

Comments on ISOM First Draft, 30 June 2013

Prepared by Adrian Uppill, Orienteering Australia

Acknowledgements

In preparing these comments I acknowledge the papers and comments provided by Alex Tarr (mapping), Eric Andrews (mapping), Ken Dowling (printing), Barbara Junghams (colour vision) and other members of the Australian orienteering community.

General comments

This submission is made from an Australian perspective. However we believe that some of the issues and comments may also apply in other countries outside northern and central Europe, particularly those countries with a comparable geological history and or warm and dry climates.

Format and size of Draft ISOM

Although the draft has a better layout and provides greater explanation, it is a huge document. In contrast the current booklet is a good size for carrying around for reference, is concise but still provides sufficient detail for a mapping specification. Therefore the draft needs to be cut back in size.

As a first step the reference to Control Descriptions should be deleted. Although useful it does not form part of a mapping specification. If the control descriptions are to be imbedded into the mapping specifications it will then become virtually impossible to make changes to control descriptions. In this regard Orienteering Australia in June 2011 made a suggestion to the Chair IOF Rules Commission for further unification of the symbols used for control descriptions and mapping ie

1.10 Knoll		to	
2.4 Boulder		to	
2.5 Boulder field		to	
2.6 Boulder cluster		to	

The Chair IOF Rules Commission has indicated that OA's suggestion will be considered after the new version of ISOM, but by then it will be too late if the control descriptions are part of ISOM. I have accordingly sent a copy of this report to the Chair IOF Rules Commission.

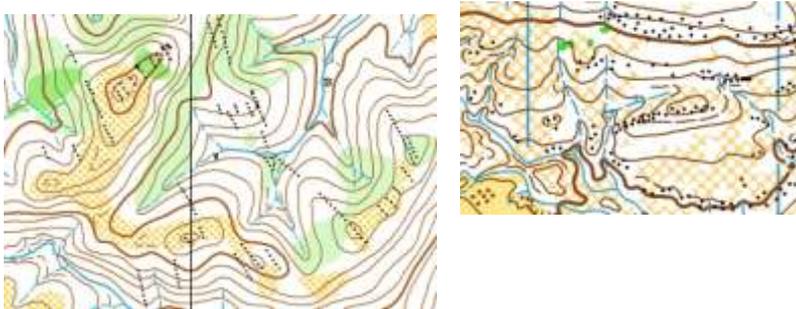
Chapter 5 Printing' needs to be reduced in content. Much of the discussion about the various printing methods can be taken out to form a separate printing document to ISOM. Such a separate document can then more easily be updated as new technologies and printing methods become available.

Australian terrain

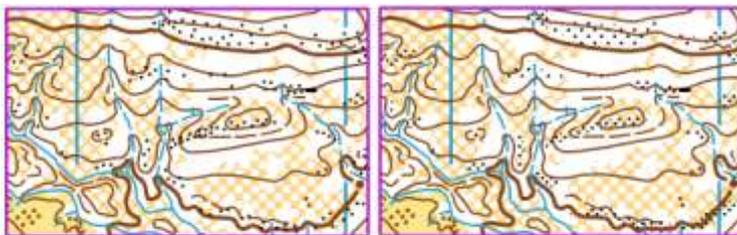
The draft proposes to abandon some symbols that are particularly appropriate to Australian terrains by restricting stony ground, boulder field and broken ground to fixed density, area symbols. The current symbols work well for the Australian terrain. The dots or shape symbols should be individually placed. There are terrains in Australia which have for example lines of rocky or stony outcropping and it is here that the single dot best describes the terrain.

In particular the draft proposes to ban the drawing of a single row of dots. Although the freehand drawing of a single row of dots may appear to cause confusion with 416 Distinctive vegetation boundary (uses the larger dot size of 0.22 at a regular interval), this has not caused a problem on Australian maps.

The map examples below show distinctive narrow bands of rock outcropping, to outcropping at varying density and variable width, and to isolated outcropping.



It would also be very time consuming to convert existing maps to the new fixed density area screen. The example below shows the old and new treatment of stony ground. In the new the stony ground is less precise and less representative of the actual situation.



old

new

The scanned image below of a test print from our usual digital commercial printer reveals that use of the new fixed density screens present significant problems. The two variations of 215 Stony ground: very difficult to run, will appear as black blobs on the map – see bottom two circles. The stochastic pattern 214 Stony ground: difficult to run, will have greatly reduced legibility of under-lying detail. Only the regular patterns for Slow running F213.1 and Difficult to run F214.1 appears to offer any alternative symbol to the existing single dot symbol.



NB: Scanned at 600dpi, 1:15000 scale

The colour settings are as per OCAD ISOM Draft.

All the colours setting would normally be adjusted to suit the printer.

On this basis the fixed density area symbols for Stony ground and Broken ground must be rejected. The same also applies to 217 Dense boulder field, which similarly appears as a indistinguishable blob on the map ie the triangle shapes are too close for legibility and blot out underlying features.

The current single dot (stony ground and broken ground) and single shape (boulder field) symbols must therefore be retained.

If other countries require the fixed density area screens then these can be an addition to complement the existing dot / shape symbols.

Map samples and colour blocks

The next Draft needs to provide sample maps and colour blocks to properly assess the symbols. Paper copies of the Print Tech 'test sheet' should be used as the reference to enable an informed comparison between old and new.

Map printing, print quality and symbol size

There needs to be more flexibility in the print quality of a map to be used for an IOF ranking event particularly for a small orienteering nation like Australia. It is accepted that spot colour / offset is the 'benchmark' standard that we should all aspire to, however for small print runs digital printing must be permitted provided the map is legible. In Australia the vast majority of competition maps are digitally printed, many direct from OCAD so as to take advantage of benefits it offers. Only for IOF ranked events will spot colour / offset printing be considered given the fact that digital printing is highly price competitive over spot/offset (digital at \$1 per map versus spot/offset at \$12 per map based on a print run of ~ 50) and that for much of our terrain, digital copies can meet a legibility criteria albeit not at the spot colour / offset quality as currently stipulated. Spot colour / offset is generally used for the more complex terrains.

Therefore the Print section should also have a quality control statement on map printing to cater for small print runs. Such a statement could be: 'The course map must be legible for the purpose of an orienteering competition and satisfy the criteria of fair play'.

The legibility of maps is also dependent on the size and colour of symbols. The existing symbols are mostly at their limit for legibility at 1:15000 hence any further reduction in size, no matter how slight, must be tested before implemented. While these symbols may be just legible for spot colour / offset printing, many are simply too small to be legible for digital printing. Where the symbols are not legible it is then necessary to either increase the size and or increase the colour intensity of the symbol. But more importantly it puts greater pressure on the need to digitally print at the 1:10000 scale to achieve legibility. And then if more printing is done at the 1:10000 scale there will be more pressure put on mappers to map even more detail, hence a self-defeating exercise.

I have tested the new symbols at our usual digital commercial printer and on this basis I have now formed the opinion that no symbols should be reduced in size and further some of the new symbols should be increased in size. However I reserve the right to make further comments on symbol size and colour intensity following further experimentation and testing with real maps under competition conditions.

Specific comments

1 Introduction (Main Page?)

Agree with the content.

Suggest editing.

2 General Requirements

Agree with new text / content.

Agree with the new headings

Suggest editing and checking of header numbering.

2.1 Orienteering and the map

2.2 Content

2.3 Runability

The table listing 5 categories of running speed should align with the similar table under Vegetation, in particular, terminology:

- 1 Fast running (replace Normal running speed)
- 2 Slow running (no change)
- 3 Difficult to run (take out fast walking)
- 4 Very difficult to run (take out = walking /fight)
- 5 Impassable (no change)

2.4 Map reading

2.5 Generalisation

The last sentence refers to 'Generalisation guidelines'. I am not aware of this document. Can you please advise where it may be found?

2.6 Accuracy

2.7 Georeferencing

2.8 Colour vision deficiency

The inclusion of this section is strongly supported.

For this section please read Appendix 1 for comments provided by Barbara Junghans.

As Barbara has pointed out there appear to be no changes in colour settings. This is needed.

I note the PMS colours have not changed as per table at chapter 5 Printing. I also note this colour table is incomplete. General comments on colours include:

- Purple: OCAD setting should be changed from 100% M to a Purple setting such CMYK 30 100 15 00
- Brown PMS 471: Always difficult for digital printing. Common practice is to increase the %K in the OCAD CMYK settings from 0 56 100 0 to 0 56 100 45 so that contour lines are more discernible.
- Light Brown: This should not be a pale colour, must be more saturated, otherwise it is confused with light green for colour blind.
- Green: The mid and light greens are often adjusted to increase the differentiation between all three Greens.
- Yellow: Currently PMS 136. This needs to be changed to a brighter, more saturated colour and away from the dull mustard colour of PMS 136.
- Yellow / Orange misunderstanding: What is the problem here. Orange is CMYK 0 50 100 0
- Gray: Bare rock is often set at ~40%K, less than this it is too pale
- Blue: The line and point symbols generally need to be more saturated to increase their legibility. The default setting on OCAD of CMYK 87 18 0 0 is often changed to 87 25 0 4.

3 Map Specification

Also read the comments by Barbara at section 3 of her report contained at APPENDIX 1.

Scale

Agree

Map enlargement

Strongly Agree

Contour interval

Agree

Dimensions of map symbols

Agree.

The table of examples is useful re graphical minimum dimensions

Landform (brown)

101 Contour

OK

102 Index contour

OK

103 Form Line

The existing form line should be retained. It is a standard topographic symbol.

OCAD can force the position of the dash thereby negating the argument against the current symbol in that gaps may be at the wrong position.

The suggestion that the Form line should have a reduced visual impact is not supported, particularly the use of pale brown. Using pale brown would be a retrograde step for those with colour impaired vision.

The second choice is F103.4 – the thin and long dashed line.

The other suggestions for this symbol are not supported.

104 Slope line

OK

106 Earth bank

OK

107 Earth wall

Retain existing, but include minimum length

108 Ruined earth wall

Retain existing.

109 Erosion gully

OK

110 Small erosion gully

Dots are too close especially for digital printing. Try 0.4

Test print required.

112 Small knoll

OK

113 Small elongated knoll

OK

115 Small depression

Do not reduce in size, retain existing size.

116 Pit

Minor change to definition: replace '.....symbol 106' with '.....contours'

Do not reduce in size, retain existing size.

117 and 119: Broken and Very Broken Ground

As already stated the proposed change to a fixed density area symbol is not suitable for

application to Australian terrain. The existing dot symbol works very well in Australia hence must be retained.

No reason is given for the proposed fixed density area symbols.

An important advantage of the dot symbol is that the dots can be placed individually by the mapper to represent what is on the ground in a more precise manner and also avoid other small point features where necessary.

The suggested fixed density screens will obscure contour lines and point features, resulting in reduced legibility. This is particularly the case for two higher density screens as per the scanned digitally printed map example above.

If there is a need in other countries for the fixed density area symbols, then for Australian terrain it is absolutely necessary that the dot symbols be retained and thus compliment the proposed fixed area symbols.

118 Special prominent land form feature

Do not reduce in size, retain existing size..

Use of the second symbol F118.1 triangle shape will be useful for colour blind given its different shape where a green cross is used, and vice versa. This new symbol must be increased in size so that the hollow centre is legible even for a good quality print from a commercial digital printer.

201 and 203 Impassable and Passable Cliffs

The ends should remain straight.

Rounded ends will reduce clarity.

204 Rocky pit or cave

OK

206 Boulder

OK

207 Large boulder

OK

209 Boulder cluster

Retain the two sizes, 0.8 & 1.0, as these are used in Australia.

208 Boulder Field

The proposed fixed area density symbol is not suitable for Australian terrain, hence the existing shape symbols for this feature must be retained thereby enabling individual placement and sizing as appropriate.

If the fixed density area symbol proposal is required in other countries, then for Australian terrain it is absolutely necessary that the existing shape symbols of different sizes be retained and thus compliment the proposed fixed density area symbols (2) as proposed.

It is noted that there are no reasons given for using a fixed density.

217 Dense Boulder Field

As per 208 above.

For Australian terrain the density of the individual point symbol is increased and or its size enlarged to reflect the actual density and size of a boulder field.

The use of this symbol appears as a blob on a commercial digital printer that we use for printing orienteering maps and totally obscures underlying map detail. This symbol must be rejected.

The current symbols for Boulder field work extremely well in Australia with no need to change this symbol and indeed no reason is given for such a change.

Further, if the proposed area symbols are to be adopted, it would be extremely time consuming to convert existing maps to the new specification.

211 Sandy Ground

Print sample required to test the slight reduction in dot size.

216 Trench

OK

213; 214 and 215 Various Stony Ground

The current single dot symbol works very well in Australia and accordingly must be retained.

No reasons are given for changing this symbol to a fixed area symbol, either regular or stochastic pattern.

In Australia stony ground is mapped accurately and at the correct density and accordingly can be used for fine navigation and as control sites. The fieldworker should retain the ability to place the various dots where they best suit the map.

215 Stony ground: very difficult to run, will reduce the legibility of underlying map detail as the black dots go over the top. Single dot placement can avoid overlapping underlying symbols.

For Australian terrain the current single dot used as an area symbol must be retained.

If other countries require the three fixed area screens then these can be an addition to the existing symbol.

Water and Marsh (blue)

To cover the Australian situation, the introduction should specifically mention that obvious watercourses, lakes, ponds and marsh are mapped with blue even when dry.

Much of Australia is dry, but it is still essential to show where water runs and pools. In respect to mapping marshes, these are mapped where there is a distinct change in vegetation ie different grass, etc before they are mapped as a marsh. They do not necessarily have water in them particularly during the dry season and or dry periods.

For digital printing the colour Blue for point and line features is often increased in intensity ie stronger blue colour (CMYK from 87 18 0 0 to 87 25 0 4), so as to improve legibility. Hence the colour blue needs review.

301 Uncrossable water body

OK

305 Shallow water body

F305 OK

F315 OK (line in OCAD legend needs correction)

F305.1 OK (line in OCAD legend needs correction)

F305.2 Suggest line to be 0.16 for improved legibility and or increase colour intensity

F315.2 Suggest line to be 0.16 for improved legibility and or increase colour intensity

312, 313 and 314 , Well / Fountain, Spring & Prominent Water features

These symbols must not be reduced in size as they are already at their limit for legibility.

312 Well / Fountain

Do not reduce in size, retain existing size.

313 Spring

Do not reduce in size, retain existing size.

314 Prominent water feature

F314 Do not reduce in size, retain existing size.

F314. Increase in size

Vegetation (green or yellow)

401 Open land

OK

402 Open Land with Scattered Tees

Agree with inversed symbol

403 Rough open land

OK

404 Rough open land with scattered trees

OK

405 White as Open Forest

OK

406 Forest: slow run

OK

408 Forest: difficult to run

OK

407 and 409 Undergrowth: Slow Running and Difficult to Run

It would be nice to show a distinct boundary for this symbol, particularly to 407.

The parallel lines of 409 are too close for digital printing (as per scanned image below: circle is current symbol, square is proposed) with the underlying symbols essentially obliterated; hence this symbol must stay unfortunately at the same line spacing to maintain legibility.



To improve 407 perhaps the line spacing could be reduced to 0.64mm which may just allow sufficient differentiation between the two symbols.

410 Vegetation: very difficult to run

OK

421 Impassable Vegetation

Use the word *planner* instead of *setter* ie course planner.

Mappers will have to be trained to carefully field work the 'green' areas so that the map remains fair.

Event controllers will need to become more involved in checking such areas especially if they are deemed as 'forbidden to cross'. I am still not certain if it needs to be 'forbidden to cross' (like the sprint maps) as it may lead to disqualifications. Just imagine watching an orienteer on the 'big screen' at the arena when someone does run in an out of bounds area.

411 Forest runnable in one direction

OK

416 Vegetation Boundary

Agree with F416.1

Could add to the definition: '*The boundary must be immediately recognisable to the orienteer*'.

Do not agree with F416.2 as the small line of green dots is indistinguishable particularly for digital printing, and is not suitable for colour blind.

418 Prominent tree

Do not reduce in size, retain existing size.

Agree

419 & 420 Prominent Vegetation feature

F419 OK

F420 OK but increase in size to make the inside of the triangle legible

412 Orchard

OK

413 Vineyard

OK

414 Distinct cultivation boundary

OK

415 Cultivated land

OK

Man-made features (black)

Use of dark gray verse black in tracks verse cliffs

The use of Dark gray (70%K) for roads, tracks and paths should only be used in exceptional circumstances. Perhaps also consider the use of Dark gray for the minimum distance required to distinguish roads from rocks. Also good cartography should be able to minimize the use of Dark gray in these situations.

504 Road

Agree with F504.1 ie use existing

Disagree with F504.2 as this symbol gets lost in detailed contour areas as per experience with the corresponding symbol in Sprint maps.

505 Vehicle Track

Use F505.1, existing

Disagree with F505.2 as this symbol gets lost in detailed contour areas as per experience with the corresponding symbol in Sprint maps.

506 Footpath

OK

507 Small path

OK

508 Less distinct small path

OK

509 Forest Ride

OK to all

515 Railway

OK.

516 Power line, cableway or skilift

OK

517 Major power line

OK

F517.1 Pylon symbol

May be confused with 503 Small ruin

518 Bridge / Tunnel

F518 Bridge - Agree

F512 Footbridge - Agree

F518.1 Tunnel – Agree, but increase size as very small / illegible.

F518.2 Tunnel – Disagree as may be confused with 204 and 205 Rocky pit or Cave.

519 Stone wall

OK.

520 Ruined Stone Wall

OK

521 Impassable Stone Wall

F521 OK

F521.1 Reject, as the dots along line tend to merge forming a very thick black line.

522 Fence

OK

523 Ruined fence

OK

524.0 Impassable Fence

OK

525 Crossing point

OK

527 Area with forbidden access

Agree to use of both F527 and F528

526 Building

F526 Building – Agree

F526.1 Huge building – Unlikely to be used, considered unnecessary at the 1:15000 scale

F526.2 Building pass through – Considered to be unnecessary and or over mapping at the scale of 1:15000, hence should be deleted.

530 Ruin

OK

532 Grave

Agree to both symbols, choice dependent on local culture

535 High Tower

OK.

536 Small tower

OK

537 Cairn

Do not reduce in size, retain existing size.

This symbol is difficult to distinguish at the best of times and should not be made smaller.

(Spelling of Cairn in description box. Not Crain.)

538 Fodder rack

Is this symbol still required given the addition of the new man made symbols.

533 Special passable line feature

F533.1 Closer spacing OK

534 Special Impassable Line feature-

F534.1 Spacing of symbols along the line probably a bit too close

539 Prominent Man Made Features

Agree with all four point features. However this must not lead to over mapping hence should be used with care. Perhaps add to the text that their use should be to aid orienteers with colour impaired vision and to use the alternative shape if already used for green or brown.

Do not reduce in size, retain existing size.

Increase the size of the two new symbols.

Technical symbols (black or blue)

601 Magnetic North Lines

The proposed 20mm line spacing is too close at the 1:15000 scale. I think it is better to retain the 33.3mm spacing which represents 500m on the ground. For the 1:10000 print scale simply add a second north line symbol for the in-between line which will then give a spacing of 250m on the ground. Then when printing at 1:15000 use OCAD to 'hide' the in-between N line.

Hence retain the current ISOM 2000 text.

602 Registration marks

OK

603 Spot height

OK

Overprinting symbols

The old requirement that the size of the symbols on the 1:10000 maps may be 150% greater than on the 1:15000 maps must be retained.

This is particularly useful for multi age competitions where both 1:15000 and 1:10000 scales are used. This is necessary so as to avoid making changes (and invariably making mistakes) to control descriptions as the control circles cover different areas on the map.

701 Start

OK

702 Control Circle

There is concern that the reduced size of the circle 5.5mm diameter is too small. Subject to review.

703 Control number

OK

704 Line

OK

705 Marked route

OK

706 Finish Circle

There is concern that the reduced size of circles to 4.0 & 5.5mm diameter is too small. Subject to review / experimentation to fully assess.

707 Uncrossable boundary

OK

708 Crossing point

OK

709 Out of bounds area

OK

710 Dangerous area

The colour Black should also be permitted for this symbol so as to avoid the use of another colour plate ie Purple, when using spot colour, off set printing.

712 First Aid post

OK

713 Refreshment point

OK

5 Printing

Colour

Colour blocks for each colour used must also be printed in the specification or at least printed as a separate sheet as per the Print Tech 'test sheet'. This will then provide a quick ready reference for the print and colour standard required.

For commentary on the printing section please read the attached paper by Ken Dowling.

APPENDIX 1

Comments by Barbara Junghans, School of Optometry and Vision Science, University of New South Wales, Sydney, NSW, 2052, AUSTRALIA. B.junghans@unsw.edu.au

My Comments:

1. Under the heading 'Symbols' on the Second Call Federations ---- the symbol for Semi open, they suggest 'using green instead of white' (i.e. yellow background with green dots?). This is also spoke of again in the Draft under Vegetation and Section 4 Runnability.

If the green dots are within the yellow field, this would reduce the contrast for colour defectives of how the green dots appear. As red-green colour defectives will confuse green and yellow, In fact, it is more likely that the whole area will look solid yellow to them. It is far better to leave the dots as white to maximise the contrast between the pattern and the background - the geometry will be the cue, but only if you can see the geometry.

2. ISOM Revision First Draft 201305. 'Colour Deficiency'.

It is not true to say that the colour deficiency known as 'tritanomaly' is rare. Only the congenital version is very rare. In actual fact there is an expected shift towards tritanomaly with cataracts and with age-related macular degeneration and it is probably quite common to some degree in anyone over the age of 70. It is true that both of these conditions will impair visual acuity at some stage, which will eventually make map reading impossible and drive the competitor to give up the sport.

Which comes first, retirement from the sport or significant impact on colour perception is likely to be quite variable.

The most obvious way of bringing greater clarity to maps for colour defective orienteers has been omitted as a dot point: namely, increase the saturation of the colours in use. Whilst saturation is mentioned in the blurb, the reasoning behind this has not been given and hence understanding by lay people will be poor. Increasing saturation would have significant effect because by far the greater number of colour defective persons only confuse the pastel colours (pinks and pale greens).

By having a darker version of the colour, more colour defectives will actually be able to recognise the colour for what it truly is. Colour normal orienteers are even disadvantaged when a colour covers only a very small area of the map (which often occurs on orienteering maps) and increasing the saturation will help colour normals too.

I notice later on in the specifications that colours are not always specified in an unambiguous way regarding ratios of CMYK. Have I missed something - or is it all covered by the colour printing process statement at the end after the specifications of symbols?

Also, I cannot see a shift in the selection of colours anywhere in the document to be more colour vision deficiency friendly than they are (aren't) now. Again, have I missed something somewhere? But I would have thought the little boxes on the right hand side indicating what the difference from ISOM2000 is, would have revealed any changes. So I am a bit miffed that this elephant in the room has not been massaged in any way.

3. ISOM Revision First Draft 201305. 'Symbols'

It is stated that under 'Brown', 'Black' etc that some point symbol be reduced in size. The smaller any brown symbol becomes, the more it could be confused by a colour defective orienteer.

The new blue symbols look much paler than the blue in the uncrossable water features (70% blue). I would suggest that without the black outline, the paler blue will look even less 'coloured' because many of the features are linear and necessarily small area surrounded by lots of white and hence even colour normals will have difficulty recognising these.

The striped patches (e.g. 409 undergrowth difficult to run) now have denser stripes by way of thicker lines spaced more tightly. This worries me as it looks borderline illegible. Admittedly I was looking only at the monitor and there might be some aliasing, but it looks to me that the moment an orienteer is not wearing a perfect pair of spectacles, they will be at a disadvantage because the mild blur around the stripes will 'fill in' the white stripes and it will appear as the average saturation between the green and white (i.e. it will all look a paler shade of green). For people with astigmatism (a condition where the spectacle power required at one orientation such as along the horizontal is distinctly different to the opposite orientation, i.e. at 90°, such as the vertical in this case) the orientation of the stripes might be critical to them seeing the lines sharp versus blurred-out if they do not have their spectacles on.

We can look at this from the point of view of expected visual acuity. I use the term visual acuity in the sense whether two dots separated by a gap can be seen distinctly as two entities because the gap between them is visible. To understand the dimensions in question we must understand that at a test distance of 6 metres, the person who has average visual acuity just sees the 6/6 line of letters (20/20 in the imperial measures) if they are wearing their correct spectacles (probably representative of 40 year olds - with many younger persons seeing even smaller detail, but older persons seeing more poorly). That is, they can just resolve a black letter on white background that is 8.73mm high when the letter has a stroke width of 1.746mm and a gap between strokes of 1.746mm (technically speaking, where the stroke of the letter or the gap between strokes subtends 1 minute of arc at the eye). Several points arise out of this:

First, orienteers are likely to be holding their map in the vicinity of 40cm (15 times closer) and therefore the minimum resolvable gap between dots would be 1/15th of 1.746mm, i.e. 0.1164mm. Admittedly, if the map is brought closer still, say at 33cm, the gap will become more resolvable because it now subtends a larger angle to the eye and looks relatively bigger. The stated dimensions of the IOF symbols relate to size on paper for 1:15,000 scale as I understand it, and therefore applies to younger people whose eyesight should generally be better. But there are exceptions to this notion that younger people see better, mainly those who have higher degrees of short sightedness (myopia) as they are often are a line or two behind on the letter chart despite best correction being worn. There is a very strong correlation between the presence of short sightedness

in those who have undertaken higher education, so if they are our target market for attracting new people to the sport we will have increasingly more numbers of people with only average to even slightly below average visual acuity. The proportions vary from country to country and the educational demographics sampled, but a reasonable cross section of the community would see already 30-40% of young adult Europeans and 80% of South Asians graduating from high school with myopia, with up to 10% of these having a high degree of myopia.

For the for all orienteers over the age of 40 years, their spectacle correction (or contact lenses) that corrects for the long distance will become progressively inadequate over the years and vision more compromised the closer the reading material is held. To some degree, the 1:10,000 scale map will permit visualisation of the symbols despite the blur due to poor focus. Good sunlight will minimise the blur as the smaller pupils create a better depth of focus through the 'pinhole effect' (which is well understood from the olden days of the pinhole camera). However, in quite shady areas as often occurs in orienteering, this effect is lost and the only way to cater for inaccurate focussing is with reading glasses. The power in reading glasses can be tailored to any near distance the customer wants, but this is generally set at 40cm for the person of average stature doing a range of daily home and office tasks. The chosen near distance becomes most critical for those over the age of about 55 years where the natural flexibility within the eye has dropped to almost imperceptible levels, and the depth of focus of the solid plastic lens in the spectacles is very limited (\pm several cm only). If persons older than ~55 years bring a map closer than the distance for which their glasses were made, the map will become progressively more blurry. Few orienteers pay for orienteering-reading spectacles tailored to a closer reading distance just to see detail on orienteering maps.

Second, in actual fact, the number of people who are adequately corrected by spectacles is relatively low. That means that relatively few people of average age will see the gap widths referred to above. The reasons for this vary. In order to get a driver's licence in most parts of Australia, one only needs to see letters double the size seen by the person who can just see 6/6 (i.e the driver's licence cut-off is 6/12). In addition, an optometrist or ophthalmologist would generally not consider changing a spectacle prescription until a person is having difficulty with letters at least 25-50% larger than their potential best. Hence, one could reasonably expect many orienteers to have vision at 40cm that only permits them to resolve gaps of 0.1455mm to 0.1746mm. Thus, the potential for the 1:10,000 scale map to allow the older orienteer to see the detail is lost on many people (but I guess it is still better than no level of accommodation for older eyes).

All the reasoning and dimensions quoted above apply only to high contrast black on white.

However, orienteering maps use symbols that are much poorer contrast and will require superior acuity to see them (the graph is not linear, and the paler the symbol the far poorer the acuity). So, the actual linear cut-offs to ensure visual resolution for all colours and especially the less saturated versions would require more detailed calculation.

Another point relates to the fact that countering the negatives expressed above, a gap between parallel lines (e.g. on a grid) can be somewhat tighter than the gap between dots and yet still be seen as a gap. However, the shorter the stripes, the less this effect will prevail.

The new triangle symbols that are smaller might not be seen as a hollow triangle due to the reasoning based on sub-optimal visual acuity offered above.

412/413 orchard/vineyard. Although not a change, this symbol will be seen by many colour defectives as a continuous yellow, and the dots will not appear visible to them.

Optional use of dark grey. This is a difficult call. My gut feeling is that dark grey will not be as visible, which is counter to the intention. However, it certainly does make the black track more

visible if all the surrounding rock features are in grey. It is a matter of what is more important for the orienteer to recognise, especially from a safety point of view. No use dulling a cliff line that then might not rate as highly in the thinking process and lead to serious misjudgements by a fast runner.

537 Cairn. There is a typo in the 'Description' box.

I really agree with enlarging the first aid point.