

## ***Mapping Bulletin – Impressive Use of Lidar, Change to Sprint Specification***

### ***Orienteering NZ Mapping Committee***

**21 Oct 20**

Summary: We present a “lockdown project” – Cam de Lisle’s “O-Map of New Zealand”. We discuss the powers and the limitations of Lidar data. We advise ongoing change to the sprint specification. And a Facebook group for NZ mappers.

The first section is non-technical. If you’re not a mapper just read as far as you can manage.

Aside - The word LiDAR is supposed to have a small “i” but it’s too easy to forget. If you’ll excuse us we’ll just spell it “Lidar”, it will soon be in the dictionary 😊

### ***O-Map of New Zealand***

The following report comes from Cam de Lisle of Auckland.

The NZ Omap Project was an idea had during lockdown to utilise increasing amounts of Lidar data available in NZ to create a giant orienteering map of New Zealand. Currently we have access to data covering around 20% of New Zealand, with large new areas currently being captured by most councils across the country. The map is being generated using the Karttapullautin software developed by Jarkko Ryyppo in Finland, with data bundled up into 20x20km areas and distributed to a network of orienteers who have offered their PCs for processing. Tracks, roads, buildings and selected other features have also been added using data from OpenStreetMap which results in a highly usable, auto-generated orienteering map.

Contours and vegetation are generated by special algorithms from the Lidar data. One interesting feature of this is that the contours often bear a much higher resemblance to a real orienteering map than those usually generated for a base map. The vegetation, while imperfect given the range of New Zealand forest types, can usually be interpreted in useful ways - sometimes to the level of spotting individual bushes!

Following the pioneering work in Finland, we’ve put this onto a website for all to see. Some features may not be entirely intuitive or working yet. The most useful tool for mappers is probably the export function. Click the black square on the top left corner of the map, select an area and click export, and a PNG image file will be generated from map tiles in the selected area, accompanied by a PGW world file. This can then be opened as a background map in OCAD or even course setting programs like Purple Pen. Another useful feature is the marker button, also on the top left of the map. Click this button and then a location on the map and it will open Google Maps with a pin in the approximate location selected.

So far, most of the data made available by LINZ on the 'OpenTopography' website has been processed. Additional data has been sourced for a large region North of Auckland and is being sought for the entirety of Northland. The whole of the Wellington Region has been processed

and is by far the most impressive area on the map, covering around 10,000 square km. In total 30,000 square km had been processed by mid year and work is continuing.

Aside from the obvious use as a basemap, it is hoped that the map will prove useful in the future for events such as Rogaines and Adventure races in place of Topo50 maps. Another potential use is finding and evaluating new areas to map - use the button 'Interesting Areas' to flick through some intriguing locations spotted during processing!

Visit the O-Map of New Zealand at <http://omap.nz>

### ***Powers and Limitations of Lidar Data***

Some comments and questions from the ONZ Mapping Committee.

Sometimes, “Lidar data” is loosely used to refer to contours generated from Lidar surveys by a local authority, perhaps available from them or through the LINZ website. In what follows we go back to the “Point-Cloud Data” which is the mass of XYZ figures which we can now process ourselves to get contours, and much more besides. For a background to Lidar data in a New Zealand orienteering mapping context, see our Dec 2018 Mapping bulletin via the ONZ website Mapping Resources.

The “power” of Lidar data comes from

1. Productivity. Once a plane has flown over an area, contours are obtained by data processing rather than human action. So we’re looking at getting most of NZ covered within the next few years.
2. The ability of laser pulses to “see” the ground, a limitation of aerial mapping in the past
3. New types of outputs such as tree height, detection of features such as cliffs, even inferences about runnability

It all seems like Christmas. But sometimes you come to try on that T-shirt with the clever slogan and it doesn’t fit. We’ve got some experience now, and would encourage you to test Lidar results on areas you know well, before relying on it for new projects. Here are some things we’ve come across. The Mapping Committee would be pleased to hear about (a) other things to look out for and (b) ways to overcome these.

1. Karttapullautin and OCAD can both analyse Lidar data but don’t produce the same results. KP (for short) seems to be aimed at producing a field-work-free training map. It has smartness in its contour calculation which (a) smooths more and (b) detects high points that don’t quite come up to the half-contour interval. Whereas OCAD seems more aimed at the fieldworker. Its contours (even when you ask it to smooth) are quite wiggly. That’s fine if you’re going to use them as a base. They aren’t great to use holus-bolus.
2. KP and OCAD don’t produce the same vegetation results either. In theory vegetation is inferred from multiple reflections of each laser pulse except for the last one, which is assumed to be the ground. We aren’t sure about why, but KP output we have

compared is much whiter than OCAD output. (On a scale of very low=yellow, very tall=white, and shades of green in between.)

3. In both softwares you can set parameters to determine this vegetation picture. We suspect that the defaults are tuned to Scandinavian or European vegetation. It will require experimentation to adjust them to NZ forests. They may well be different from pine, to native bush, to Rotorua redwoods.
4. Both softwares produce blatant errors. They are getting smarter but can still make the wrong guesses that THIS reflection comes from the ground and THAT reflection comes from the tree canopy. Expect for example to find a series of depressions up a stream. This is clearly nonsense, but we should be equally suspicious of a series of “knolls” up a ridge.
5. There may be limitations on the penetration of the laser pulses through dense bush. We have examples of false high points and spurs, associated with (apparently) low vegetation height, in places where both are untrue. Remember that the “Li” of Lidar stands for light. If insufficient light pulses reach the ground, this could explain the treetops being treated as the ground in the vicinity. 6 pulses per sq.m (as in the Wgtn Regional Council dataset) doesn’t mean that they all hit the ground.
6. The software temptingly offers automatic feature recognition, ie considering adjacent elevations to figure out what might be a cliff, knoll or depression. On limited testing in areas we know well these seem to vastly over-predict. Quite possibly we can learn to set the parameters to make these more selective.

The above is hardly surprising, we had a learning curve with aerial photography and what made for good and bad basemaps.

### ***Status of the Sprint Specifications***

It’s been a busy few years with both our main mapping specifications changing. Twice. Each.

This section is particularly aimed at those responsible for collections of maps. If you deal with one map at a time just make sure its symbols come directly from the latest version of OCAD.

The Sprint Specification changed last year, to the ISSprOM2019. Then, early this year with little fanfare, the IOF released an update to ISOM Appendix 1 – including changed colour order and definitions for ISSprOM. This effectively created an ISSprOM Version 2!!!

Sorry don’t blame us. Here are the three situations:

1. Sprint files made to the “old” sprint spec ISSOM and not so far updated. The advice in our Sep 2019 Mapping Bulletin still applies, so re-read it via the ONZ website Mapping Resources. There’s a club version and a mappers’ version.
2. Sprint files made NOW using the “new” facility in the latest OCAD will pick up OCAD’s implementation of the latest colours. For those using earlier OCAD versions we have made an OCAD11 file which you can use to start your map off with. It’s the same file that contains a sprint “Fieldwork Legend” as described in the above bulletin.

OOM has had ISSprOM symbols with appropriate colours since version 0.9.2 (March 2020). Both OCAD and OOM have additional colours to do clever things so you won't find an exact match to the IOF. For example the browns where the path infill cleans up the sidelines at junctions.

3. We'll call the third case "early-bird files" - those made or converted to ISSprOM when it came out last year, and up to early 2020. OR those which inherited their symbols from such a file. For OCAD files the colour table has colour numbers 50 and 51 at the top. (If it has 54 and 55 at the top you're already on the latest colours.)

Sorry you can't just wheel in the new colour table because Mr OCAD in his wisdom has dropped some colour numbers. It's safest to do a complete symbol/colour change. Use the Symbol Conversion routine in OCAD 2018/19/20. For the "new symbol set", choose ISSprOM 2019 4000.ocd. For the CRT file use "ISSprOM 2019 to ISSprOM 2019.crt". Yes that doesn't appear to make sense, but it will convert ISSprOM from Version 1 to Version 2 and look after the colour number/order changes.

If you're on an earlier version of OCAD it's much harder. We recommend asking someone with the latest OCAD instead. If there aren't many non-standard symbols it is really easy. If you have an early-bird OOM map please ask – we don't have experience yet but will try to help.

Some will remember that there were also changes to ISOM shortly after it came out. Our advice on that is in the May 2019 Mapping bulletin, via the ONZ website Mapping Resources. Go to Appendix: More Detail for Mappers.

### ***Informal Mapping Communication***

Whew! After that you need some light relief. Committee member Michael Croxford has set up a Facebook group called "Orienteering Mappers New Zealand". Recent topics include the new version of OOM, more Lidar data on the OpenTopo website, and quirky discoveries in the field. It's a public group that all can see, but you have to join to post.

There's also "Orienteering Mappers Australia", and a more active "Orienteering Mappers Int."

### ***Conclusion***

We look forward to seeing many of you at the NZ Champs at Labour Weekend.

### ***Distribution***

This bulletin goes to regular mappers known to the Mapping Committee, and ONZ clubs.