. For details of the derivation of *FPEXT* values, please refer to the Science Report for project SC050050 (EA, 2008).

ESTIMATING QMED AT AN UNGAUGED SITE

Where no flood data are available at the site of interest, *QMED* has to be estimated from catchment descriptors. The estimate can subsequently be adjusted using data transfer from a nearby gauged catchment (a donor site).

A new QMED model

Through a combination of methodological developments and extensive exploratory analysis of model residuals, a revised QMED model was developed for use on rural catchment

$$QMED = 8.3062 AREA^{0.8510}\, 0.1536^{\left(\frac{1000}{SAAR}\right)}\, FARL^{3.4451}\, 0.0460^{BFIHOST^2} \qquad (1)$$

where *AREA* is the catchment area [km^2], *SAAR* is the standard average annual rainfall [mm] based on measurements from 1961-1990, *FARL* is an index of flood attenuation due to reservoirs and lakes, and *BFIHOST* is the baseflow index derived from HOST soil data. The factorial standard error (fse) of *QMED* values estimated from this new QMED model are 1.431, which is a 7.5% reduction compared to the fse value of 1.541 reported for the original FEH QMED model. While significantly increasing the predictive accuracy of the QMED model when compared to the FEH, the new model is also analytically more simple using only four catchment descriptors compared to the six used in the QMED model reported in the FEH.

A Revised Procedure for Use of Donor Catchments

The FEH emphasises that the uncertainty of *QMED* estimated using the QMED model is generally much larger than the uncertainty of estimates obtained directly from flood data. Consequently, the FEH recommends that data transfer from nearby donor or analogue catchments should be used wherever possible. However, based on research by Kjeldsen and Jones (2007) and results obtained in project SC050050, it has become clear that the benefits from the FEH donor transfer method are generally less than previously thought. It is therefore recommended that the data transfer procedure is revised to account for the geographical distance, d_{sg}, in kilometres between the centroids of the subject site and a donor catchment as

$$QMED_{s,adj} = QMED_{s,cds}\left(\frac{QMED_{g,obs}}{QMED_{g,cds}}\right)^{a_{sg}} \qquad (2)$$

where

$$a_{sg} = 0.4598\exp(-0.0200 d_{sg}) + (1 - 0.4598)\exp(-0.4785 d_{sg}) \qquad (3)$$

And where the subscript *s* refer to the ungauged target (or subject) site and *g* the gauged donor site. The subscript *cds* refer to an estimate derived from catchment descriptors at the gauged and target sites, *obs* the observed value at the gauged donor site and *adj* the adjusted value at the ungauged target site. The donor adjustment in the form given above will automatically reduce the influence of the donor site as the geographical distance between the two catchment centroids increases. Note that currently the donor adjustment procedure is only capable of considering one donor site at the time. Further development is needed to develop a method capable of considering multiple donor sites.

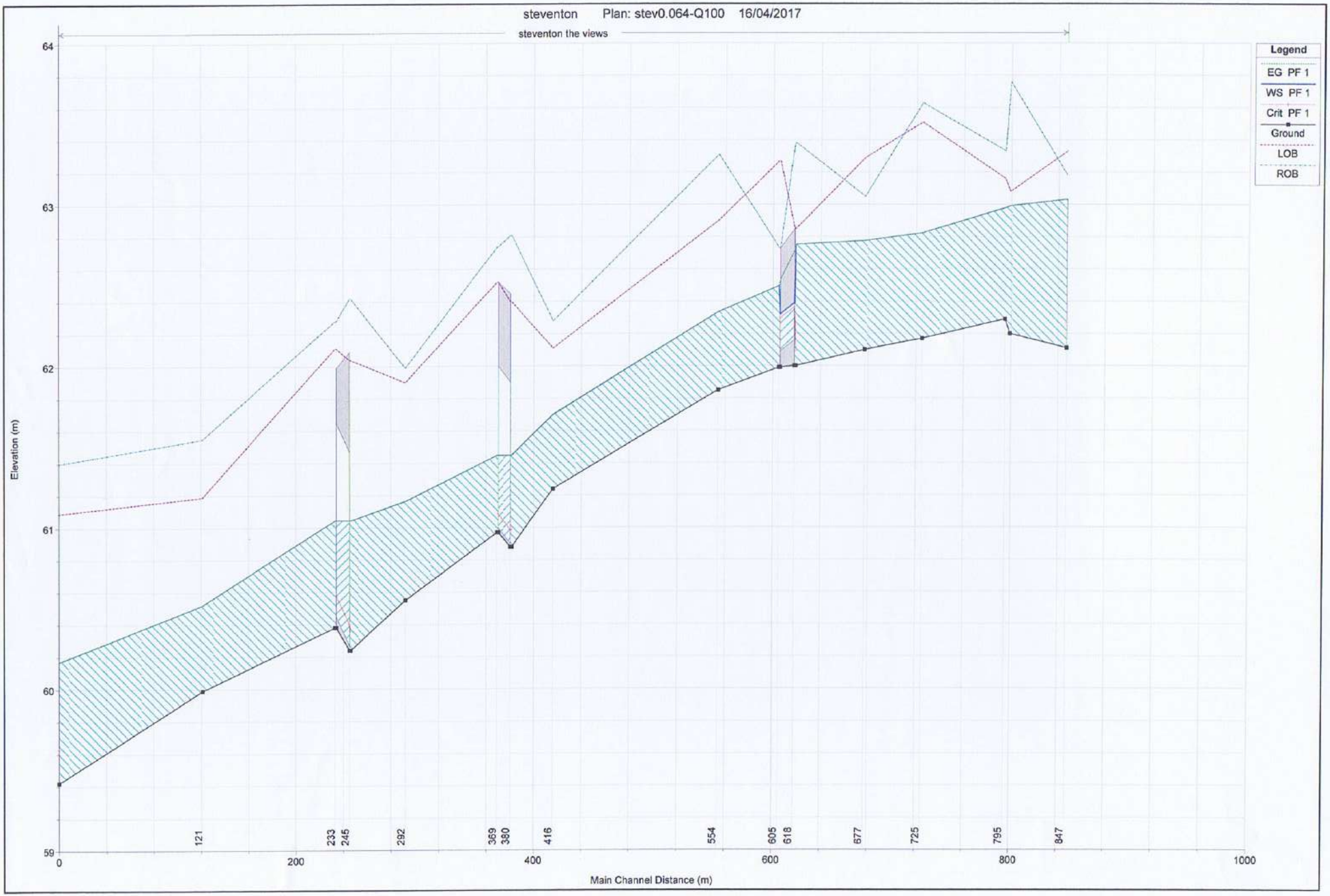
Plan: p02 steventon the views RS: 630 Lat Struct Profile: PF 1 @1000

E.G. US. (m)	63.09	Weir Sta US (m)	0.00
W.S. US. (m)	63.09	Weir Sta DS (m)	10.00
E.G. DS (m)	63.09	Min El Weir Flow (m)	63.04
W.S. DS (m)	63.09	Wr Top Wdth (m)	7.90
Q US (m3/s)	0.13	Weir Max Depth (m)	0.05
Q Leaving Total (m3/s)	0.04	Weir Avg Depth (m)	0.02
Q DS (m3/s)	0.09	Weir Flow Area (m2)	0.19
Perc Q Leaving	29.49	Weir Coef (m^1/2)	1.099
Q Weir (m3/s) still over weir	0.04	Weir Submerg	0.00
Q Gates (m3/s)		Q Gate Group (m3/s)	
Q Culv (m3/s)	0.00	Gate Open Ht (m)	
Q Lat RC (m3/s)		Gate #Open	
		Gate Area (m2)	
Q Breach (m3/s)		Gate Submerg	
Breach Avg Velocity (m/s)		Gate Invert (m)	
Breach Flow Area (m2)		Gate Weir Coef	

Plan: p01 steventon the views RS: 618 Culv Group: Culvert #1 Profile: PF 1

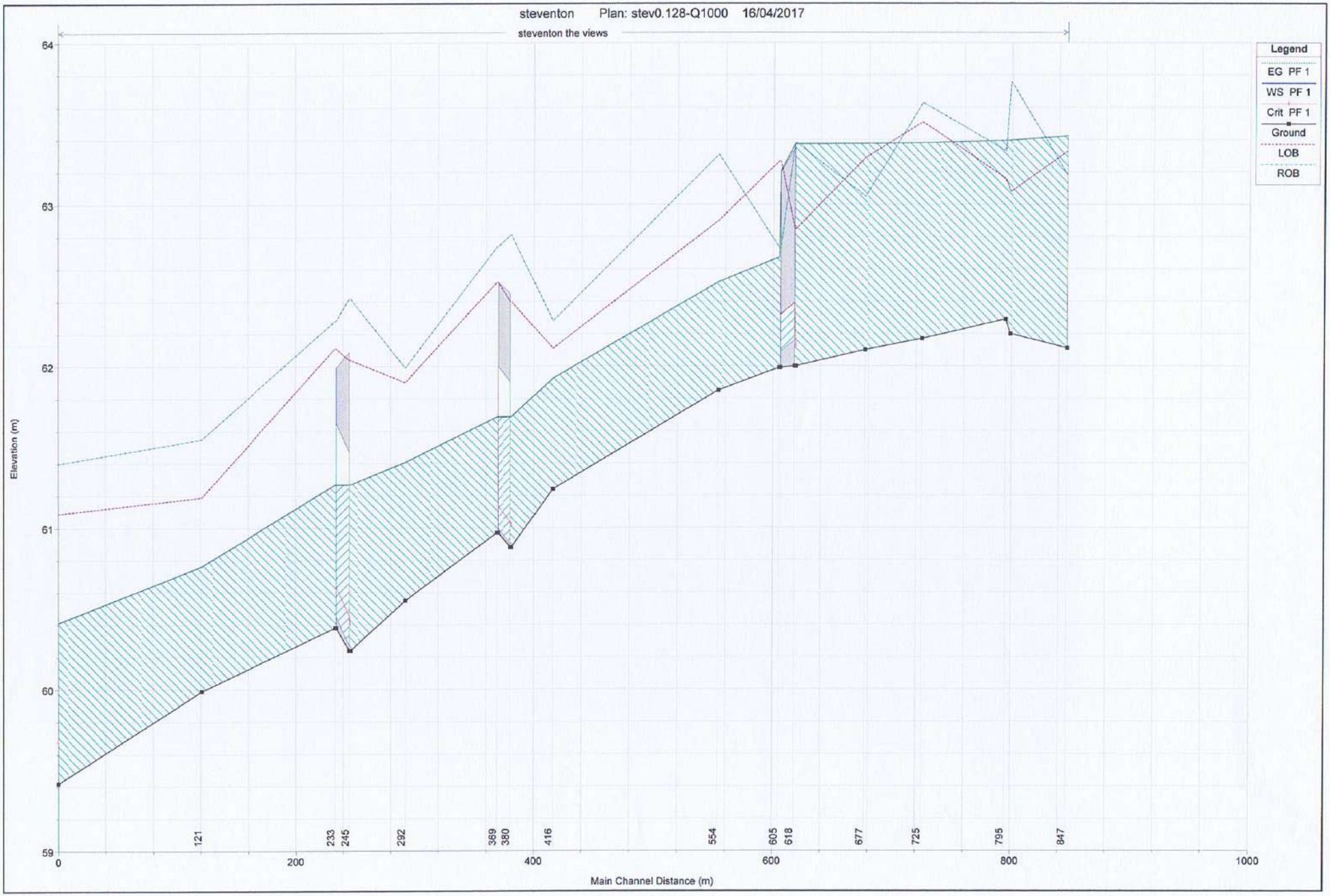
Q Culv Group (m3/s)	0.06	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.51
Q Barrel (m3/s)	0.06	Culv Vel DS (m/s)	0.43
E.G. US. (m)	62.51	Culv Inv El Up (m)	62.16
W.S. US. (m)	62.51	Culv Inv El Dn (m)	62.09
E.G. DS (m)	62.50	Culv Frctn Ls (m)	0.01
W.S. DS (m)	62.50	Culv Exit Loss (m)	0.00
Delta EG (m)	0.01	Culv Entr Loss (m)	0.00
Delta WS (m)	0.01	Q Weir (m3/s)	
E.G. IC (m)	62.40	Weir Sta Lft (m)	
E.G. OC (m)	62.51	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	62.49	Weir Max Depth (m)	
Culv WS Outlet (m)	62.49	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.16	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.17	Min El Weir Flow (m)	63.35

230 dia Q100


steventon Plan: stev0.064-Q100 16/04/2017
steventon the views
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (m)
64
63
62
61
60
59
0
200
400
600
800
1000
Main Channel Distance (m)
121
233
245
292
369
380
416
554
605
618
677
725
795
847

HEC-RAS Plan: p01 River: steventon Reach: the views Profile: PF 1 Q100

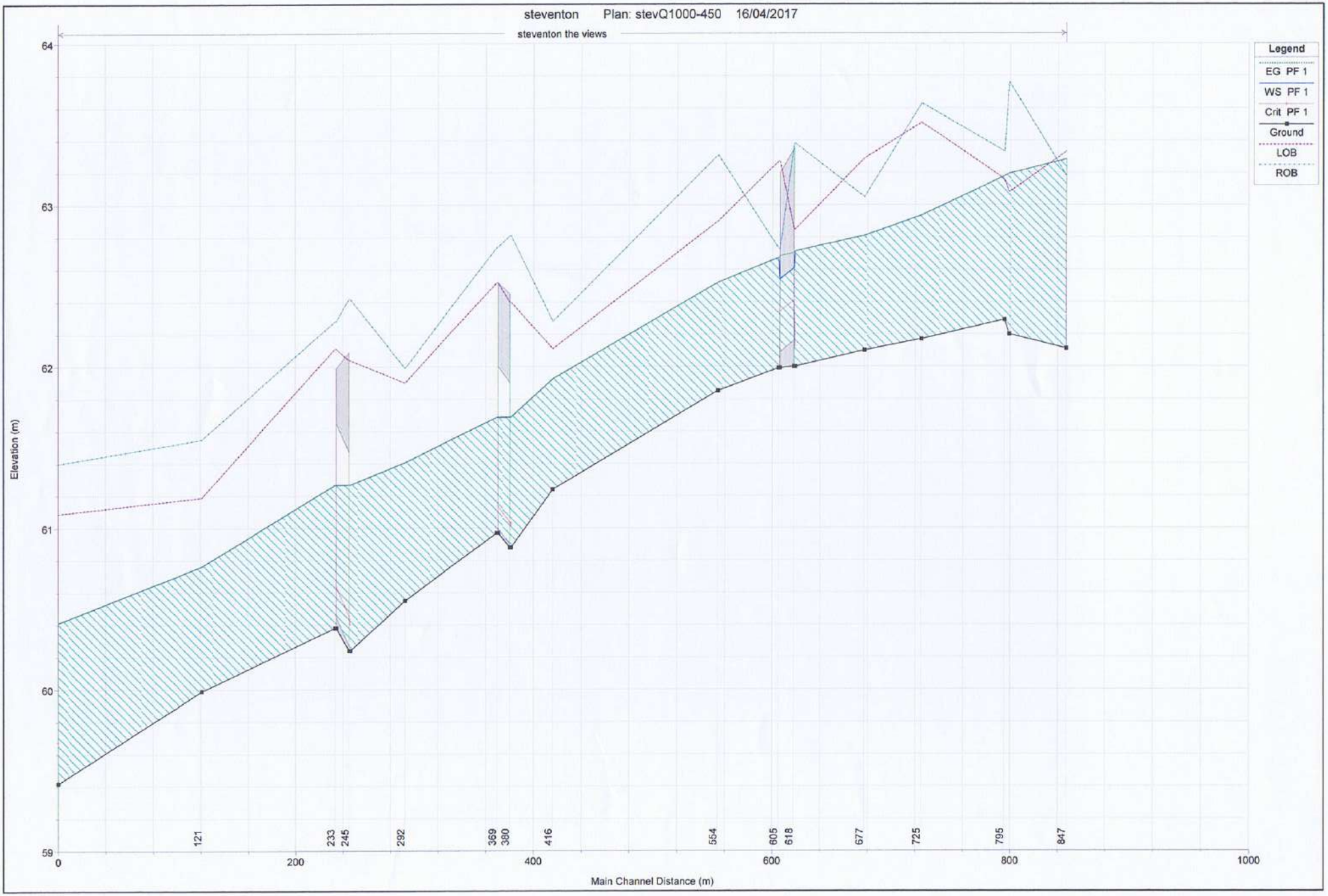
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
the views	847	PF 1 16	0.064	62.110	63.031	62.26	63.03	0.000	0.04	1.57	2.76	0.02
the views	799	PF 1 15	0.064	62.200	62.991		62.99	0.002	0.07	0.92	1.86	0.03
the views	795	PF 1 14	0.064	62.290	62.979		62.98	0.004	0.09	0.75	2.07	0.05
the views	725	PF 1 13	0.064	62.170	62.824		62.82	0.001	0.06	1.01	2.42	0.03
the views	677	PF 1 12	0.064	62.100	62.776		62.78	0.001	0.04	1.51	4.64	0.02
the views	619	PF 1 11	0.064	62.000	62.752	62.09	62.75	0.000	0.03	2.02	3.94	0.01
the views	618		Culvert	230 pipe								
the views	605	PF 1 10	0.064	61.990	62.495		62.50	0.006	0.10	0.67	2.63	0.06
the views	554	PF 1 9	0.064	61.850	62.334		62.33	0.002	0.07	0.95	2.83	0.04
the views	416	PF 1 8	0.064	61.240	61.700		61.70	0.021	0.17	0.39	1.43	0.10
the views	381	PF 1 7	0.064	60.880	61.448	60.98	61.45	0.004	0.09	0.71	1.64	0.04
the views	380		Culvert	ubsite dam U								
the views	369	PF 1 6	0.064	60.970	61.447		61.45	0.005	0.10	0.66	1.66	0.05
the views	292	PF 1 5	0.064	60.550	61.164		61.16	0.003	0.09	0.75	1.94	0.04
the views	246	PF 1 4	0.064	60.240	61.045	60.36	61.05	0.002	0.06	1.03	1.90	0.03
the views	245		Culvert	1200 bra								
the views	233	PF 1 3	0.064	60.380	61.045		61.05	0.009	0.10	0.67	1.79	0.05
the views	121	PF 1 2	0.064	59.990	60.521		60.52	0.003	0.08	0.79	1.99	0.04
the views	0	PF 1 1	0.064	59.420	60.170	59.63	60.17	0.003	0.08	0.80	1.91	0.04


steventon Plan: stev0.128-Q1000 16/04/2017
steventon the views
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (m)
64
63
62
61
60
59
0
200
400
600
800
1000
Main Channel Distance (m)
121
233
245
292
369
380
416
554
605
618
677
725
795
847

HEC-RAS Plan: p02 River: steventon Reach: the views Profile: PF 1

Q1000

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
the views	847	PF 1 16	0.128	62.110	63.301	62.31	63.30	0.001	0.04	3.40	13.20	0.02
the views	799	PF 1 15	0.128	62.200	63.233		63.23	0.003	0.08	1.57	3.37	0.04
the views	795	PF 1 14	0.128	62.290	63.224		63.22	0.002	0.04	3.00	16.98	0.03
the views	725	PF 1 13	0.128	62.170	63.127		63.13	0.001	0.07	1.89	3.40	0.03
the views	677	PF 1 12	0.128	62.100	63.099		63.10	0.000	0.03	4.48	19.18	0.02
the views	630		Lat Struct	10 m sidewier								
the views	619	PF 1 11	0.090	62.000	63.087	62.11	63.09	0.000	0.02	5.14	15.92	0.01
the views	618		Culvert		230 mm dia							
the views	605	PF 1 10	0.090	61.990	62.576		62.58	0.005	0.10	0.90	3.03	0.06
the views	554	PF 1 9	0.090	61.850	62.414		62.41	0.002	0.08	1.19	3.08	0.04
the views	416	PF 1 8	0.090	61.240	61.880		61.88	0.009	0.13	0.70	2.06	0.07
the views	381	PF 1 7	0.128	60.880	61.688	61.03	61.69	0.004	0.11	1.12	1.78	0.05
the views	380		Culvert									
the views	369	PF 1 6	0.128	60.970	61.686		61.69	0.005	0.12	1.07	1.79	0.05
the views	292	PF 1 5	0.128	60.550	61.407		61.41	0.003	0.10	1.30	2.59	0.04
the views	246	PF 1 4	0.128	60.240	61.269	60.41	61.27	0.003	0.09	1.50	2.23	0.03
the views	245		Culvert	1200								
the views	233	PF 1 3	0.128	60.380	61.258		61.27	0.008	0.12	1.09	2.05	0.05
the views	121	PF 1 2	0.128	59.990	60.763		60.76	0.003	0.10	1.31	2.35	0.04
the views	0	PF 1 1	0.128	59.420	60.414	59.68	60.41	0.003	0.10	1.35	2.56	0.04


steventon Plan: stevQ1000-450 16/04/2017
steventon the views
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (m)
64
63
62
61
60
59
0
200
400
600
800
1000
Main Channel Distance (m)
121
233
245
292
369
380
416
554
605
618
677
725
795
847

HEC-RAS Plan: p04 River: steventon Reach: the views Profile: PF 1 Q1000 new 450

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
the views	847	PF 1 16	0.128	62.110	63.283	62.31	63.28	0.001	0.04	3.17	13.17	0.03
the views	799	PF 1 15	0.128	62.200	63.195		63.19	0.004	0.09	1.44	3.31	0.04
the views	795	PF 1 14	0.128	62.290	63.179		63.18	0.004	0.08	2.26	15.94	0.05
the views	725	PF 1 13	0.128	62.170	62.936		62.94	0.003	0.10	1.30	2.75	0.05
the views	677	PF 1 12	0.128	62.100	62.810		62.81	0.002	0.08	1.68	5.00	0.04
the views	619	PF 1 11	0.128	62.000	62.715	62.13	62.72	0.001	0.07	1.88	3.82	0.03
the views	618		Culvert	new 450								
the views	605	PF 1 10	0.128	61.990	62.674		62.67	0.005	0.10	1.22	3.58	0.06
the views	554	PF 1 9	0.128	61.850	62.520		62.52	0.002	0.08	1.53	3.42	0.04
the views	416	PF 1 8	0.128	61.240	61.924		61.93	0.013	0.16	0.80	2.22	0.09
the views	381	PF 1 7	0.128	60.880	61.688	61.03	61.69	0.004	0.11	1.12	1.78	0.05
the views	380		Culvert									
the views	369	PF 1 6	0.128	60.970	61.686		61.69	0.005	0.12	1.07	1.79	0.05
the views	292	PF 1 5	0.128	60.550	61.407		61.41	0.003	0.10	1.30	2.59	0.04
the views	246	PF 1 4	0.128	60.240	61.269	60.41	61.27	0.003	0.09	1.50	2.23	0.03
the views	245		Culvert									
the views	233	PF 1 3	0.128	60.380	61.268		61.27	0.008	0.12	1.09	2.05	0.05
the views	121	PF 1 2	0.128	59.990	60.763		60.76	0.003	0.10	1.31	2.35	0.04
the views	0	PF 1 1	0.128	59.420	60.414	59.68	60.41	0.003	0.10	1.35	2.56	0.04