Course Setter Workshop

Using Free Mapping Software

Preliminary

The Greater Phoenix Orienteering Club
http://gphxo.org

Course Setter

Mapping Software

Checklist

Note1: "**[Event]**" in the filenames below is replaced with an actual event text. Examples: "SophiesFlat_", "**20181027_SophiesFlat**_Basemap.jpg","**20181027_SophiesFlat_Night-O**_Controls.gpx", etc.

Note2: *OOM* = Open Orienteering Mapper, *GE* = Google Earth, *PP* = Purple Pen

#	Tool	Description: [Event] = _____	✓
1	Web Browser	**Obtain Basemap** **Initial Input: [Event]**_Basemap.jpg/jgw (for *OOM,PP*), **[Event]**_Basemap.tif/tfw (for *GE*)	
2	Google Earth	**Create a Course Proposal** Input: **[Event]**_Basemap.tif, **[Event]**_Basemap.tfw Output: **[Event]**.kmz, **[Event]**_ProposedControls.kmz, **[Event]**_ProposedTrack.kmz	
3	Web Browser	**Convert KMZ to GPX** http://www.zonums.com/online/kml2x/. Input: **[Event]**_ProposedControls.kmz, Output: **[Event]**_ProposedControls.gpx	
4a	Purple Pen (Preferred)	**Print Flagging Plan (Preferred)** Note: Controls are added manually to Purple Pen using locations observed in Google Earth. Input: **[Event]**_Basemap.jpg Output: **[Event]**_ProposedMap.pdf, **[Event]**.ppen	
4b	OpenOrienteering Mapper (Alternative)	**Print Flagging Plan (Alternative)** Note: Georeferenced control locations added to map using gpx file. Input: **[Event]**_Basemap.jpg, **[Event]**_ProposedControls.gpx. Output: **[Event]**_ProposedMap.pdf, **[Event]**_ProposedMap.omap	
5	Event Map GPS Receiver	**Field Check** (Output from GPS Receiver) Input: **[Event]**_ProposedControls.gpx, **[Event]**_ProposedMap.pdf Output: **[Event]**_Controls.gpx	
6	Google Earth	**Calculate Actual Equivalent Distance** Input: **[Event]**_Controls.gpx Output: **[Event]**_FinalTrack.kmz, Distance, Climb, Equivalent Distance.	
7a	Google Earth (Preferred)	**Transfer Field Check Data to Map (Preferred)** Input: **[Event]**_Controls.gpx Output: None. View locations from .gpx (#5) in GE, transfer manually to PP final map (#8)	
7b	OpenOrienteering Mapper (Alternative)	**Transfer Field Check Data to Map (Alternative)** Input: **[Event]**.omap, **[Event]**_Controls.gpx. Output: **[Event]**_OOMMap.omap, **[Event]**_OOMMap.pdf	
8	Purple Pen	**Create Final Map and Control Clues** Input: **[Event]**_Basemap.jpg, Control Codes (Alternative: **[Event]**_OOMMap.pdf) Output: **[Event]**.ppen, **[Event]**_Descriptions.pdf, **[Event]**_Clues.pdf, **[Event]**_ControlCard.pdf **Final Output:** **[Event]**_Map.pdf	
9	Excel (Obsolete)	**Create Control Card/Clue Sheet** Input: **[Event]**.ppen Output: **[Event]**_ClueSheet.xls, **[Event]**_ControlCard.pdf, **[Event]**_ClueSheet.pdf	
10	Inkscape	**Create Final Control Sheets** Input: **[Event]**_Descriptions.pdf, **[Event]**_ControlCard.pdf, **[Event]**_Clues.pdf **Final Output:** **[Event]**_DescriptionsSheet.pdf, **[Event]**_ControlCardSheet.pdf, **[Event]**_CluesSheet.pdf	
	Final Output	**[Event]**_Map,pdf, **[Event]**_DescriptionsSheet.pdf, **[Event]**_CluesSheet.pdf, **[Event]**_ControlCardSheet.pdf	

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Modification History

Version	Date	Description
1	24Oct2018	Document Creation
2	17Dec2022	Update to capture current workflow.

1 Introduction

This document describes free mapping software a course setter of an orienteering event can use and a suggested workflow to create event documents. Creating orienteering maps requires a fairly large time commitment. The examples below summarize a suggested workflow.

This document does not describe work involved in creating a basemap. The course setter creates event maps based on an existing basemap. Details for creating basemaps are described elsewhere.

2 Tools

The course setter workflow described in this document depends on several programs that are free to download and use. No commercial software is included in the suggested workflow. The commercial software OCAD is mentioned as a tool used to create the majority of the world's orienteering maps.

Tool, Version	Website	Notes
Course Setter Tools		
PurplePen	http://purplepen.golde.org/	The main course setting tool.
Google Earth Pro (64-bit)	https://www.google.com/earth/desktop/	Georeferenced satellite views.
Support Tools		
Inkscape	https://inkscape.org/	Vector graphics tool.
PDFXChangeViewer	https://www.tracker-software.com/product/pdf-xchange-viewer/	Optional. Free PDF viewer.
PDFill PDF Tools	https://pdfill.com/	Optional. Free PDF tools.
Basemap Tools		
Open Orienteering Mapper	https://www.openorienteering.org/	Optional in this document.
QGIS	https://www.qgis.org/en/site/	Not used in this document.
(Commercial) OCAD	https://ocad.com	Not used in this document.

Instructions to download and install the tools are provided on the tool websites. The instructions are not repeated in this document.

Throughout the remainder of this document, the tools are referred to as follows:

- Purple Pen: PP
- Google Earth: GE
- Open Orienteering Mapper: OOM

The examples in this document were completed using the Windows 10 64-bit operating system.

2.1 Discussion

The workflow described below relies on a number of different software tools. Having a single tool for everything would help streamline the workflow. For now, we use different tools for different parts of the process.

- Google Earth is very good for viewing satellite data. It is easy to place destination markers on a geo-referenced image and calculate actual distance and climb necessary to travel between the locations. Google Earth is not useful for defining symbols or creating the final orienteering map.
- Purple Pen is an excellent tool for basic course setting. The user can add destination points, string the points into various courses, add descriptions on a map, etc. Purple Pen cannot make the original basemap and is (currently) unable to import geo-referenced basemaps except those created by Open Orienteering Mapper or OCAD. Without the georeferencing, the user must manually move destination markers to the correct locations on the basemap.
- Inkscape is a vector graphics program similar to Adobe Illustrator and Corel Draw. It is used to place multiple copies of documents from Purple Pen onto a single sheet.
- PDFXChangeViewer is a free utility used to view PDF files. Any PDF viewer serves the same purpose.
- PDFFill is a group of free utilities used to manipulate PDF files. It includes PDF functions including merge, split, rotate, etc.

2.2 Basemaps

The process to create a basemap is not included in this course setter document. Basemaps are typically created using one of three tools:

1. **OCAD**

   OCAD is the standard mapping tool used by orienteering clubs around the world. It is full of features specific to creating quality orienteering maps. The license for older versions of OCAD is free or inexpensive. Newer versions of the program are expensive. Orienteering symbols are pre-defined to meet international orienteering specifications. Data from external sources (aerial photos, satellite images, etc.) are imported as templates. The user needs to make sure different imported layers are geo-referenced correctly with respect to the orienteering map.

2. **OpenOrienteering Mapper (OOM)**

   OpenOrienteering Mapper is a good free alternative to OCAD. It is also a tool specific to orienteering and is full of features for creating orienteering maps. Like OCAD, external data is imported as a map template. Orienteering symbols are pre-defined to meet international orienteering specifications.

3. **QGIS**

   This is a full GIS program with features that go well beyond creating orienteering maps. Using QGIS for orienteering mapping requires some work up front to define orienteering symbols. The advantage of using QGIS comes from the built-in access to geo-referenced external data. Google and Bing satellite images, OpenStreetMap, and other external data sources are linked into maps as georeferenced layers. The learning curve to use QGIS is higher than what is needed to use OCAD or OpenOrienteering Mapper. Using a full GIS program has the advantage of having all operations done with a single tool.

3 Workshop Files

The following files are part of the course setter's workshop. The files are customized for an individual event by replacing "**[Event]**" in the filename with text associated with the specific event. The files are presented in the order they appear in the workflow.

When multiple events are presented at a given date and location, the specific event text such as "Night-O" or "Sprint1" is added.

Examples of events include "**20181027_SophiesFlat_Night-O**.jpg", "**20181124_RioSalado_Sprint1**.gpx", "**20181025_BomboyMine**_Map.pdf", etc.

Category	File(s)	Description
Basemap **Initial Input**	**[Event]**_Basemap.jpg **[Event]**_Basemap.jgw	This is a georeferenced basemap. The .jpg is a normal image file. The .jgw is a "world file". The world file contains georeferencing information for the .jpg file. Example: **20181027_SophiesFlat**_Basemap.jpg **20181027_SophiesFlat**_Basemap.jgw
Basemap **Initial Input**	**[Event]**_Basemap.tif **[Event]**_Basemap.tfw	This is another georeferenced basemap. Google Earth cannot easily import .jpg files as georeferenced image files. It can open georeferenced .tif files. Example: **20181027_SophiesFlat_Night-O**_Basemap.tif **20181027_SophiesFlat_Night-O**_Basemap.tfw
Google Earth	**[Event]**.kmz	This contains all items in the Google Earth map, including the controls, the track, and the superoverlay of the original .tif map. Example: **20181027_PapagoPark**.kmz
Google Earth	**[Event]**_ProposedControls.kmz	These are the proposed control locations. Example: **20181027_SophiesFlat_Night-O**_ProposedControls.kml
Google Earth	**[Event]**_ProposedTrack.kmz	This is the straight-line track of the proposed course. It determines the course's distance and climb. Example: **20181027_SophiesFlat_Night-O**_ProposedTrack.kml
Web	**[Event]**_ProposedControls.gpx	These are the proposed control locations. The .gpx file is loaded inot a GPS Receiver. Example: **20181027_SophiesFlat_Night-O**_ProposedControls.gpx
OOM (Optional)	**[Event]**_ProposedMap**.pdf**	This is a proposed map with controls on the map. Example: **20181027_SophiesFlat_Night-O**_ProposedMap.pdf
OOM (Optional)	**[Event]**.omap	This is the OpenOrienteering Mapper file. Example: **20181027_SophiesFlat_Night-O**.omap

Field Check	**[Event]**_FinalControls.gpx	These are the control locations marked with flagging tape. Example: **20181027_SophiesFlat_Night-O**_ProposedControls.gpx
Google Earth	**[Event]**_FinalTrack.kmz	This is the straight-line track of the actual course, using GPS data gathered during the Field Check step. Example: **20181027_PapagoPark**_StraightTrack.kmz
PP **Final Output**	**[Event]**_Map.pdf	This is the final event map. Example: **20181027_SophiesFlat_Night-O**_Map.pdf
PP	**[Event]**_Descriptions.pdf	These are the standard orienteering symbol descriptions. The descriptions only include the symbols. Symbols and text are included in the "clues" file (below). Example: **20181027_SophiesFlat_Night-O**_Descriptions.pdf.
PP	**[Event]**_Clues.pdf	These are the orienteering clues with both symbols and text. Example: **20181027_PapagoPark**_Clues.pdf.
PP	**[Event]**_ControlCard.pdf	This is the punch card for the event. This document is unnecessary if the event uses electronic timing. Example: **20181027_PapagoPark**_ControlCard.pdf.
PP	**[Event]**.ppen	This is the Purple Pen project file. Example: **20181027_PapagoPark**.ppen.
Inkscape **Final Output**	**[Event]**_DescriptionsSheet.pdf	This file contains multiple descriptions on a single sheet. Example: **20181027_PapagoPark**_DescriptionsSheet.pdf
Inkscape **Final Output**	**[Event]**_CluesSheet.pdf	Multiple descriptions on a single sheet. Example: **20181027_PapagoPark**_CluesSheet.pdf
Inkscape **Final Output**	**[Event]**_ControlCardSheet.pdf	Multiple control cards on a single sheet. Example: **20181027_PapagoPark**_ControlCardSheet.pdf

4 Workflow Summary

This section is a summary of the course setter's workflow. Additional details, including screen shots, are found in the "Workflow Details" section. For filenames listed below, "**[Event]**" represents the event name. For example, the course setter could change "**[Event]**_Basemap.jpg" to "**SophiesFlat**_Basemap.jpg", "**20181027_SophiesFlat**_Basemap.jpg", "**20181027_SophiesFlat_Night-O**_Basemap.jpg", etc.

Step 1: Obtain Basemap

Initial Input: [Event]_Basemap.jpg/.jgw**, [Event]**_Basemap.tif/tfw.

These are georeferenced image files for OOM (.jpg, .jgw), PP (.jpg), and GE (.tif, .tfw). The course setter obtains a web link or e-mail that contains the georeferenced basemap in the two formats.

Note: The ,jpg and .tif files are easy to generate when the basemaps are created using QGIS. Instructions on generating basemaps is beyond the scope of this document.

Step 2: Google Earth - Create a Course Proposal

Input: **[Event]**_Basemap.tif, **[Event]**_Basemap.tfw
Output: **[Event]**.kmz, **[Event]**_ProposedControls.kmz, **[Event]**_ProposedTrack.kmz, Course length and climb.

The course setter uses Google Earth to plan a course. The plan is not the final course. The course setter must walk the planned route to determine if the plan is sufficient or if changes are required. The output of the step with Google Earth includes the proposed control points in KMZ and GPX formats and the distance/climb of the proposed route.

Step 3: Web - Convert KMZ to GPX

Input: **[Event]**_ProposedControls.kmz
Output: **[Event]**_ProposedControls.gpx

The proposed controls are output from Google Earth in the KMZ format. OpenOrienteering Mapper cannot read the KMZ format but can import GPX data. For field checking, GPS receivers also use GPX data. The KMZ from Google Earth is converted to georeferenced GPX using the online tool http://www.zonums.com/online/kml2x/.

Step 4a: OpenOrienteering Mapper - Print Flagging Plan (Preferred)

Input: **[Event]**_Basemap.jpg
Output: **[Event]**_ProposedMap.pdf, **[Event]**.ppen

Import the basemap .jpg image into Purple Pen. View the proposed control locations in Google Earth. Add the control points manually to the Purple Pen map. Print the map "**[Event]**_ProposedMap.pdf" to use for field checking. Save the project in Purple Pen to "**[Event]**.ppen". Note: The event

Step 4b: OpenOrienteering Mapper - Print Flagging Plan (Alternative)

Input: **[Event]**_Basemap.jpg, **[Event]**_Basemap.jgw, **[Event]**_ProposedControls.gpx.
Output: **[Event]**_ProposedMap.pdf, **[Event]**.omap (the OOM file).
Import the basemap .jpg image and GPS data into OpenOrienteering Mapper. Convert the control data to orienteering control symbols. Move the control symbols on the map, if necessary. Print the map "**[Event]**_ProposedMap.pdf" used for field checking. Save the project to "**[Event]**.omap".

Step 5: Field Check

Input: **[Event]**_ProposedMap.pdf, **[Event]**_ProposedControls.gpx
Output: **[Event]**_Controls.gpx (Actual filename depends on the GPS receiver.)

The course setter walks the proposed course marked on **[Event]**_ProposedMap.pdf. Final control locations are determined based on the actual terrain, not on the proposed locations. The course setter marks the final location with flagging tape and records the location with a GPS receiver. The output of this step is the .gpx file created by the GPS receiver. Rename the file as **[Event]**_Controls.gpx.

Step 6: Google Earth - Calculate Actual Distance/Climb

Input: **[Event]**_Controls.gpx
Output: **[Event]**_StraightTrack.kmz, **[Event]**_FinalControls.kmz, Distance, Climb, Equiv Distance.

The distance and climb are calculated using the GPS points collected during the field check. A straight-line path is drawn between the points the same way the line was drawn in Step 2.

Step 7: OpenOrienteering Mapper - Transfer Field Check Data to the Map

Input: **[Event]**.omap, **[Event]**_Controls.gpx.
Output: **[Event]**_ProposedMap.pdf, **[Event]**.omap

After field checking the course, the GPS data is transferred to the map. The GPS data almost always has controls placed at locations that are different than the proposed course. The course setter modifies the map based on the GPS data.

Special Note: Please remember that orienteering is a navigation activity and not a GPS activity. The control locations from the GPS receiver may not match exactly with the map details. It is up to the course setter to move the locations on the map to reasonably represent the actual locations in the field.

For example, if the control in the field is in the middle of a re-entrant but the GPS data shows the location up the side of the re-entrant, the course setter should make sure the control appears in the middle of the re-entrant on the map. GPS receivers vary in accuracy.

Step 8: Purple Pen - Create the Final Map and Control Clues

Input: **[Event]**_ProposedMap.pdf, **[Event]**_Basemap.jpg, Control Codes
Output: **[Event]**_Map.pdf, **[Event].**ppen

Import the basemap into Purple Pen. Manually place the controls based on the locations seen in Google Earth or Open Orienteering Mapper. Change control numbers to actual control codes (two-letter codes on bags, three character code on Night-O reflectors, etc.) Create the final map, control cards, individual descriptions, and individual clues. Save the Purple Pen file.

Step 9: Excel - Create Control Card/Clue Sheet (Obsolete)

Input: **[Event]**_Map.ppen, **[Event]**_Map.pdf
Output: **[Event]**_ControlCard.pdf, **[Event]**_ClueSheet.pdf

Use the Excel template to create the event's control card and clue sheet. This step is retired in favor of a simpler process using Purple Pen in the previous step to create the control cards, clues, and descriptions, and Inkscape in the next step to create multiple copies of each on single sheets.

Step 10: Inkscape - Create Control Sheets

Input: **[Event]**_Descriptions.pdf, **[Event]**_ControlCard.pdf, **[Event]**_ClueSheet.pdf

Final Output: [Event]_DescriptionsSheet.pdf, **[Event]**_ControlCardSheet.pdf, **[Event]**_CluesSheet.pdf

Use Inkscape to create output sheets that contain multiple descriptions, control cards, and clue sheets on a single page.

5 Workflow Details

This section contains the following subsections:

For filenames listed below, "**[Event]**" represents the event name. For example, the course setter could change "**[Event]**_Basemap.jpg" to "**SophiesFlat**_Basemap.jpg", "**20181027_SophiesFlat**_Basemap.jpg", "**20181027_SophiesFlat_Night-O**_Basemap.jpg", etc.

5.1 Step 1: Obtain Basemap

Initial Input: [Event]_Basemap.jpg, **[Event]**_Basemap.jgw, **[Event]**_Basemap.tif, **[Event]**_Basemap.tfw.

The mapper and course setter are often separate individuals. The mapper provides the georeferenced JPG files (.jpg, .jgw) and georeferenced TIF files (.tif, .tfw), either through the club's website or through an e-mail.

The georeferenced image files are not for public distribution. The files would make a handy reference for someone navigating through the course with a GPS receiver. We want to keep orienteering a true map-and-compass sport.

5.2 Step 2: Google Earth - Create a Course Proposal

5.2.1 Summary

- Import the georeferenced basemap (.tif) into Google Earth.
- Place controls on the map at proposed locations.
- Determine the distance/elevation profile.

5.2.2 Input

- **[Event]**_Basemap.tif (coordinate reference system WGS 84 UTM 12 N)
- **[Event]**_Basemap.tfw ("world file" containing georeferencing information)

5.2.3 Output

- **[Event]**.kmz
- **[Event]**_ProposedTrack.kmz
- **[Event]**_ProposedControls.kmz
- Course Distance and Climb

5.2.4 Details

This section contains the following subsections:

5.2.4.1 Import the Basemap

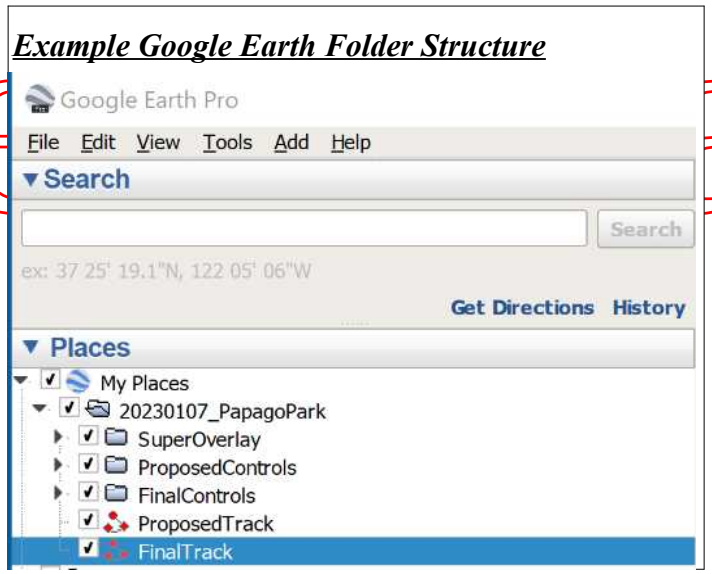
Input: **[Event]**_Basemap.tif, **[Event]**_Basemap.tfw.

This step imports the basemap into Google Earth as a "super overlay". The "super overlay" is automatically imported with the proper scaling and rotation. While it is also possible to add an image file as an "image overlay", the user must further manipulate the "image overlay" to skew and scale the image into the correct location. It's easier to import the basemap as a "super overlay".

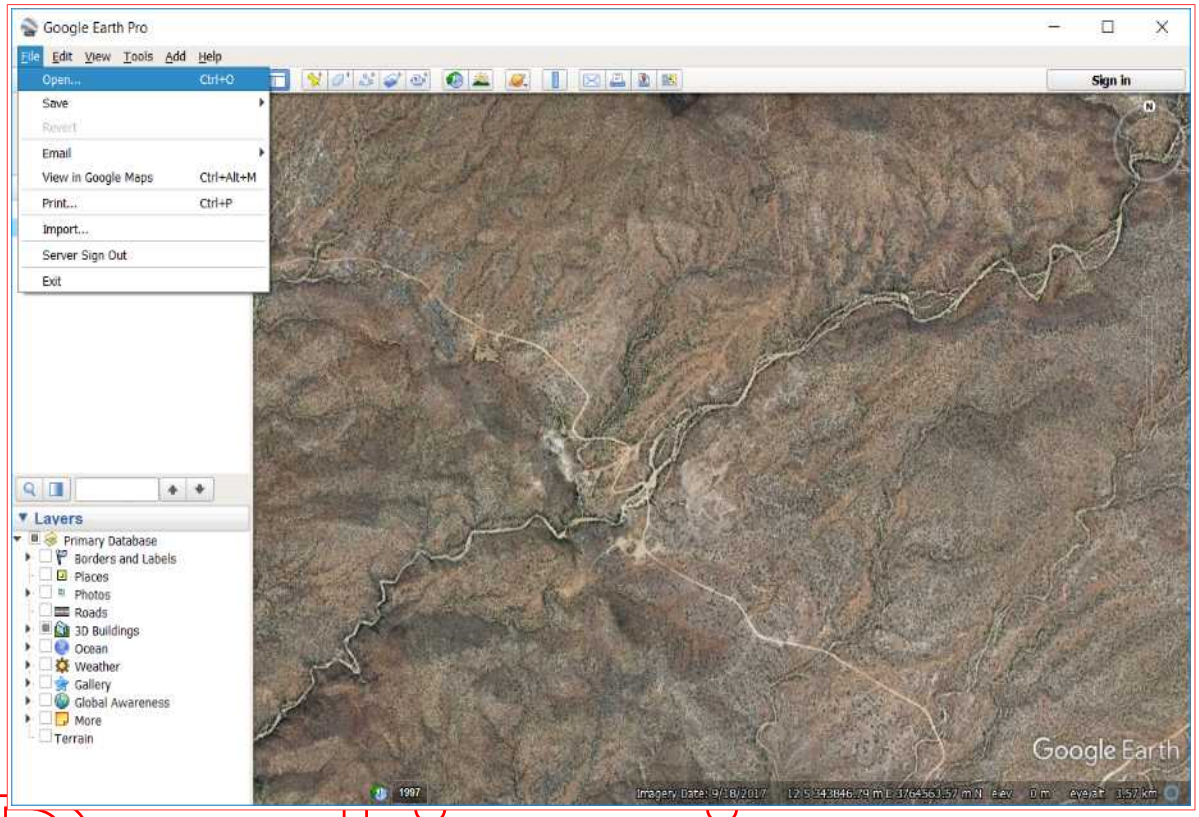
Note: There are some reports that the "super overlay" feature is only available in the Windows Pro version of Google Earth.

- In Google Earth, create a folder for the event. (For example, 20181028_SophiesFlat). Create subfolders for "SuperOverlay", "ProposedControls", and "FinalControls".

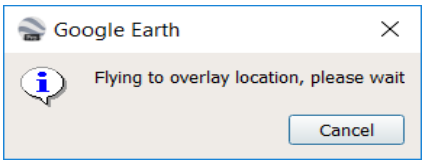
Example Google Earth Folder Structure

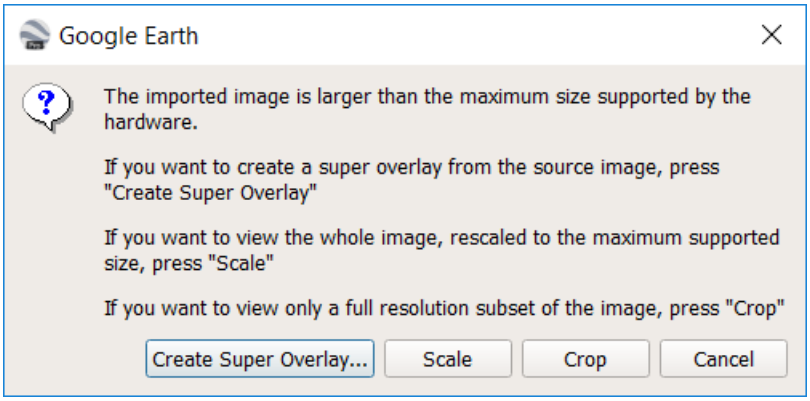


- In Google Earth, select "**[Event]**_Basemap.tif" using [File][Open].



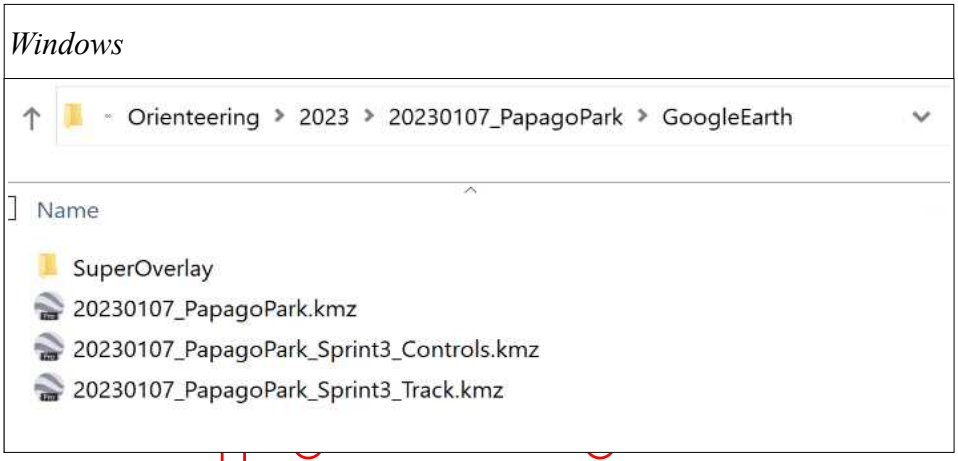
- In the pop-up window that appears, select [Create Super Overlay] to import the map. Suggestion: Place the overlay files in a windows subdirectory called "..\GoogleEarth\SuperOverlay". After creating the overlay files, in Google Earth, make sure the **[Event]**_Basemap Root folder is in the **[Event]** folder.





Google Earth

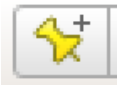
Windows



Note: The main kml file in the Windows "GoogleEarth\Superoverlay" subdirectory is "**[Event]**_Basemap_root.kml". Google Earth can create 100's of smaller .kmz files that make up the superoverlay.

5.2.4.2 Place Controls on the Map

Output: **[Event]**_ProposedControls.kmz

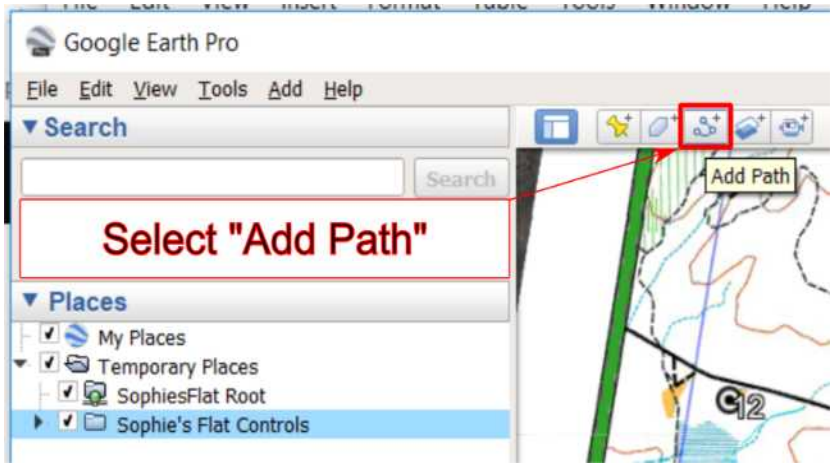
- Create a Google Earth folder called "ProposedControls" to organize the controls. (See images in the previous section.)
- Add controls at desired locations on the map using [Add Placemark]. 

  Refer to the Course Setter's Guide: Designing Courses (document TBD) for more information.
- Include a control number and description for reference. These are temporary controls. Many locations could change after field checking.
- Save the control data as "**[Event]**_ProposedControls.kmz".

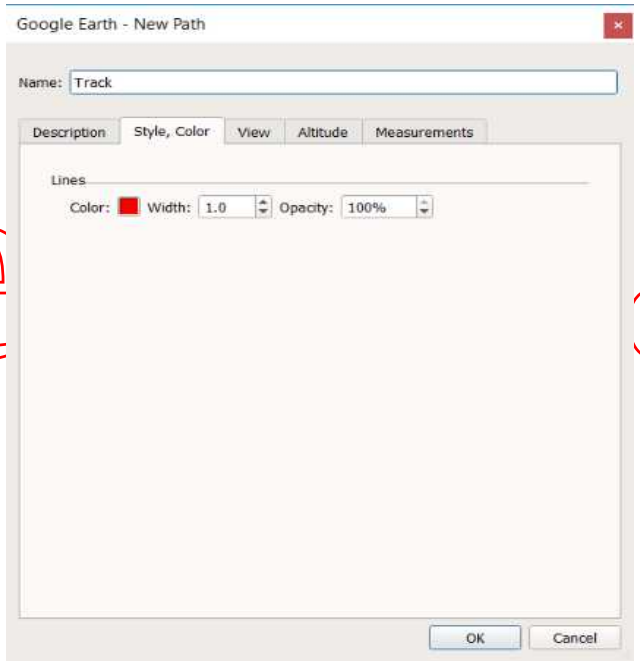
5.2.4.3 Create a Best-Route Track

Output: **[Event]**_ProposedTrack.kmz, **[Event]**.kmz

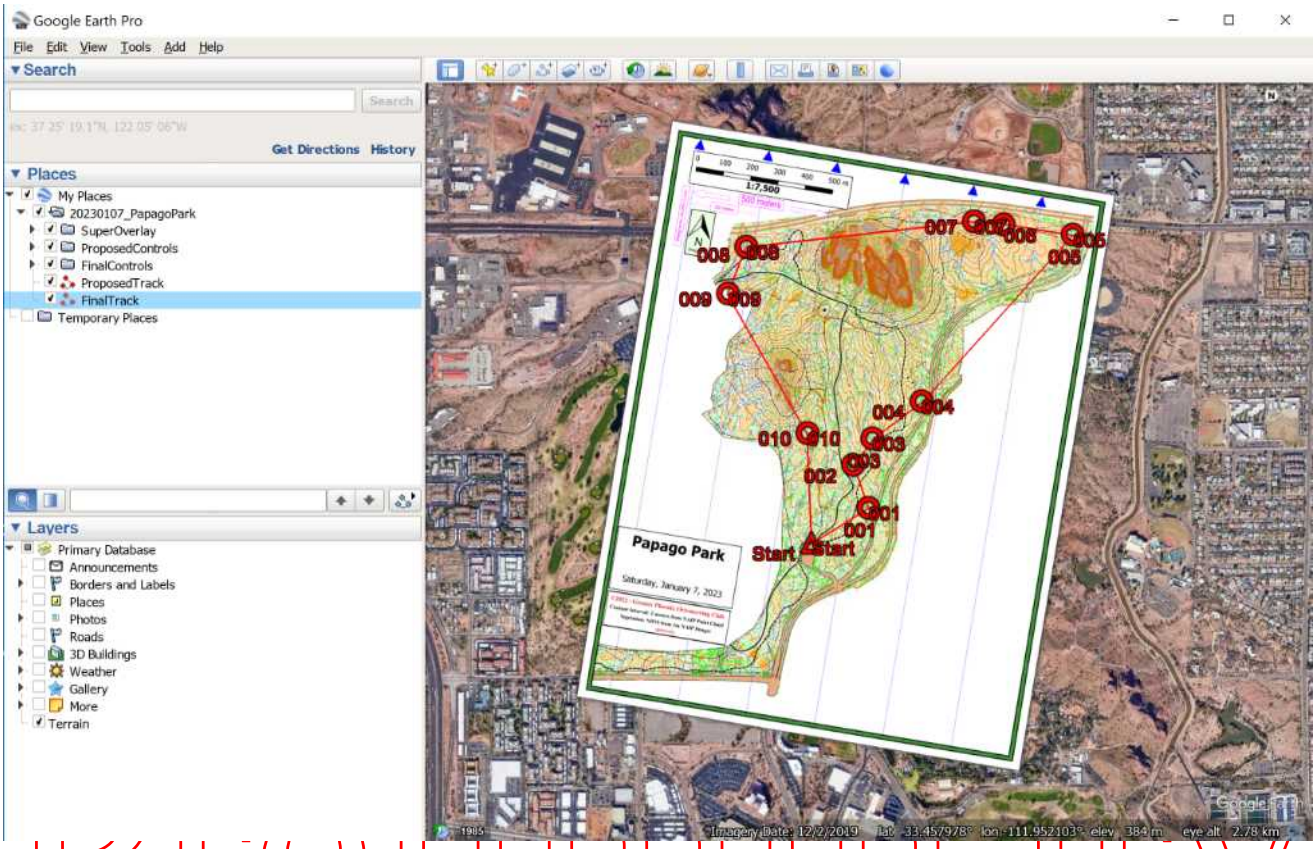
- Add a track to the map using "Add Path". The path indicates a straight-line route representing the shortest path between controls.



- Select the title, color, and thickness of the path



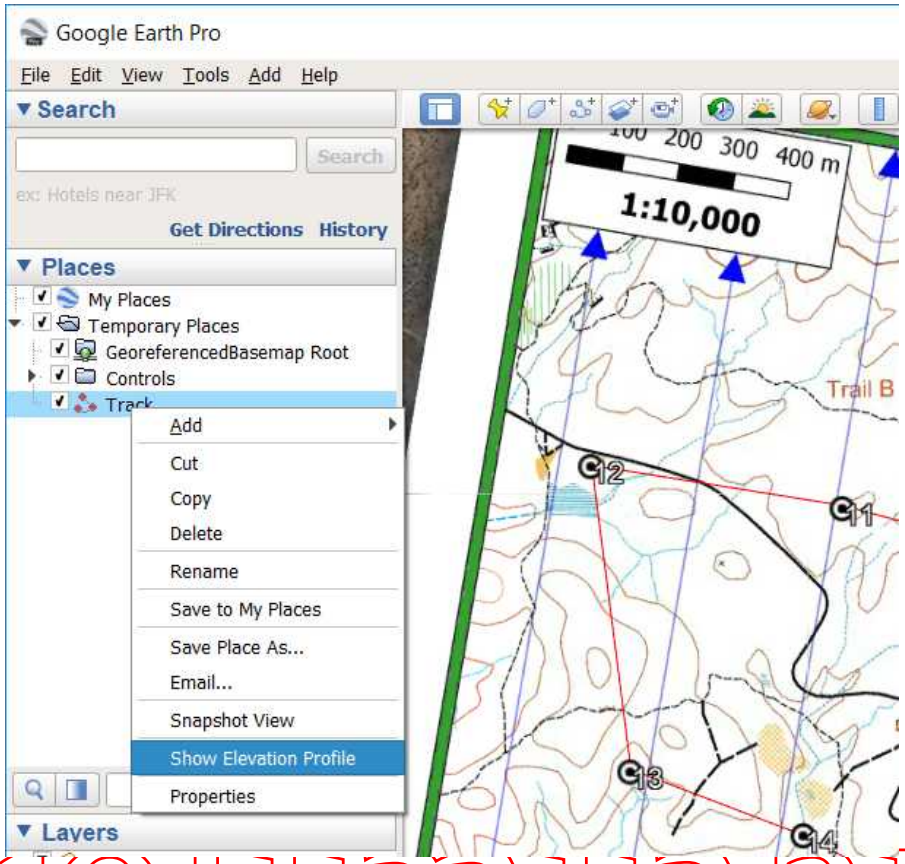
- Click to enter each point on the desired route.
  The actual route you select isn't critical, as long as it appears to reasonably string together the control points.



- Save the route as "**[Event]**_ProposedTrack.kmz". (In the example above, right click "ProposedTrack" and select [Save As] to save as "20230107_PapagoPark_ProposedTrack.kmz.)
- Save the entire Google Earth Event Folder as **[Event]**.kmz". (In the example above, right click on "20230107_PapagoPark" and select [Save As] to save as "20230107_PapagoPark.kmz".)

5.2.4.4 Determine the Distance and Climb

- Get distance and elevation using the Google Earth "Show Elevation Profile" feature.
  Right click on Track.
  Select "Show Elevation Profile". The distance and elevation are found at the bottom of the display.



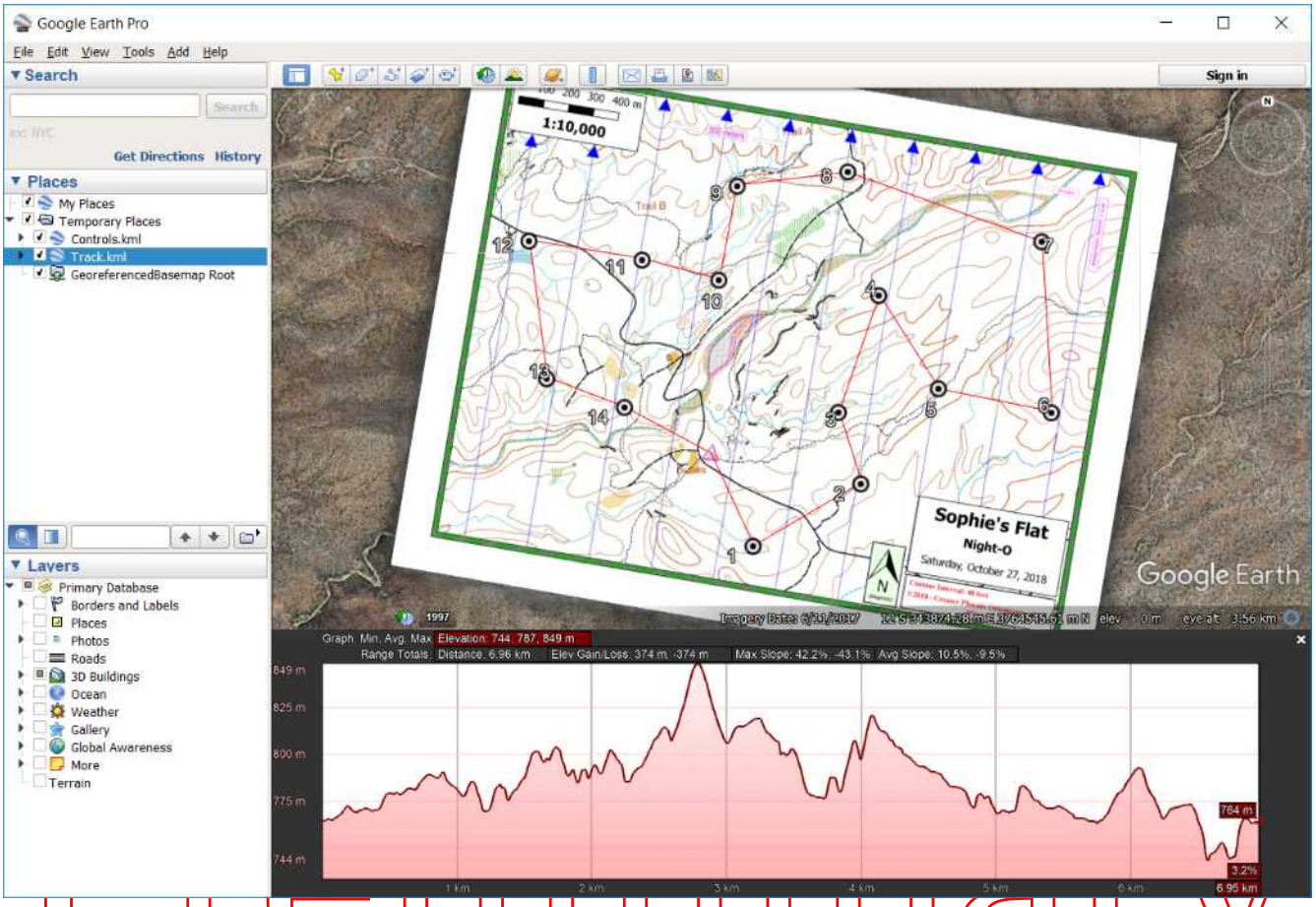
Note: For orienteering, the course length is sometimes represented in "equivalent kilometers", where

equivalent kilometers = length (km) + climb (meters)/100

With this calculation, every 100 meters of climb is equivalent to 1 kilometer in distance. We can then use equivalent kilometers to calculate desired routes.

2-Hour Night-O: 7-10 eqkm
2-Hour Score-O: 10-12 eqkm

For the example below, the equivalent distance is 6.96 km + 374m/100 = 10.70 eqkm

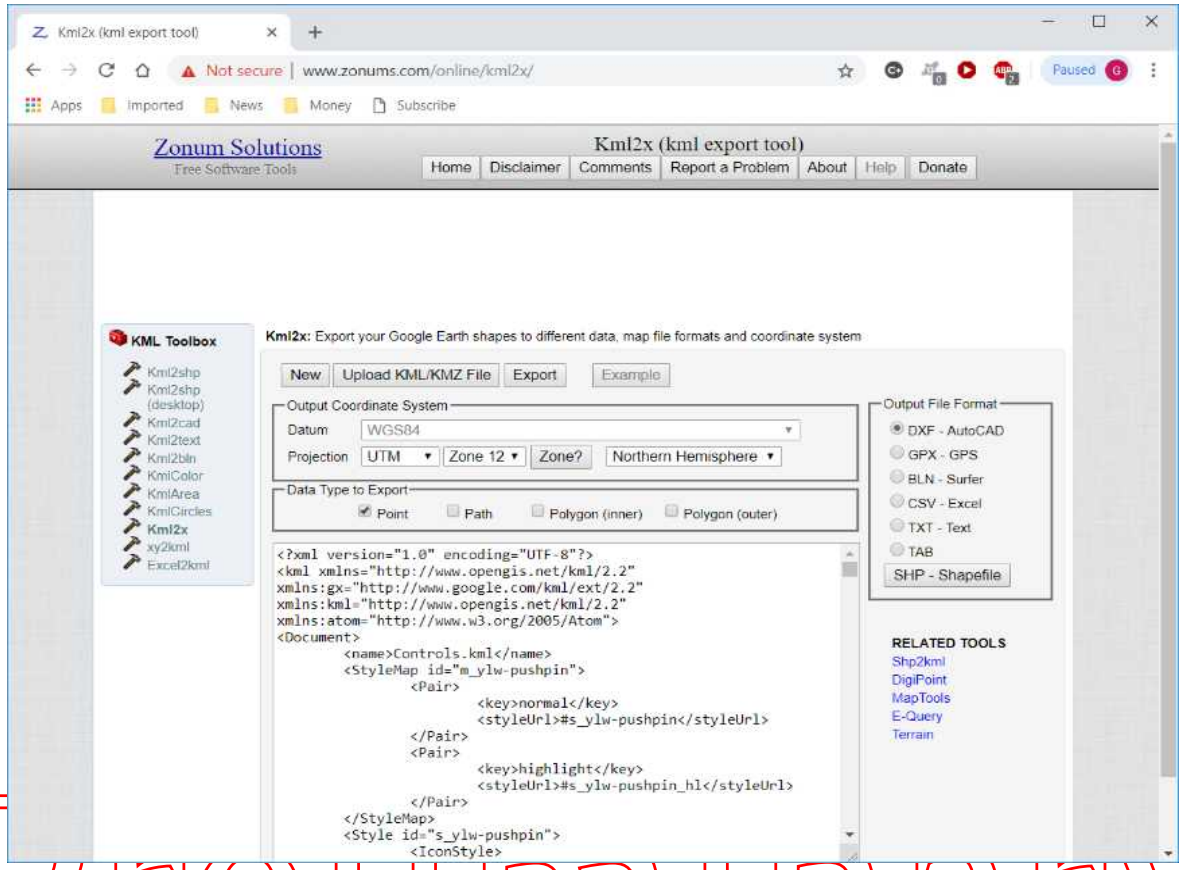


5.3 Step 3: Web - Convert KMZ to GPX

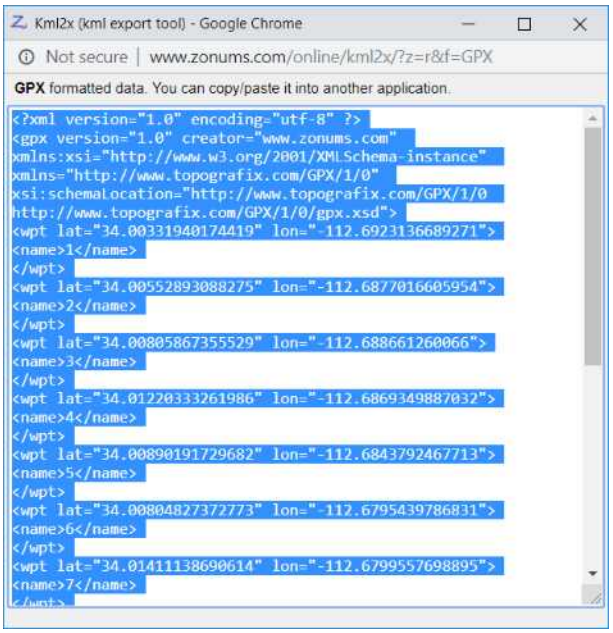
Input: **[Event]**_ProposedControls.kmz
Output: **[Event]**_ProposedControls.gpx

OpenOrienteering Mapper is one option to create a map for field checking the course. The map combines the georeferenced basemap with control data from Google Earth. The Google Earth data is in the KMZ format. OpenOrienteering Mapper needs data in the GPX format. GPS receivers also use GPX data. An online tool is used for the KMZ-to-GPX conversion.

- Navigate to "http://www.zonums.com/online/kml2x/".
- Click [Upload KML/KMZ File] and select the "**[Event]**_ProposedControls.kmz" created previously.
- Select Datum=WGS84, Projection=UTM, Zone=12, Northern Hemisphere.
- Select Data Type to Export = Point.
- Select Output File Format = "GPX - GPS".
- Press [Export] to create the GPX file.



- Copy/paste the data from the pop-up window into a text file "**[Event]**_ProposedControls.gpx".



- Note: The resulting .gpx file does not contain the <description> field from the KMZ file. If you want all the descriptions transferred to the GPX file, you need to manually include the descriptions as <cmt></cmt> fields for each waypoint in **[Event]**_ProposedControls.gpx.

  Example:

  Change:

  ```
  <wpt lat="34.0033194017442" lon="-112.692313668927099">
  <name>01</name>
  </wpt>
  ```

  To:

  ```
  <wpt lat="34.0033194017442" lon="-112.692313668927099">
  <name>01</name>
  <cmt>Re-entrant</cmt>
  </wpt>
  ```

- Upload the GPX file into a GPS receiver.

  Instructions for uploading GPS data to a GPS receiver vary for different GPS receivers. The user should refer to the GPS User's Guide for additional information.

5.4 Step 4a/4b: OpenOrienteering Mapper - Print Flagging Plan

5.4.1 Step 4a: Purple Pen (Preferred)

In this option, the control locations are viewed in Google Earth and added manually to a map in Purple Pen.

5.4.1.1 Summary

- Use the map and control locations in Google Earth from Step 2 above.
- Open Purple Pen and create a new event. Name the event **[Event]** (for example, 20180405_SophiesFlat). Load **[Event]**_Basemap.jpg into Purple Pen. Create a new course.
- Manually place controls onto the Purple Pen map.
- Output the proposed map for field checking. Save the Purple Pen file.

5.4.1.2 Input

- **[Event]**_Basemap.jpg (coordinate reference system WGS 84 UTM 12 N)

5.4.1.3 Output

- **[Event]**_ProposedMap.pdf
- **[Event]**.ppen

5.4.1.4 Details

Follow instructions found in Step 8 below for manually adding controls to a Purple Pen map.

5.4.2 Step 4b: Open Orienteering Mapper (Cumbersome, not Preferred)

In this step, the basemap is combined with control information from Google Earth to create the map used for field checking.

5.4.2.1 Summary

- Import the georeferenced basemap (.jpg) as a template.
- Import **[Event]**_ProposedContols.gpx.
- Convert the imported control points to control symbols.
- Print the flagging plan map as **[Event]**_ProposedMap.pdf. Save the OOM project as **[Event]**.omap.

5.4.2.2 Input

- **[Event]**_Basemap.jpg (coordinate reference system WGS 84 UTM 12 N)
- **[Event]**_Basemap.jgw ("world file" containing georeferencing information)
- **[Event]**_ProposedControls.gpx.

5.4.2.3 Output

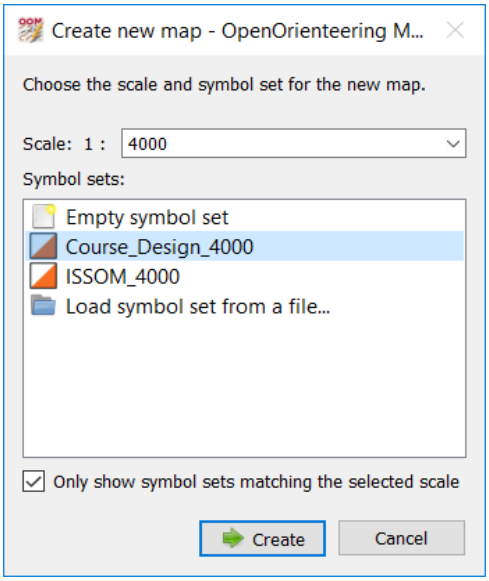
- **[Event]**_ProposedMap.pdf (OOM map with controls)
- **[Event]**.omap

5.4.2.4 Details

This section contains the following subsections:

5.4.2.4.1 Create a New OOM Project

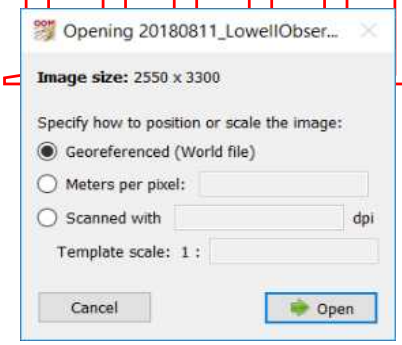
- Start OOM.
- Select [Create a new map ...]. Name the map **[Event]** (for example, 20180304_SophiesFlat).
- Select the appropriate scale. For example, if the scale is 1:4000, use "Course_Design_4000" symbols.



5.4.2.4.2 Import the Basemap as a Template

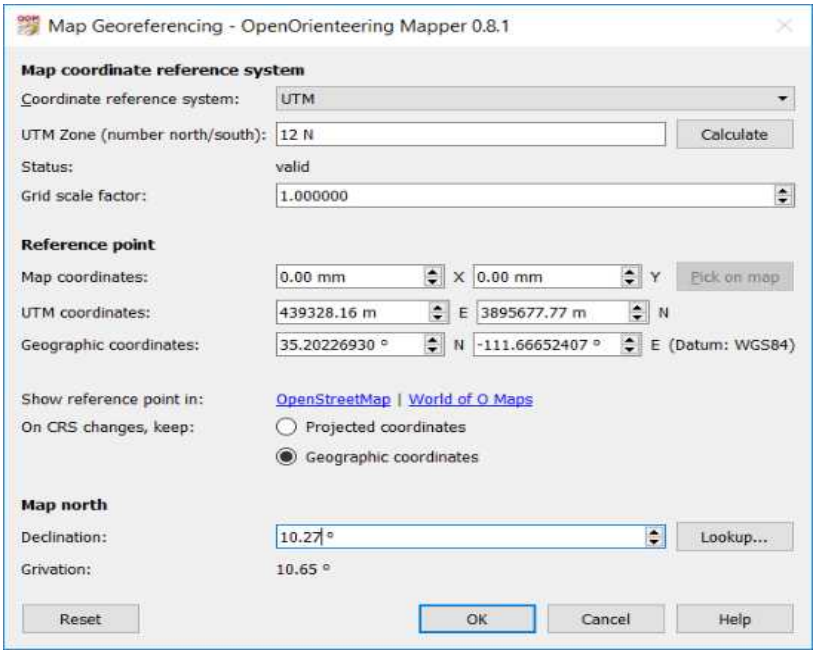
Input: **[Event]**_Basemap.jpg/jgw

- Select [Templates][Open Template].
- Open the **[Event]**_Basemap.jpg file.
- Select [Georeferenced (World File)

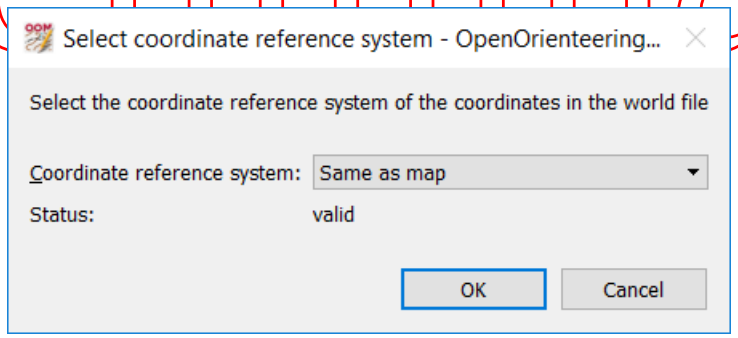


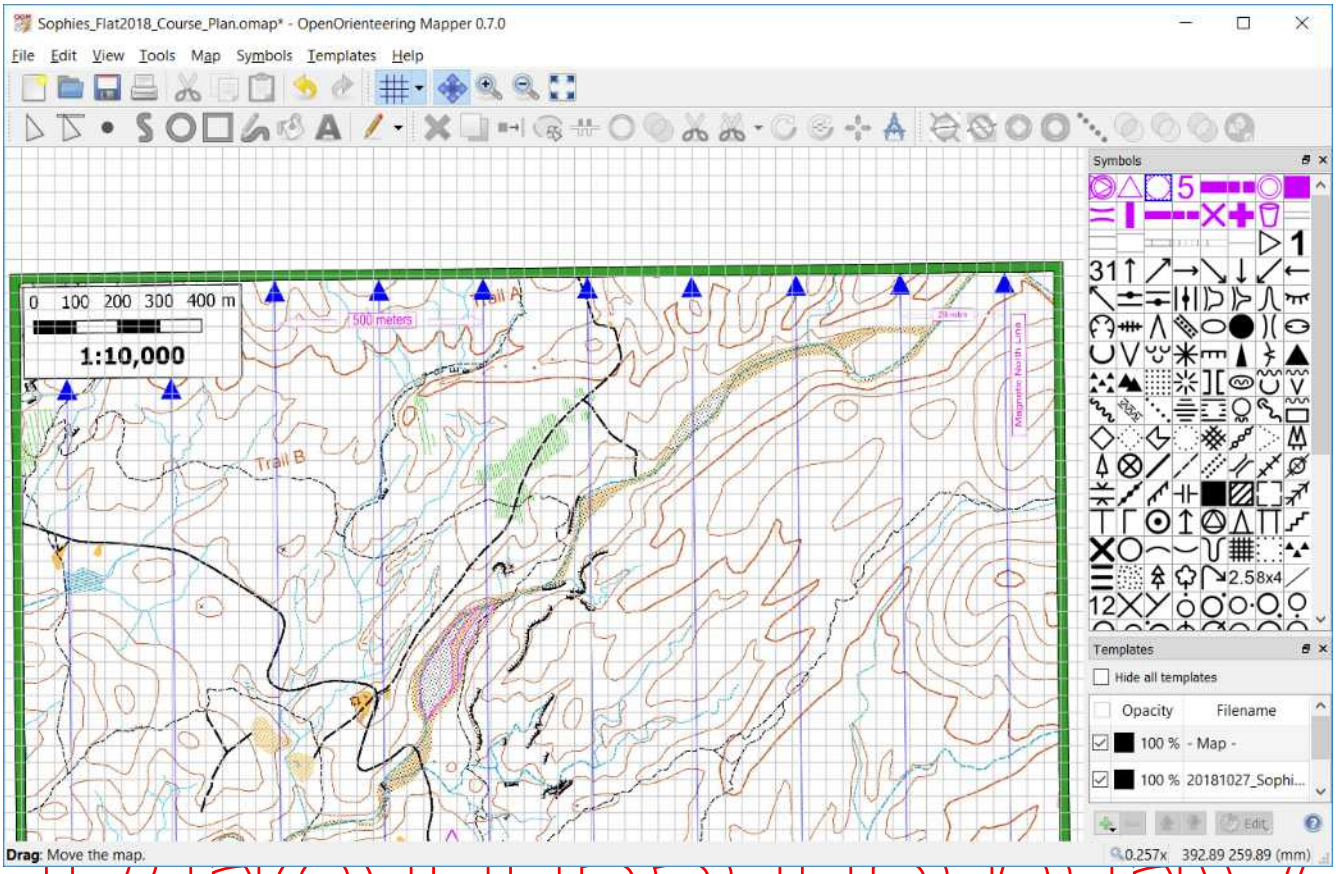
- Map Georeferencing
  - Select [Coordinate Reference System]: UTM and [UTM Zone]: 12N

- Set [On CRS changes, keep]: Geographic coordinates
- Set [Map north]: Declination = 10.27 (this varies for different events)



- Select [Coordinate Reference System]: Same as map





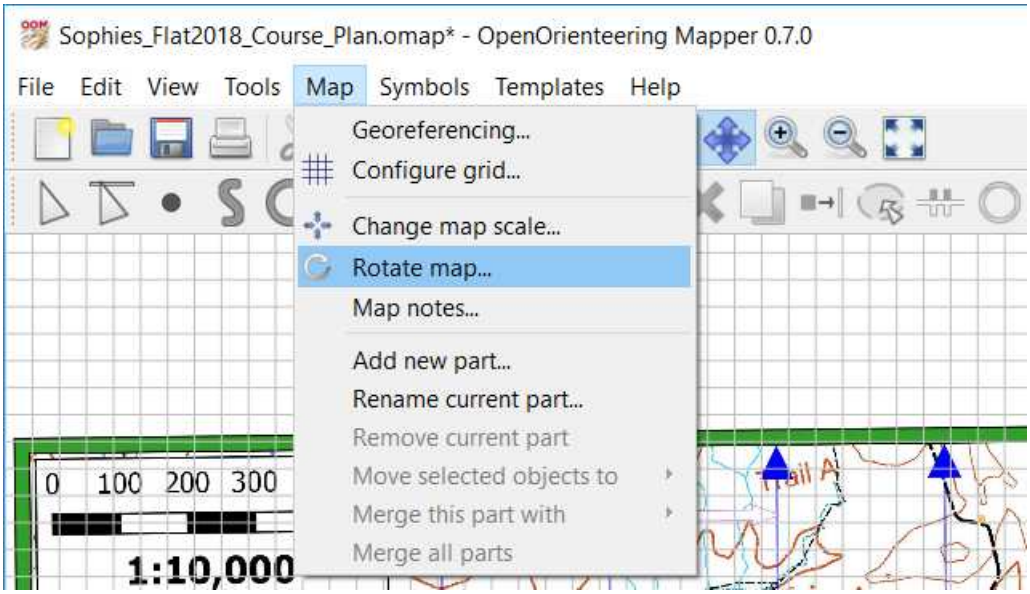
5.4.2.4.3 Rotate Map (if necessary)

- Note: OpenOrienteering Mapper takes into consideration Grivation and Convergence. The map may need rotating to account for the convergence. In general:

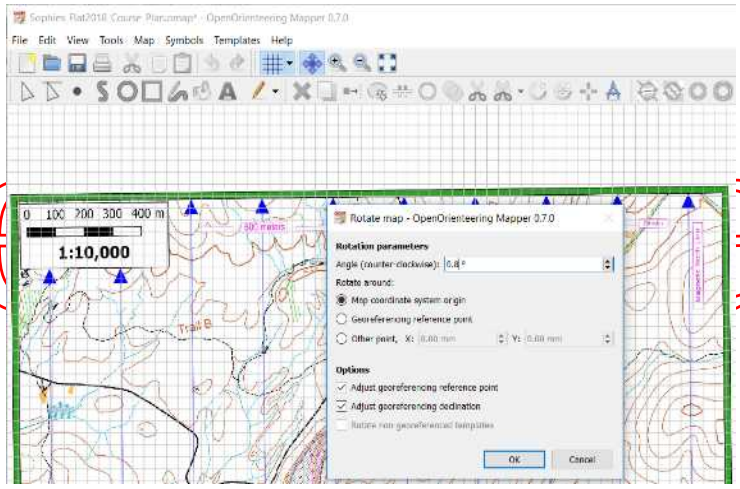
  Grivation = Declination - Convergence, where convergence is 0-2 degrees.

  For our purposes, we can simply rotate the map manually to make it parallel with the top and bottom of the page.

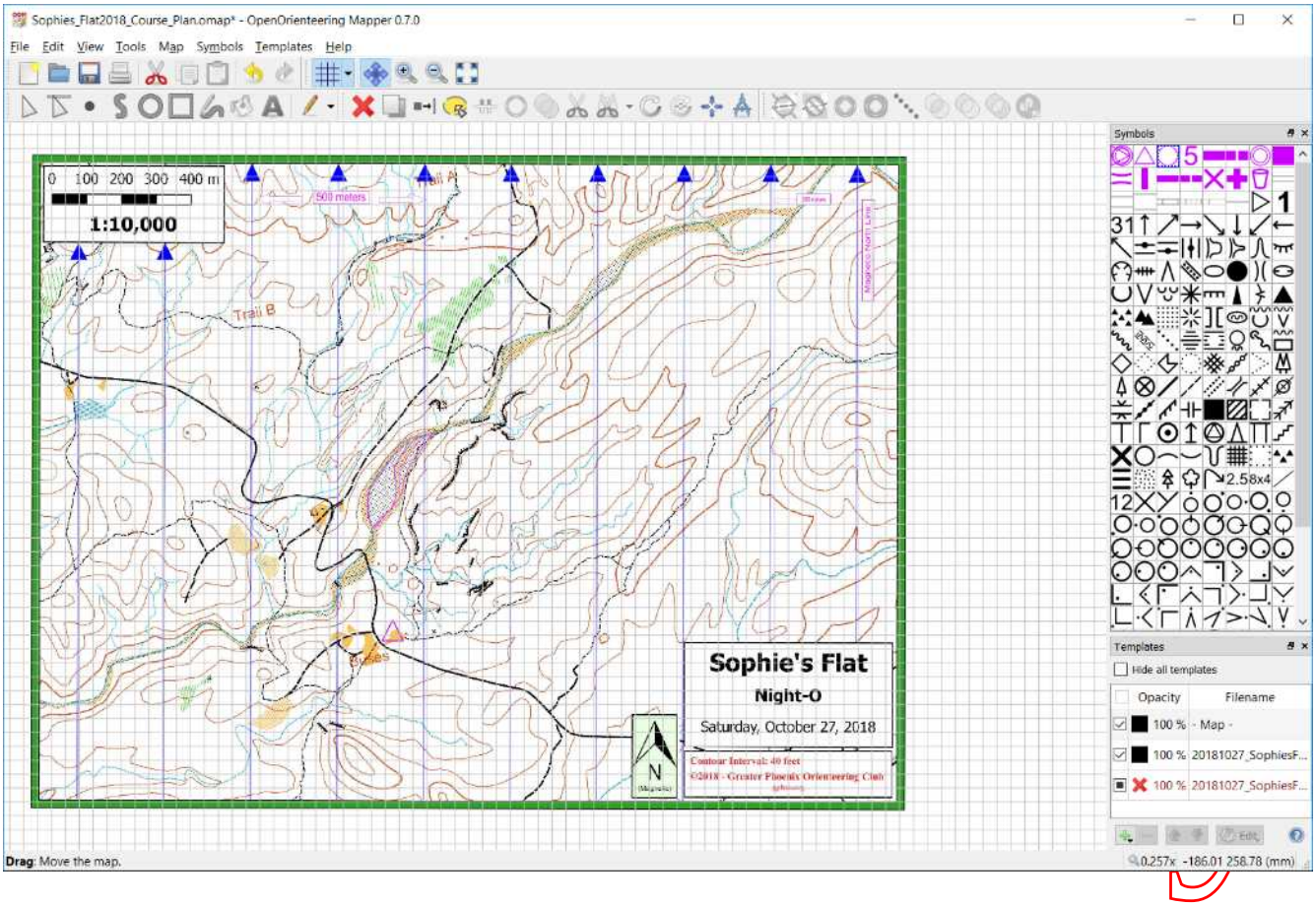
- Rotate the map using [Map][Rotate Map]



- Manually rotate map. In this example, we find that rotating 0.8 degrees is sufficient.



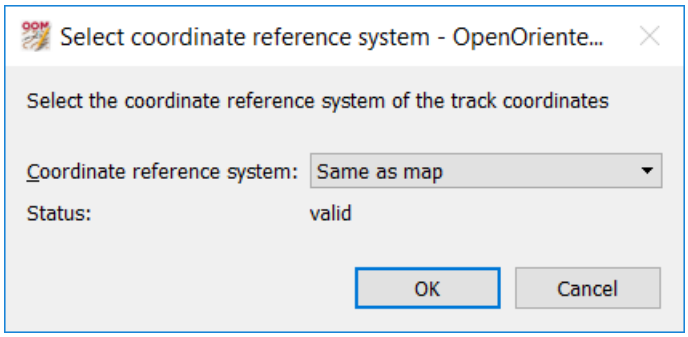
Final Map:



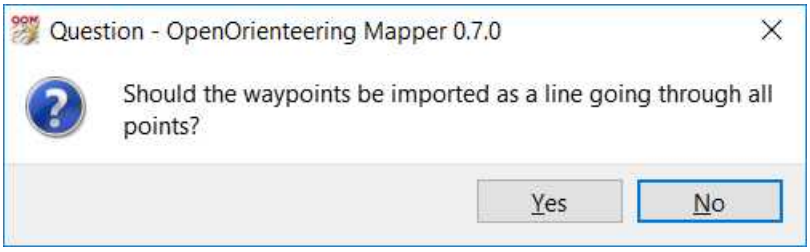
5.4.2.4.4 Import GPX Data from Google Earth

Input: **[Event]**_ProposedControls.gpx

- Select [File][Import] and open the **[Event]**_ProposedControls.gpx file.
- Select the coordinate reference system = "same as map"

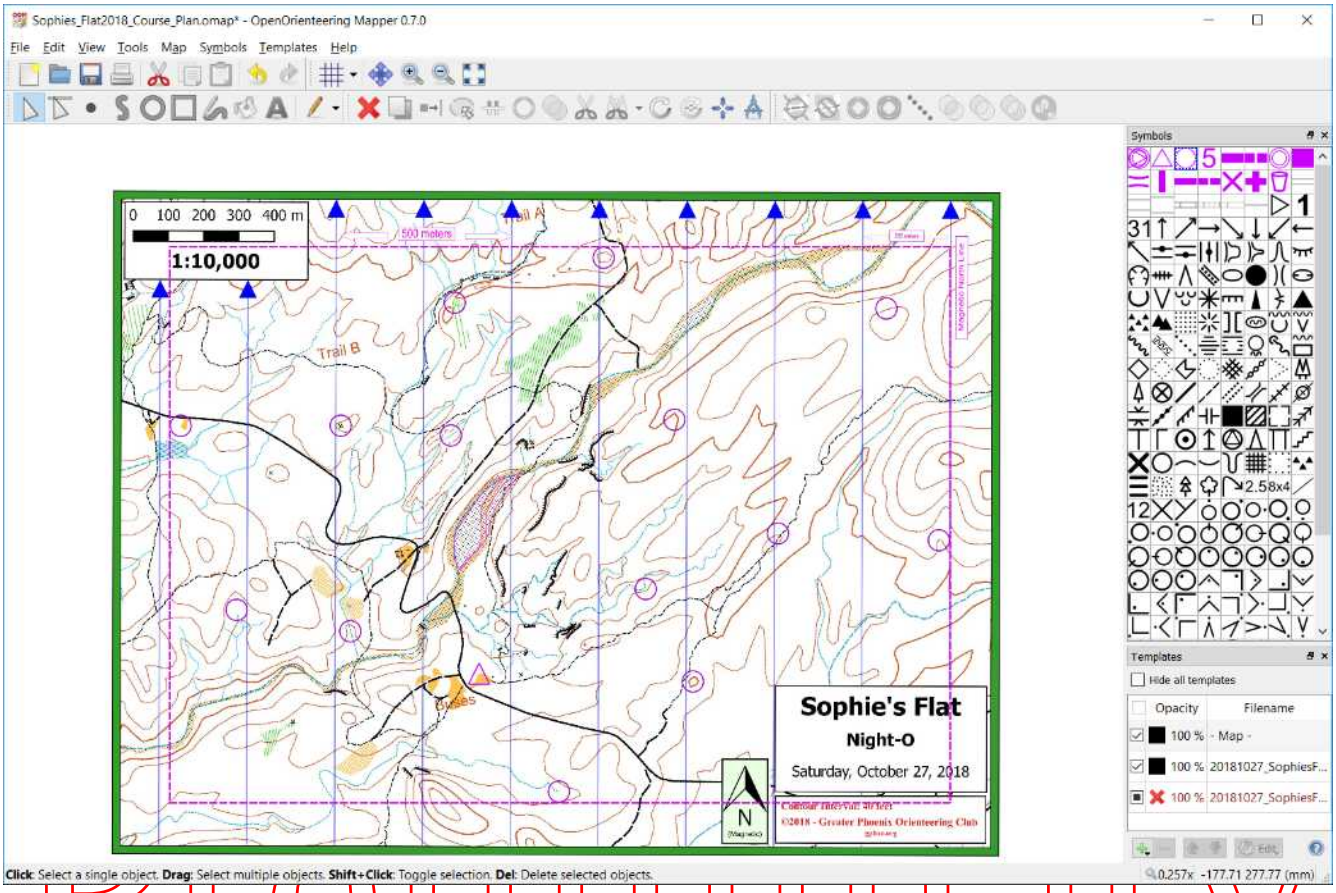


- Answer "No" to the question "Should the waypoints be imported as a line going through all the points?"



- Select symbol 702 in the symbols section at the right

- Select [Tools][Switch Symbol]. The **[Event]**_ProposedControls.gpx data is turned into control symbols on the map.
- Move the control points if you don't like the result.



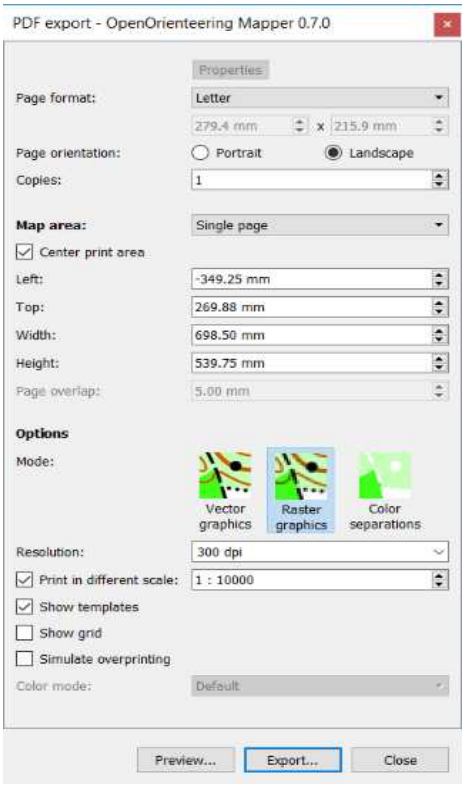
- Save the OOM project using [File][Save]
  Output: **[Event]**.omap

5.4.2.4.5 Export the Flagging Plan Map

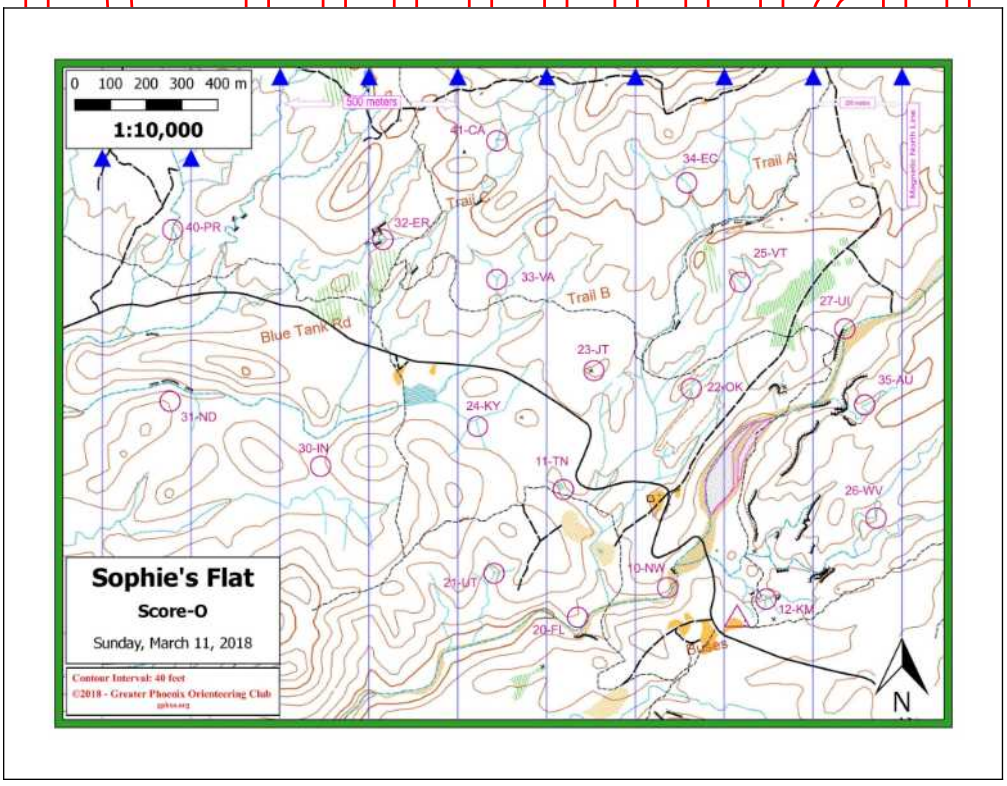
Output: **[Event]**_ProposedMap.pdf

The course setter can use the OOM map with controls to place the controls in Purple Pen. Note: The preferred method is to manually place controls based on the information in Google Earth.

- Select [File][Export][PDF]
- Set the [Page format] and [Page orientation].
- Set [Map area] = Single page and [Mode] = Raster graphics.
- Set [Resolution] = 300 dpi.
- Set [Print in a different scale] to match the scale of the map.
- Select [Export] and save as **[Event]**_ProposedMap.pdf.



Note: The scale of the map used here is the scale of the basemaps from step 1. This is also the scale used when importing the basemap into Purple Pen and printing the map from Purple Pen in step 8.



5.5 Step 5: Field Check

The course setter must visit all the proposed destinations to ensure correctness and fairness of the proposed course. The field check step is also used to add detail to the map and to obtain data for the control clues.

5.5.1 Summary

- Walk the proposed course(s).
- Place flagging tape at locations for control markers.
- Move locations based on the actual terrain.
- Mark changes to the flagging plan and map updates on the printed map.
- Record the actual control locations with a GPS receiver. Output the final control locations to **[Event]**_Controls.gpx.

5.5.2 Input

- **[Event]**_ProposedMap.pdf (Printed map containing proposed control locations).
- **[Event]**_ProposedControls.gpx, uploaded into a GPS reeiver.

5.5.3 Output

- **[Event]**_Controls.gpx (The actual control locations).

5.5.4 Details

The course setter walks the proposed course to determine the final control locations. The final locations are based on the actual terrain and the setter's best judgment. The final location for each control is marked with flagging tape. The course setter records the location with a GPS receiver.

Instructions for using any specific GPS receiver are not included here. It is left to the course setter to determine how to mark GPS waypoints into a final file "**[Event]**_Controls.gpx".

One general tip when using a GPS receiver with a built-in map, use the zoom feature to zoom into the map as you approach the control location. This increases the screen accuracy of the unit.

Another general tip when using a GPS receiver is to remain stationary for 15-30 seconds before marking a location. This allows the GPS receiver to lock into satellite signals and stabilize before recording a location.

When marking control locations, include a description of the location in the notes section of the GPS data. These descriptions will help with placing the controls on the final map. Use standard descriptions (or abbreviations of standard descriptions) for orienteering control cards, if possible.

Here are some example descriptions stored in the **[Event]**_Controls.gpx file:

- 001 Re-entrant
- 002 Hill
- 003 Stream, Bend

Upload control data from the GPS receiver to **[Event]**_Controls.gpx. Consult the GPS receiver's user's guide for details how to upload the data.

5.6 Step 6: Google Earth - Calculate Actual Equivalent Distance

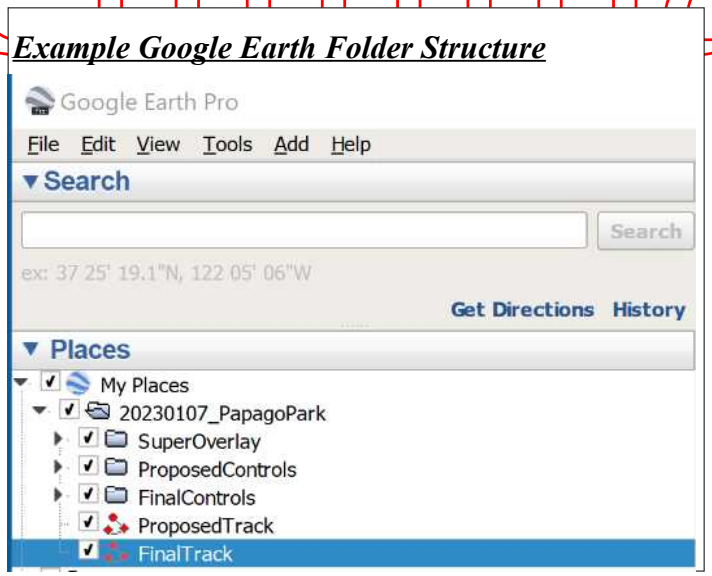
Input: **[Event]**_Controls.gpx
Output: **[Event]**_FinalTrack.kmz, **[Event]**_FinalControls.kmz, Distance, Climb, Equiv Distance.

The actual equivalent distance is calculated using the GPS points collected during the field check. A straight-line path is drawn between the points the same way the line was drawn in Step 2. Once again, equivalent kilometers = distance (km) + climb(m)/100,

- Import the GPS control data in **[Event]**_Controls.gpx into Google Earth.
- Follow the instructions in 5.2.4.4 "Determine the Equivalent Distance" to determine the actual distance, climb, and equivalent distance of the course.

  The course design should consider a recommended course length in equivalent kilometers. For Score-O course, we typically design the course for 6-8 eqkm/hour. For Night-O courses, we design for about 4-5 eqkm/hour.
- Rename the new track as **[Event]**_FinalTrack.
- Save the track as **[Event]**_FinalTrack.kmz,
- Move the track folder in Google Earth to the **[Event]** folder defined earlier.
- Rename the GPS control data in Google Earth as FinalControls. Move the folder into the **[Event]** folder defined earlier. Save the final control folder as **[Event]**_FinalControls.kmz.
- Save the main folder as **[Event]**.kmz.

Example Google Earth Folder Structure



5.7 Step 7a/7b: Transfer Field Check Data to Map

5.7.1 Purple Pen

5.7.2 : OpenOrienteering Mapper - Transfer GPS Data to Map

The final event map needs to reflect the GPS data collected during the field check step. This section describes how to transfer the field check data onto the OOM map.

5.7.2.1 Summary

- Transfer field check data to the OOM map.

5.7.2.2 Input

- **[Event]**.omap
- **[Event]**_Controls.gpx (from the GPS receiver)

5.7.2.3 Output

- **[Event]**_OOMMap_WithControls.pdf (the final OOM map with controls on the map)

5.7.2.4 Details

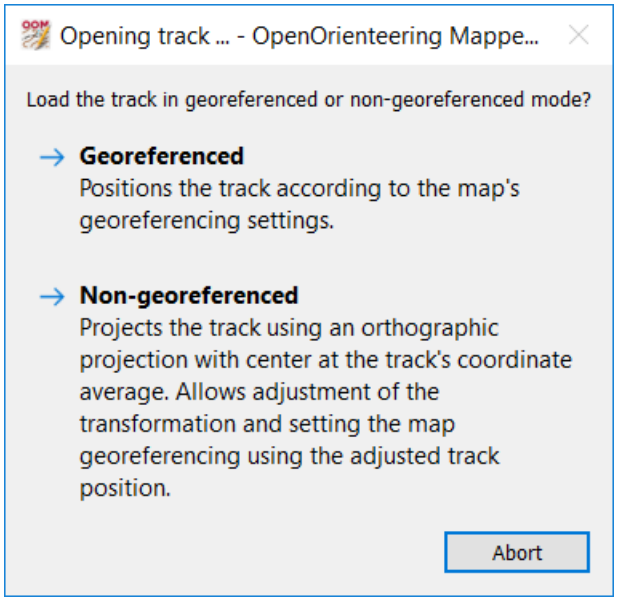
After field checking to determine final control locations, the course setter transfers the GPS data collected in the field to the OOM map. The final locations are quite frequently different than the proposed locations.

Also, because GPS receivers have varying accuracy, the course setter must adjust the final control location based on the map itself. For example, if the control is supposed to be on the west side of a fallen tree, but the GPS data shows the control 10 meters east of the tree, the course setter must move the control on the map so that it appears on the west side of a fallen tree symbol. GPS receivers vary in their accuracy.

Note that if the GPS data and the map are too different, the control location may require a change in the field. Remember, participants need to navigate from point to point. The goal is not to hide the controls but rather to provide navigation practice. The control locations on the map must reflect the actual terrain.

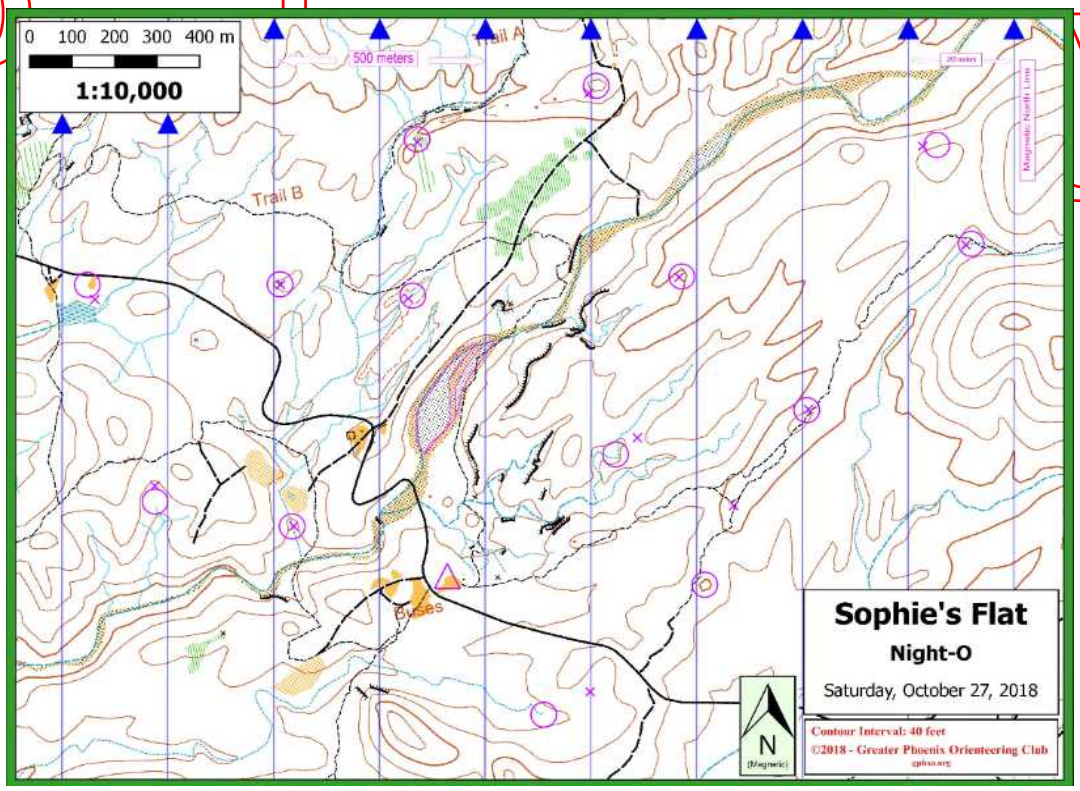
- Open **[Event]**.omap in OOM.
- Import GPS data

  Select [File][Import]. Select **[Event]**_Controls.gpx.
- Select [Georeferenced].



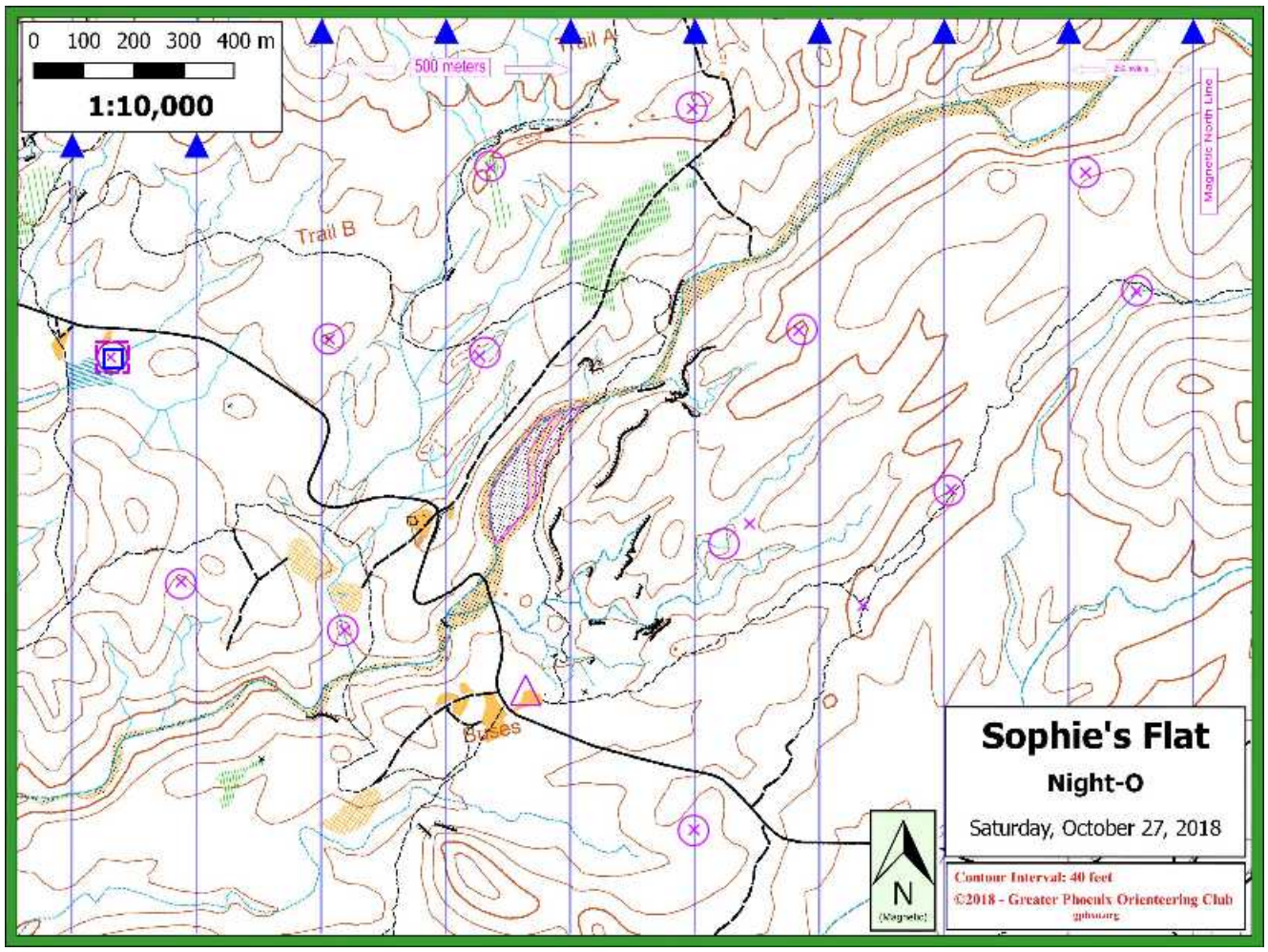
Answer "No" to the question "Should the waypoints be imported as a line going through all points?

- Select a symbol to differentiate the new points from the plan. For now, select the "Forbidden Route" symbol "711", then select [Tools][Switch Symbol].



- Move the control locations based on the description of each control. The final controls are based on the

control description, not the GPS data. The GPS data is an estimate.



- Save the OOM project as **[Event]**.omap.
- Export a PDF using [File][Export As][PDF]. Save as **[Event]**_OOMMap_WithControls.pdf.

5.8 Step 8: Purple Pen - Place Control Information on the Map

Purple Pen is a course-setting software that offers some advantages over OpenOrienteering Mapper. Because Purple Pen is specifically designed for course setting, it is easier to use to string multiple courses over the same map.

This section provides a brief overview to Purple Pen, including things we do to customize our maps. The user should consult the Purple Pen documentation for additional help.

5.8.1 Summary

- Import **[Event]**_Basemap.jpg. (Alternative: Import **[Event]**_ProposedMap.pdf from Step 4b.)
- Place Purple Pen controls at the same place as the controls.
- Add control codes (AZ, BA, etc.) to the controls
- Create one or more courses.

5.8.2 Input

- **[Event]**_Basemap.jpg (Alternative: **[Event]**_ProposedMap.pdf)
- **[Event]**_OOMMap.pdf

5.8.3 Output

- **[Event]**_Map.pdf
- **[Event]**.ppen

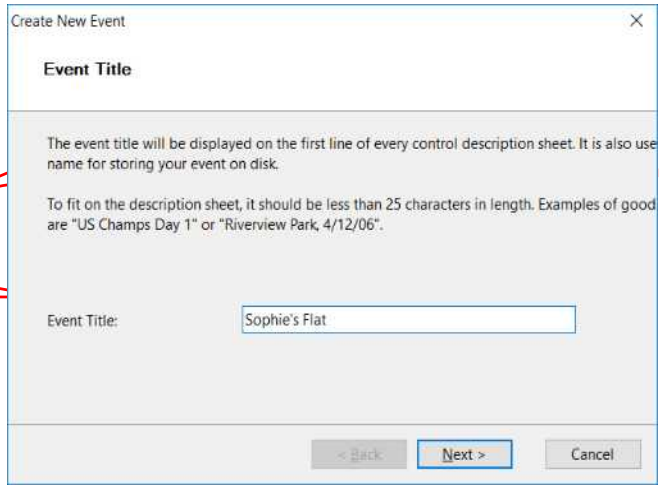
5.8.4 Details

This section contains the following subsections:

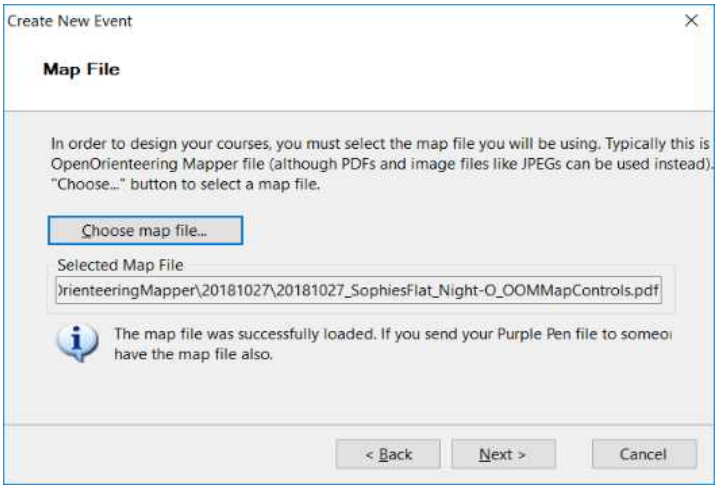
5.8.4.1 Event Setup

1. Create a new Purple Pen event

2. Provide an event title

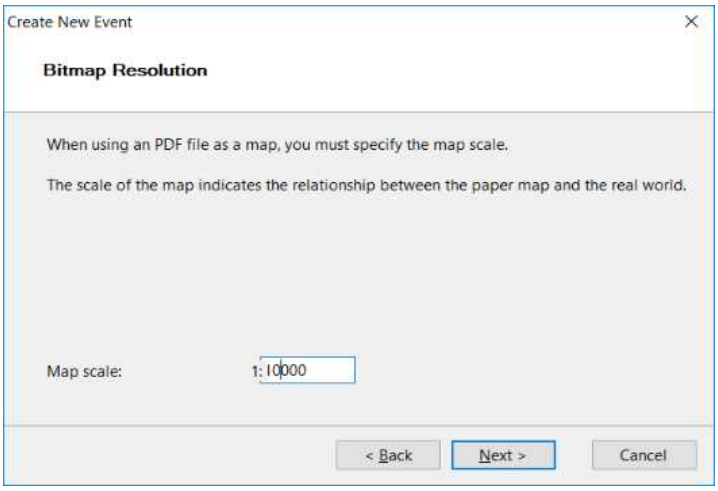


3. Press [Choose Map File] and select "**[Event]**_Baseman.jpg" (Alternative: "**[Event]**_OOMMap_WithControls.pdf").



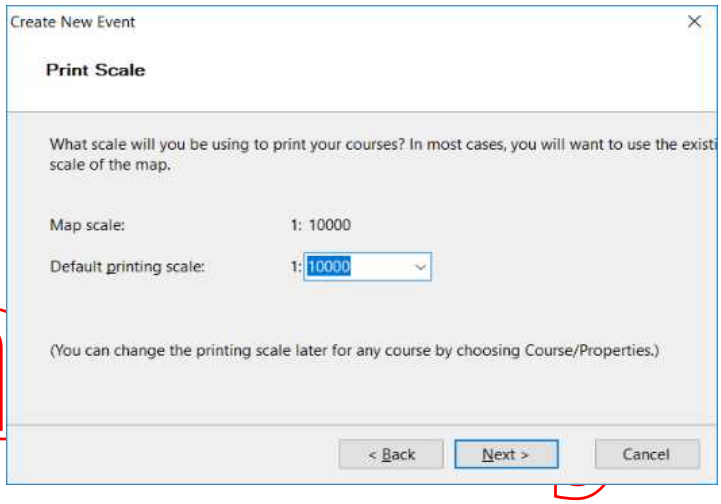
4. Set the map scale.

The map scale is the same scale used when creating the map from OpenOrienteering Mapper is step 4. The scale appears as text on the basemap.



5. Set the print scale.

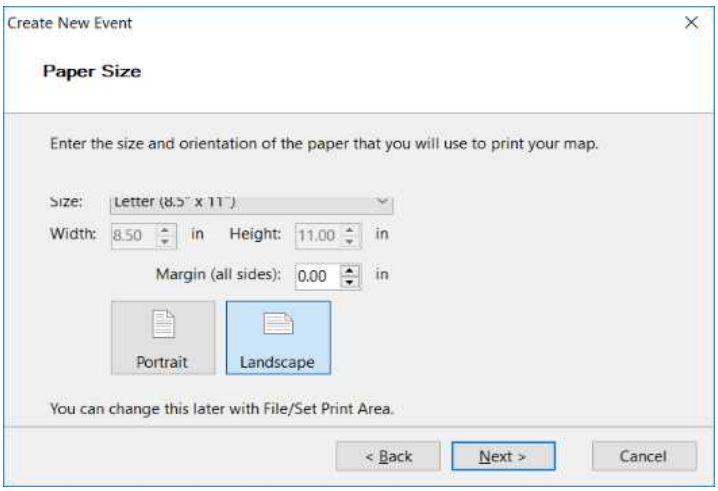
The print scale is typically the same as the map scale. An exception is when a map for a larger area is divided into a number of smaller courses.



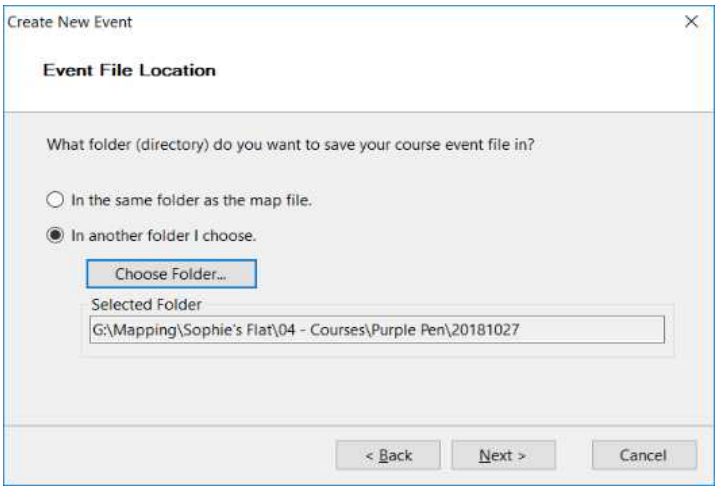
6. Set the Paper Size.

Pay special attention to this setting. Purple Pen does not appear to recognize the paper size of an imported PDF. For this example, the paper size is Letter, Landscape, with 0-inch margins.

The paper size is a function of the basemap. If the basemap is letter sized with portrait orientation, the Purple Pen map must be the same. Any change to the paper size of the original map will skew the map and make it inaccurate in Purple Pen.

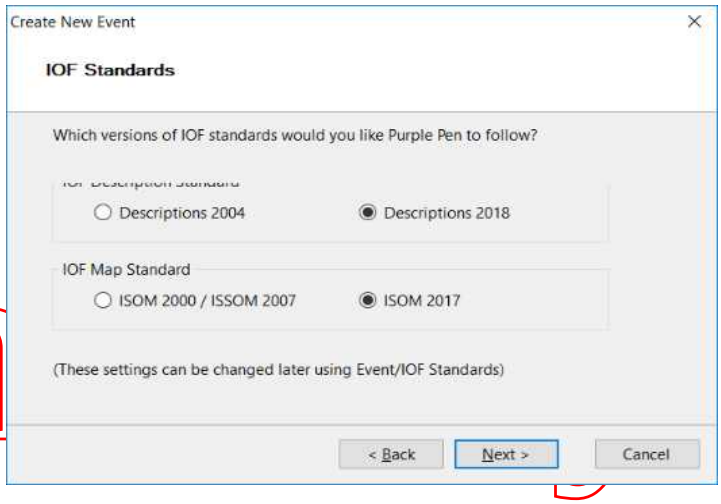


7. Select the Event File Location



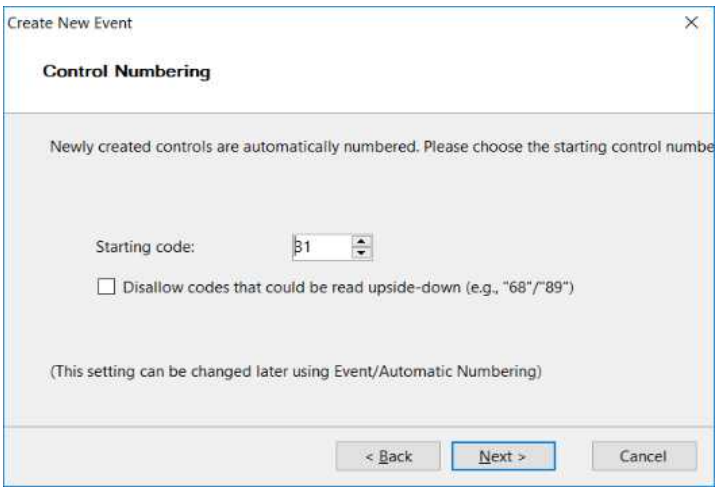
8. Set the IOF Standards

We suggest using the newest standards. Our events do not currently comply with any specific IOF standard.



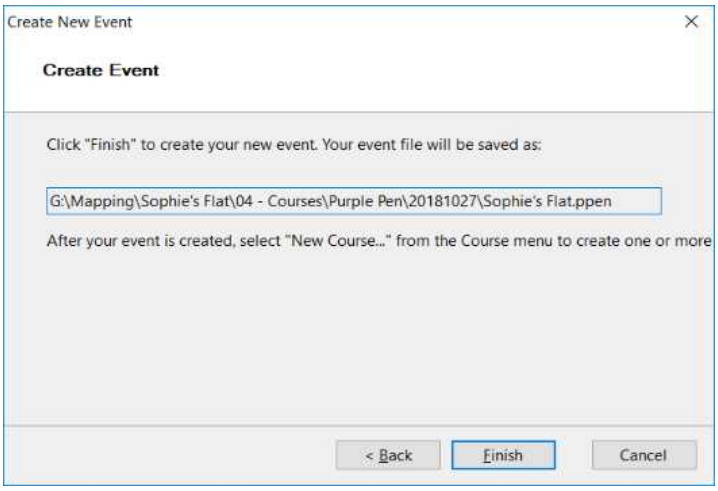
9. Set Control Numbering

It's acceptable to use the default start number "31". We use letter codes for our control locations, so we have to update the control codes later.

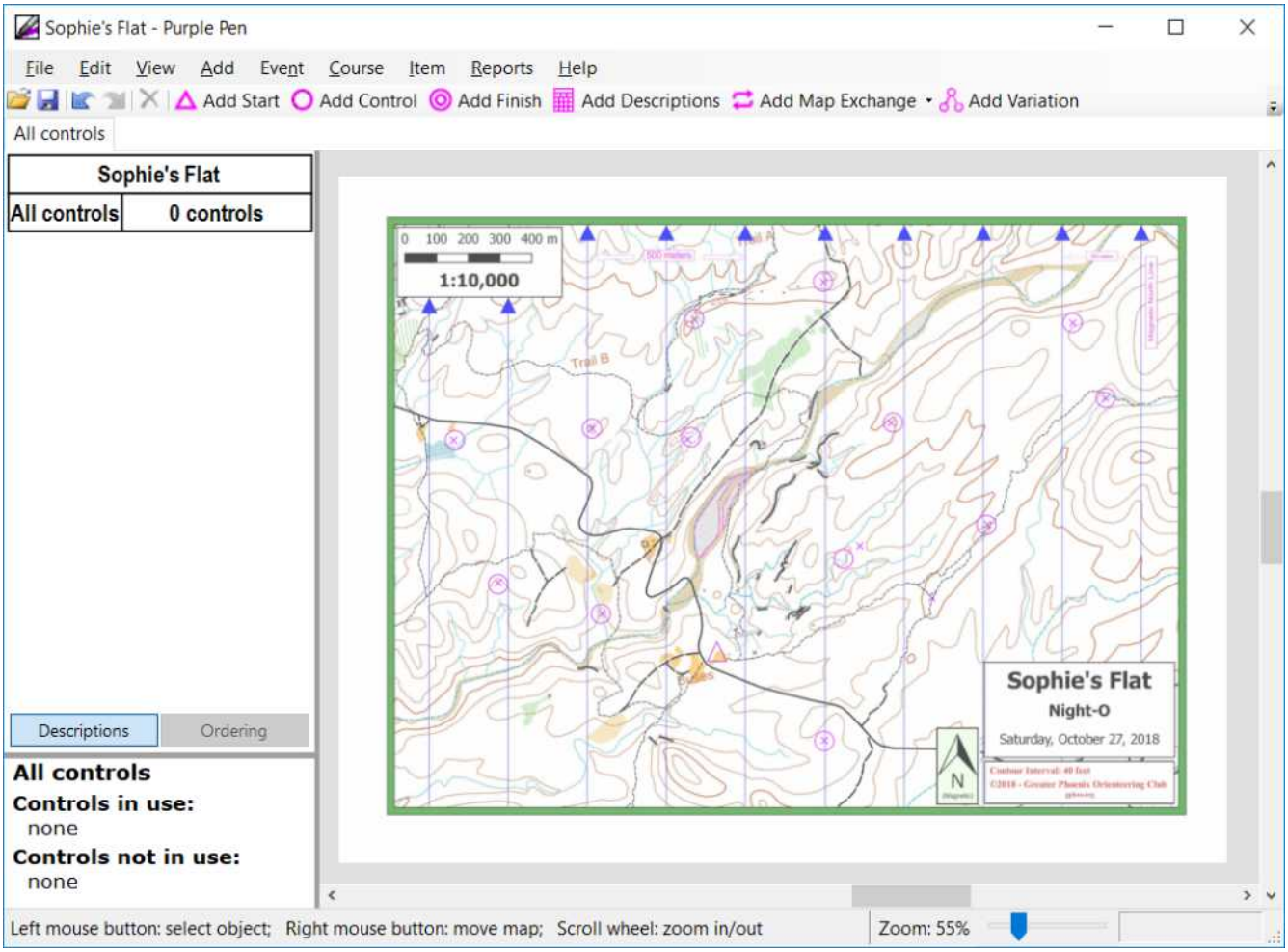


10. Create the Event

Select [Finish]



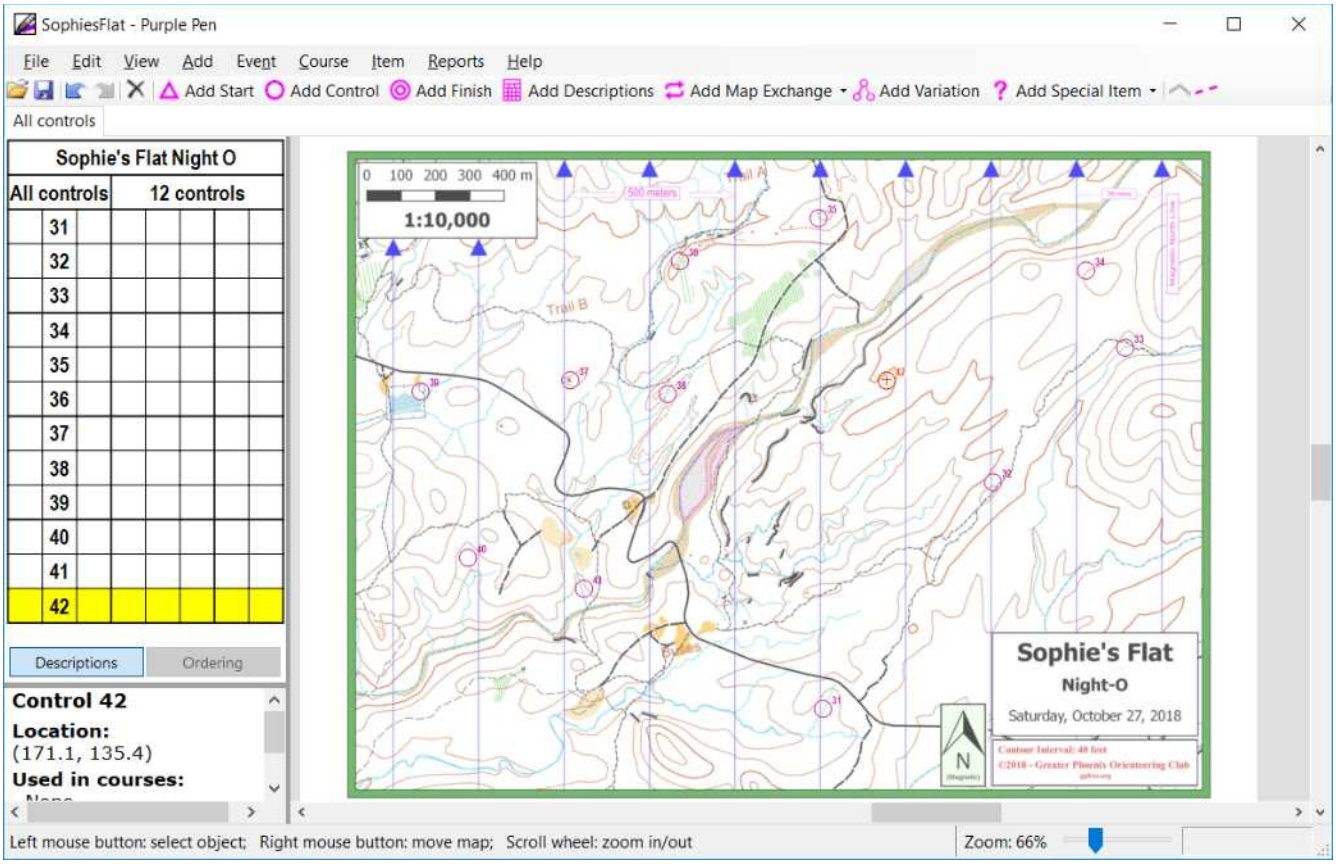
Here is the resulting Purple Pen project screen:



11. Add Control Symbols to Purple Pen.

Place the symbols where they appear on the proposal map. Do not add a Start and Finish here. The Start and Finish are added for each course later (see section 5.4.8.2 "Course Setup").

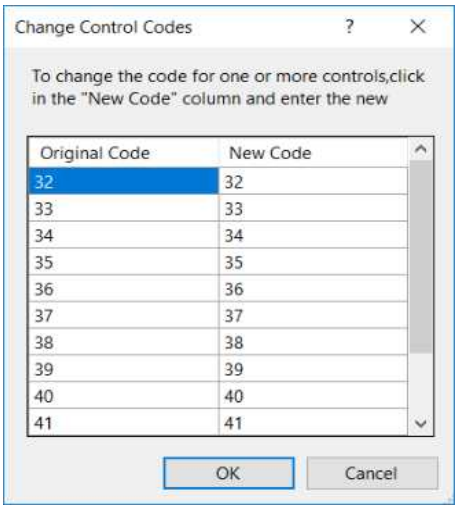
Note: The default scale for the control symbols is relative to the 1:15000 scale. To scale the control symbols more appropriately, press [Event][Customize Appearance] and set "Scale item sizes" = "Relative to map scale".

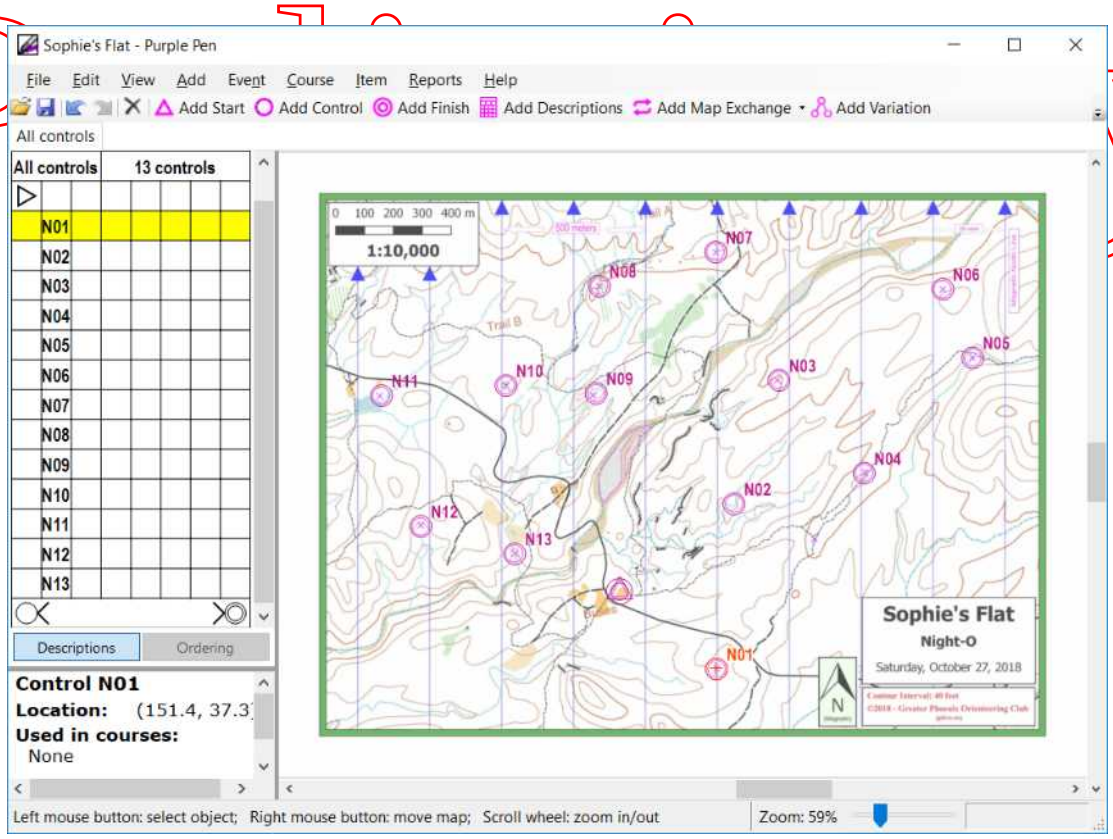


12. Change the Control Codes

The codes are the letters or letter-number combinations on the control markers. The course setter either obtains the codes themselves from the club's gear or gets the codes from the club's mapper.

One easy way to change the codes is to select [Event][Change Control Codes].





5.8.4.2 Course Setup

Create a new course by selecting [Course][Add Course]

- Provide a name for the course.
- Select the course type, either Normal or Score

  In a normal event, participants travel to each point in order. In a score event, participants travel to whatever points they think they can get to in the allocated time.
- The remaining options depend on the type of course.

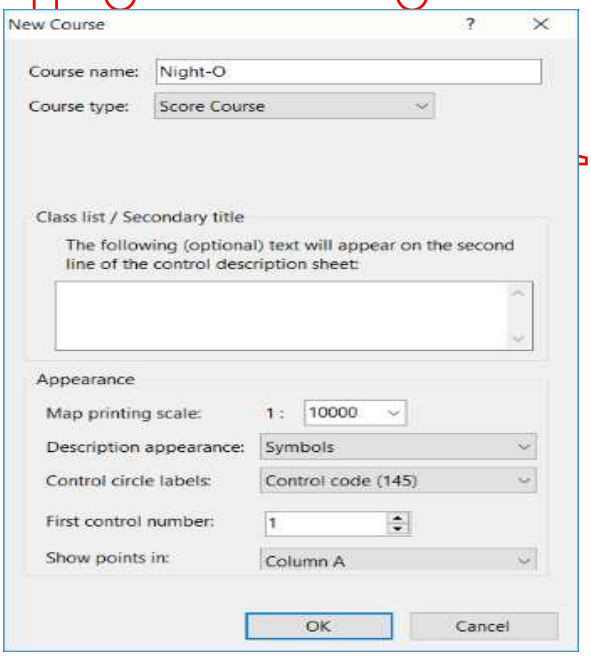
5.8.4.2.1 Classic Courses

TBD

5.8.4.2.2 Score Courses

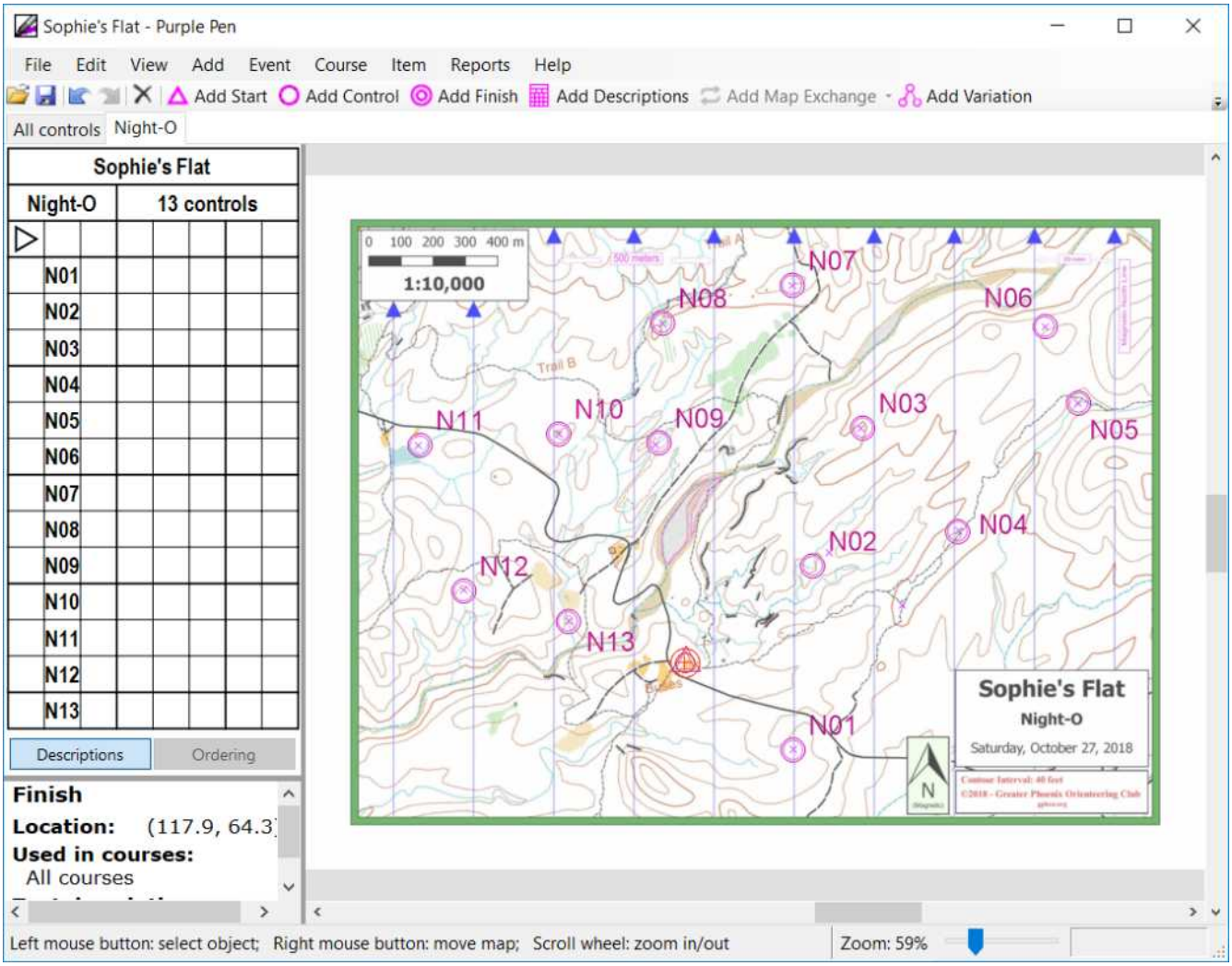
Continuing from the Course Setup

- Set Control circle labels to "Control Code".
- Set Show points in: to Column A
- Press OK.

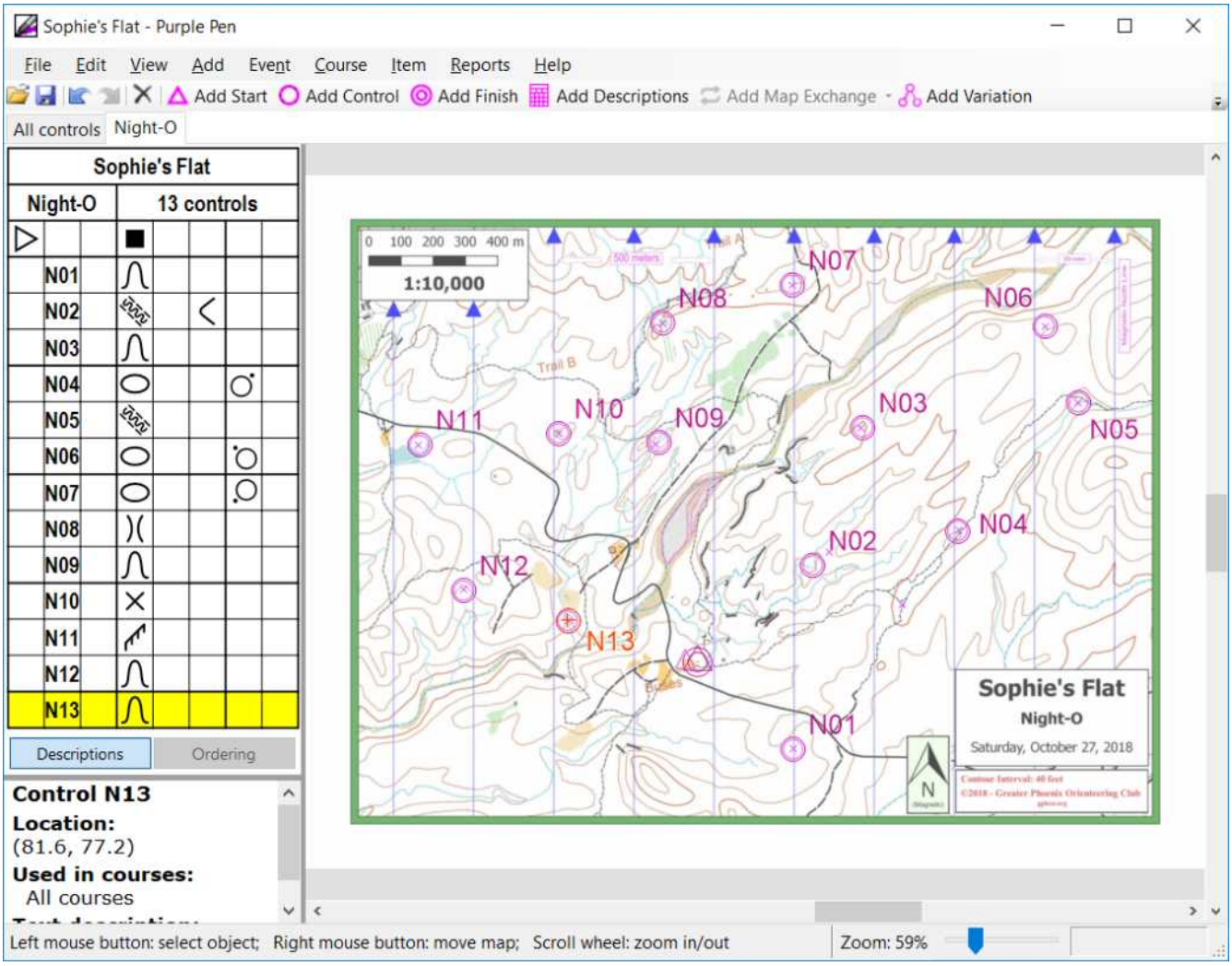


- Add Start, Finish, and Control locations for the course.

  To add controls, click the [Add Control] button. To add control locations for the course, drag the pointer to the location of an existing controls (the ones added earlier in the original Event Setup.) The added control will snap to the location of an existing location.



- Add clues for each control.



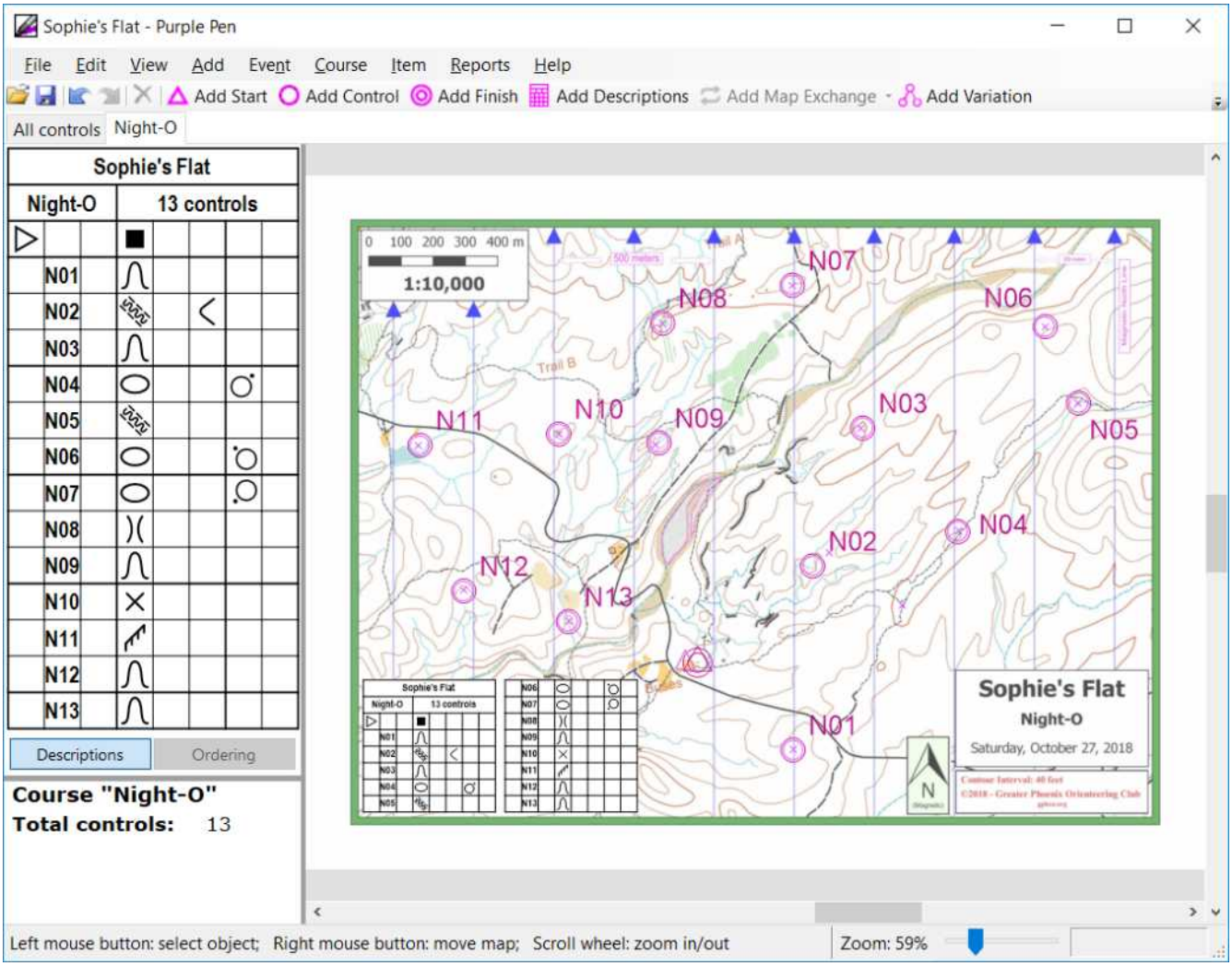
Details of the standard clue symbols are beyond the scope of this document. A good explanation of the symbols is found at http://backwoodsok.org/control-descriptions-and-map-symbols-explained. Examples include:

Column 3 describes which of multiple features contains the control. For example, if there are 3 small gullies near each other and appear on the map, column 3 might indicate "the western gully".

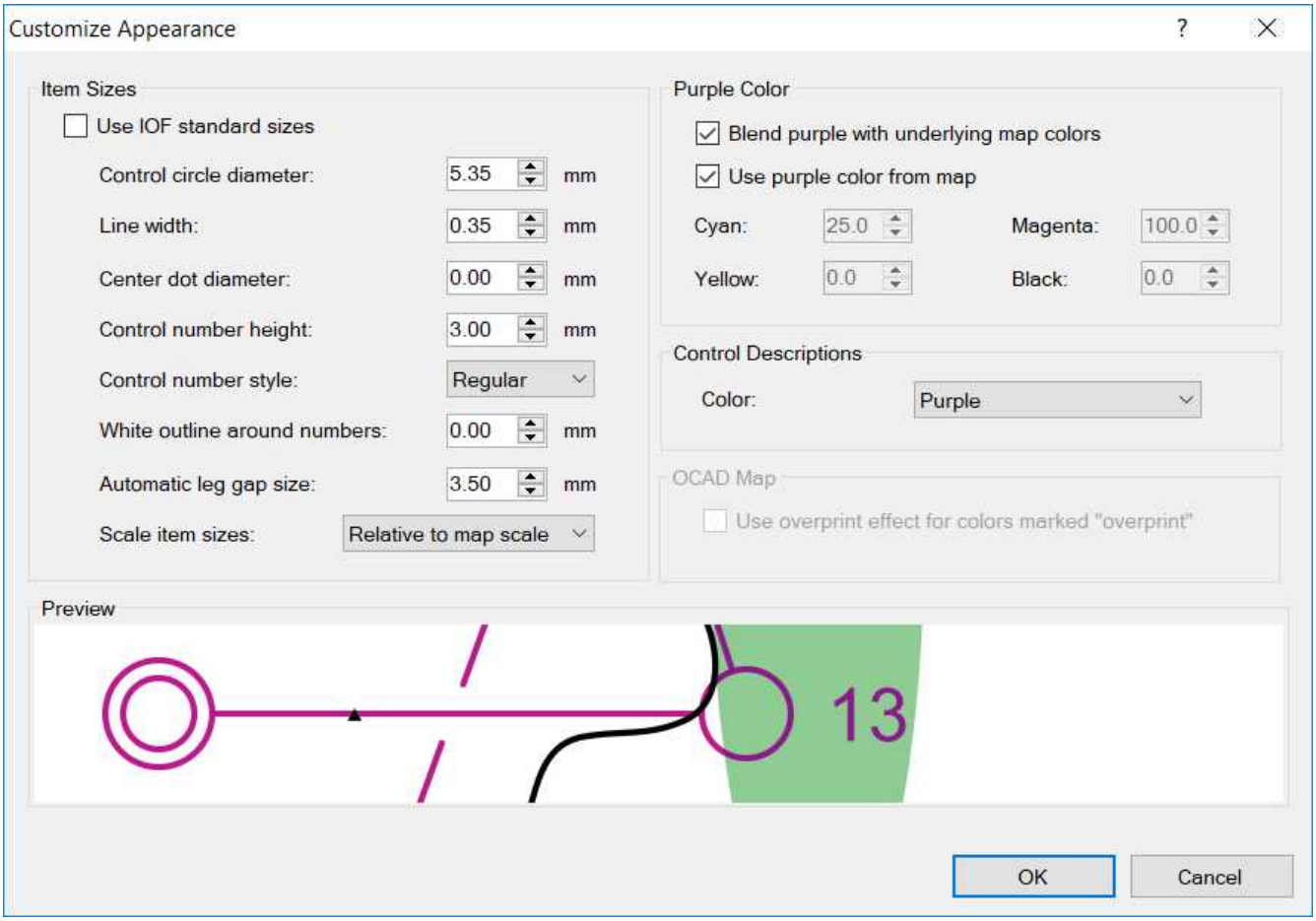
Column 4 is the main description (re-entrant, spur, etc.)

Column 5 is a secondary description. It is used when the control is placed at an intersection of multiple map features, such as a re-entrant, re-entrant junction.

- Add the description table to the map (if there is space) using [Add Descriptions].



- Customize (1) the appearance of the descriptions to "Purple", (2) the size of the control number height to 3.00 mm, and (3) Scale item sizes = "Relative to map scale" by selecting [Event][Customize Appearance].



- Add point values to the controls. Controls closer to the start and easier to navigate to are assigned numbers in the 10's (10,11,12,etc.) which are all worth 10 points. Further out are controls = 20 points, and so on. Point values are arbitrary; there is no rule.
- Customize the map by selecting [Course][Properties], then set (1) Control circle labels = "Code and Score" and (2) Show points in = "Column A".

  Important Note: The current version of Purple Pen does not allow the combination of "Code and Score" and "Show Points in Column A. To get around this limitation:

  1. Set "Control circle labels" = "Control Code" and "Show points in" = "Column A".
  2. Close Purple Pen.
  3. Edit Event.ppen with a text editor.

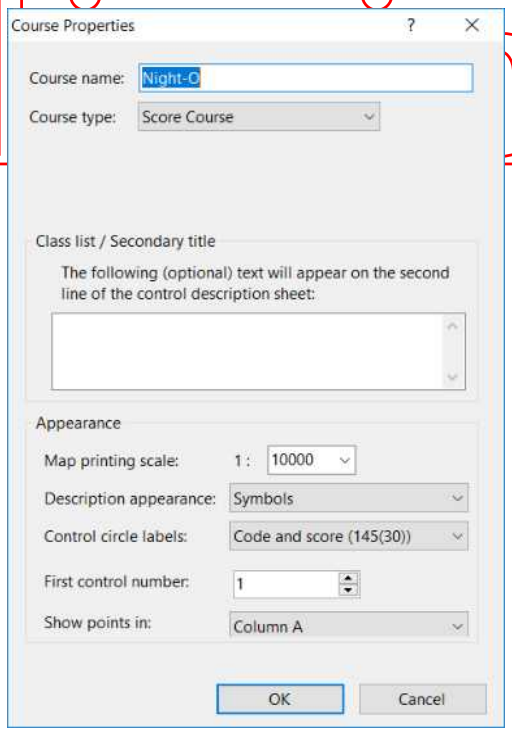
     Use the "find" function of your text editor to locate the text "label-kind". Change "code" to "code-and-score" (the dashes are required).

     Original:

     <labels label-kind="code" />

     Changed:

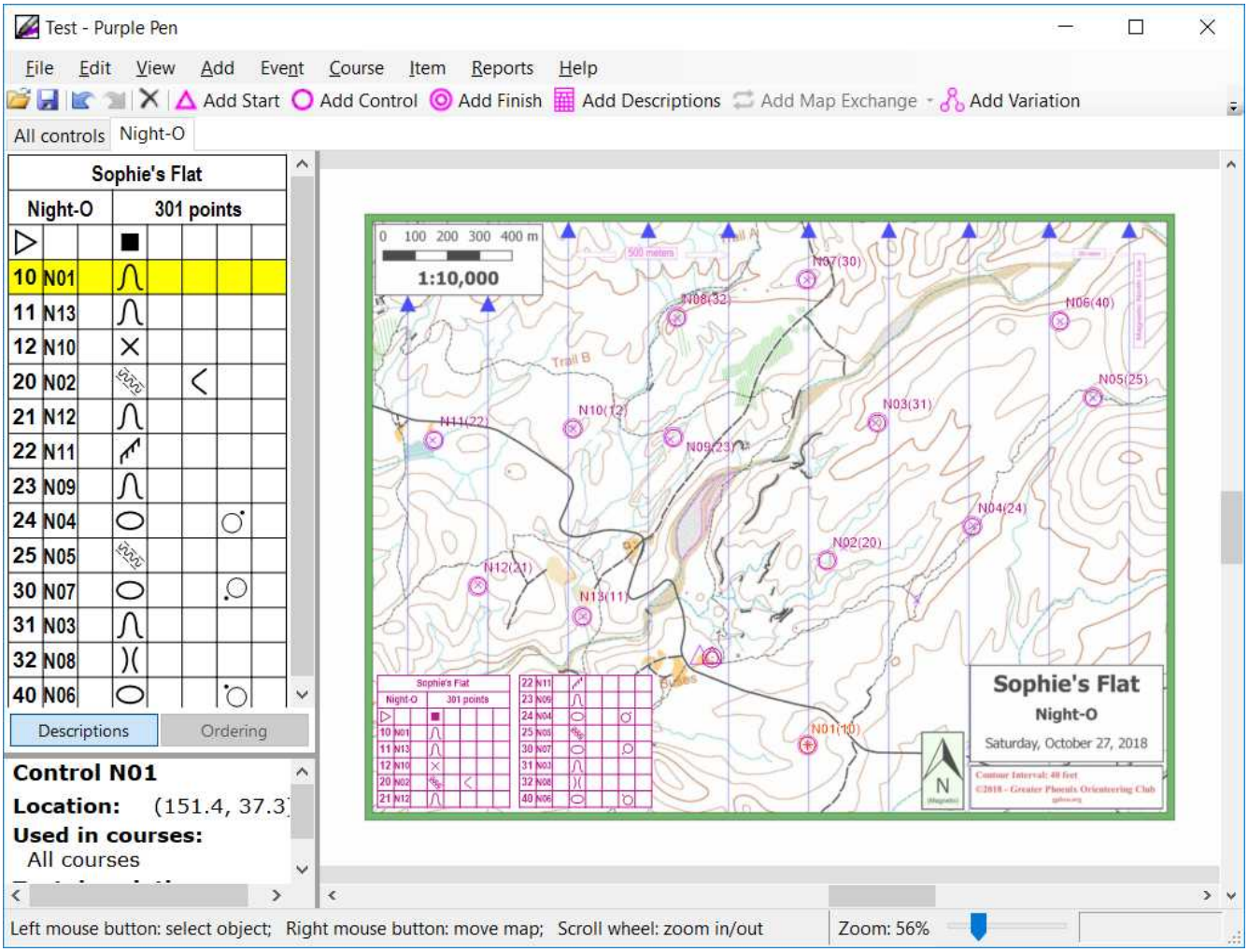
     <labels label-kind="code-and-score" />
  4. Save Event.ppen. Reopen using the Purple Pen software.



- The resulting map shows the control number in the 1st column, the control code in the second column, and the code and number next to the control circles on the map.

Note: When re-opening Purple Pen, the "All controls" tab is selected. Point totals and control descriptions are not included when this tab is selected. To see the course descriptions, select the tab for the specific course

(Night-O in this example).



- One mistake appears in the point value in Purple Pen. In the example above, the points total to 301. We assign 10 points to controls 10, 11, 12, 20 points to 20, 21, 22, etc. Our actual score is the total of all controls added together.

  10, 11, 12 = 30 Points

  20, 21, 22, 23, 24, 25 = 120 Points

  30, 31, 32 = 90 Points

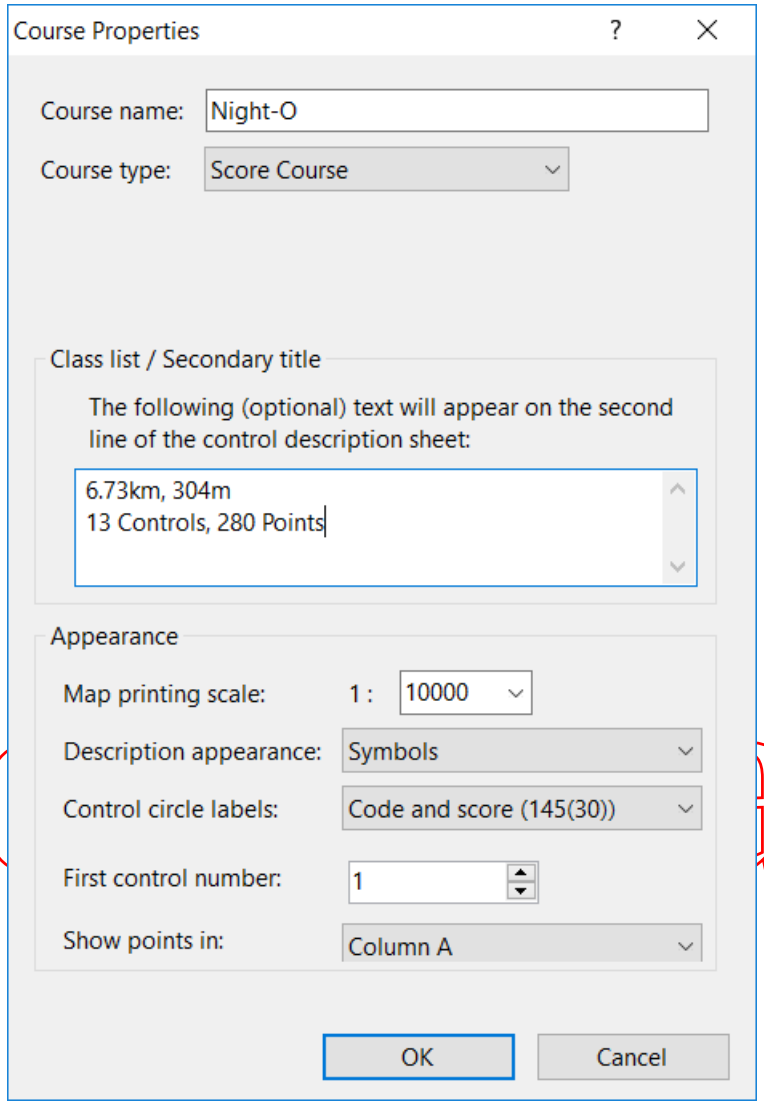
  40 = 40 Points

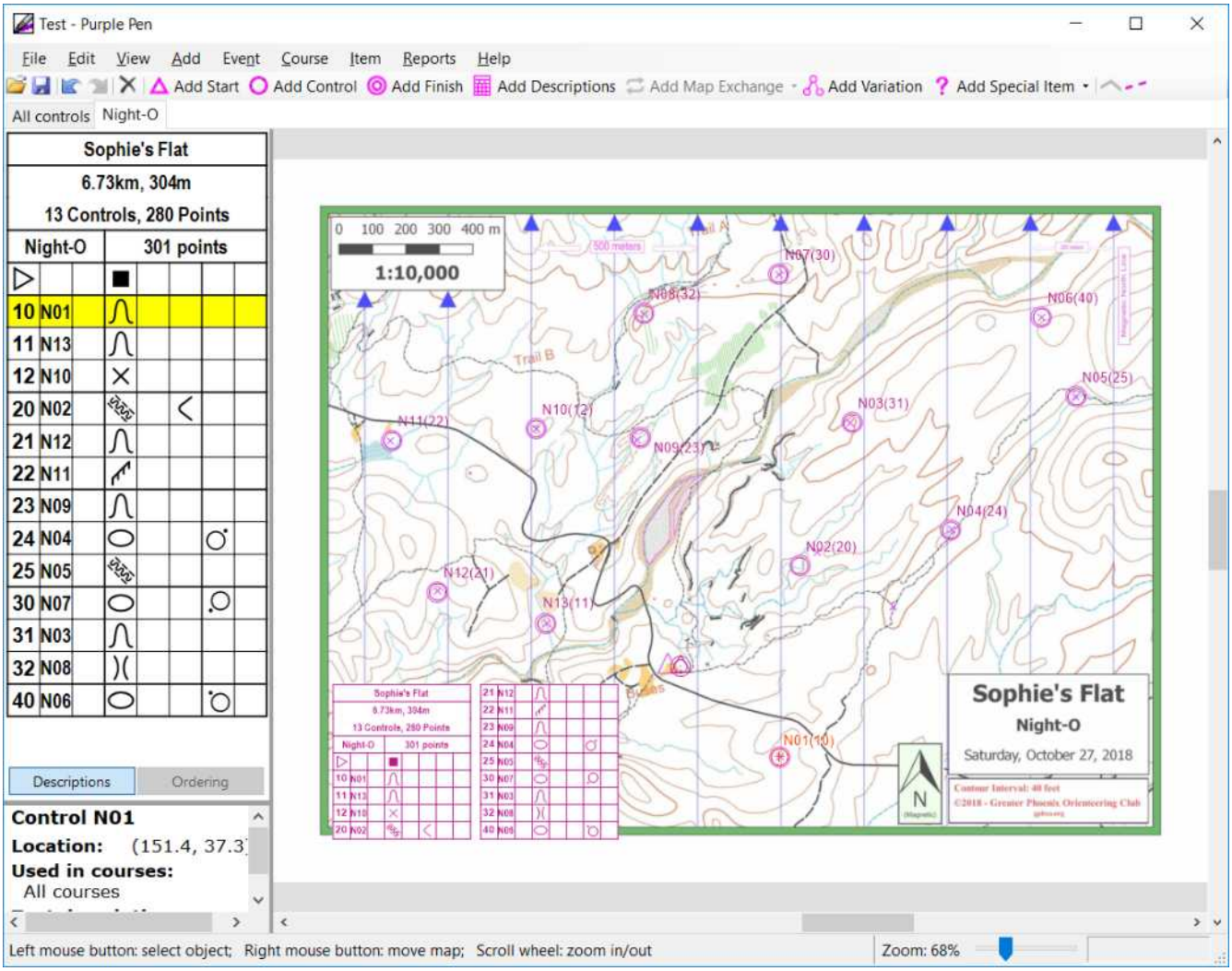
  Total = 30 + 120 + 90 + 40 = 280 Points.

  We correct the problem by adding text as a secondary title and placing a white blank rectangle over the points in the PDF output. (See description for 8_[Event]_Descriptions.pdf below.)

- Add a secondary title using [Course][Properties]. Add information for the distance and climb obtained from Google Earth in Step 6. Add the total number of controls and total points.

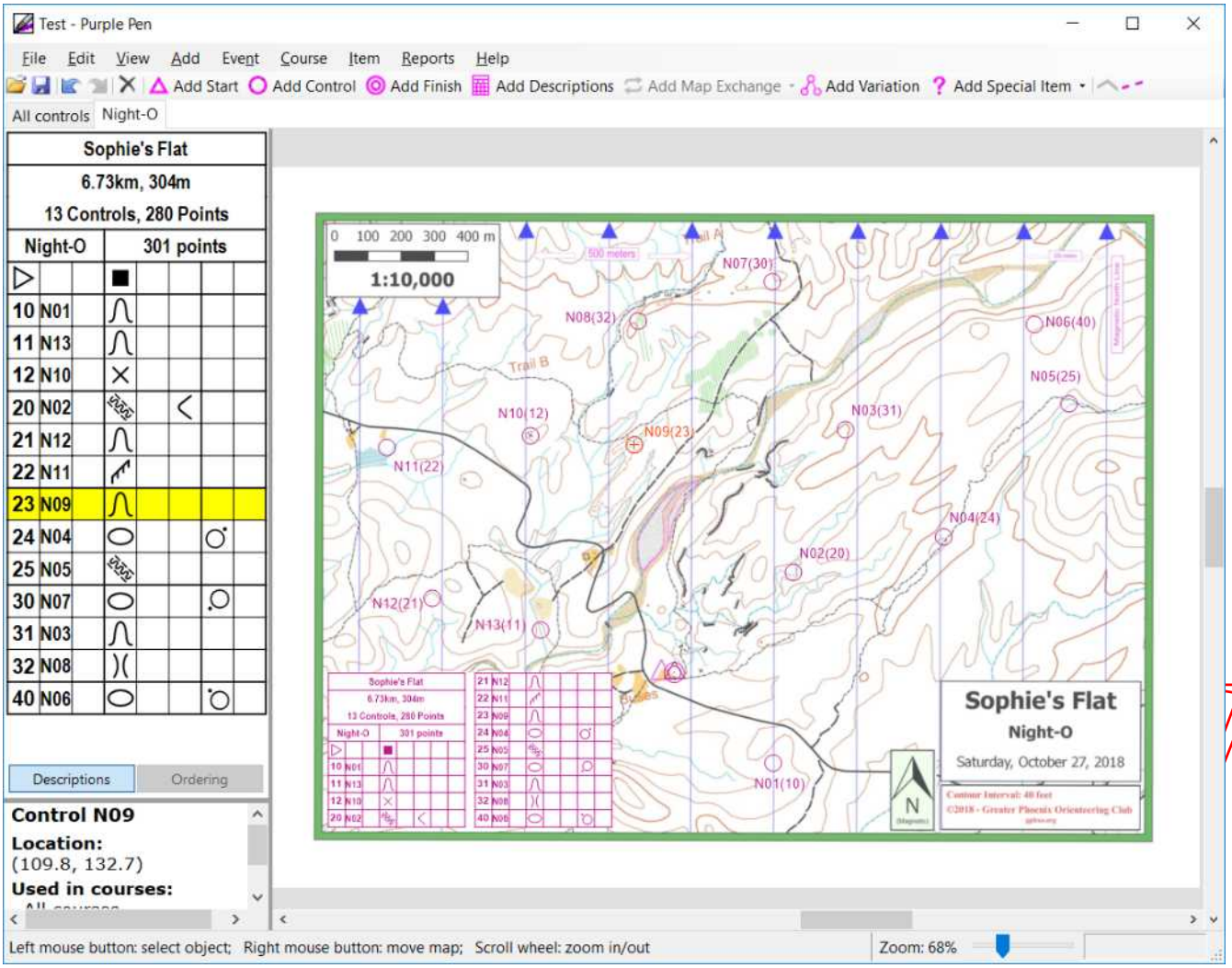
Note: The distance here is the actual straight-line distance. It is not the "equivalent distance".





- If using the OOM map with controls, replace the OOM map with baseline .jpg by selecting [Event][Map File], then loading **[Event]**_Baseline.pdf.
- Move the control circle labels to make them more readable.
- Print the final map using [File][Print Courses]. Save as **[Event]**_Map.pdf.
- Print the Control Descriptions using [File][Print Descriptions]. For "Description Type", select "Symbols". Save as **[Event]**_Descriptions.pdf.
- Print the Control Descriptions again using [File][Print Descriptions]. This time, for "Description Type", select "Symbols and Text". Save as **[Event]**_Clues.pdf.
- Print the Control Card again using [File][Print Punch Cards]. Select [Punch Card Layout]. Select "10" for columns. Select "1" for rows if there are 1-10 controls, "2" if there are 11-20 controls, "3" if there are 21-30 controls. Save as **[Event]**_ControlCard.pdf.
- Save the Purple Pen file as **[Event]**.ppen

[Event].pdf:

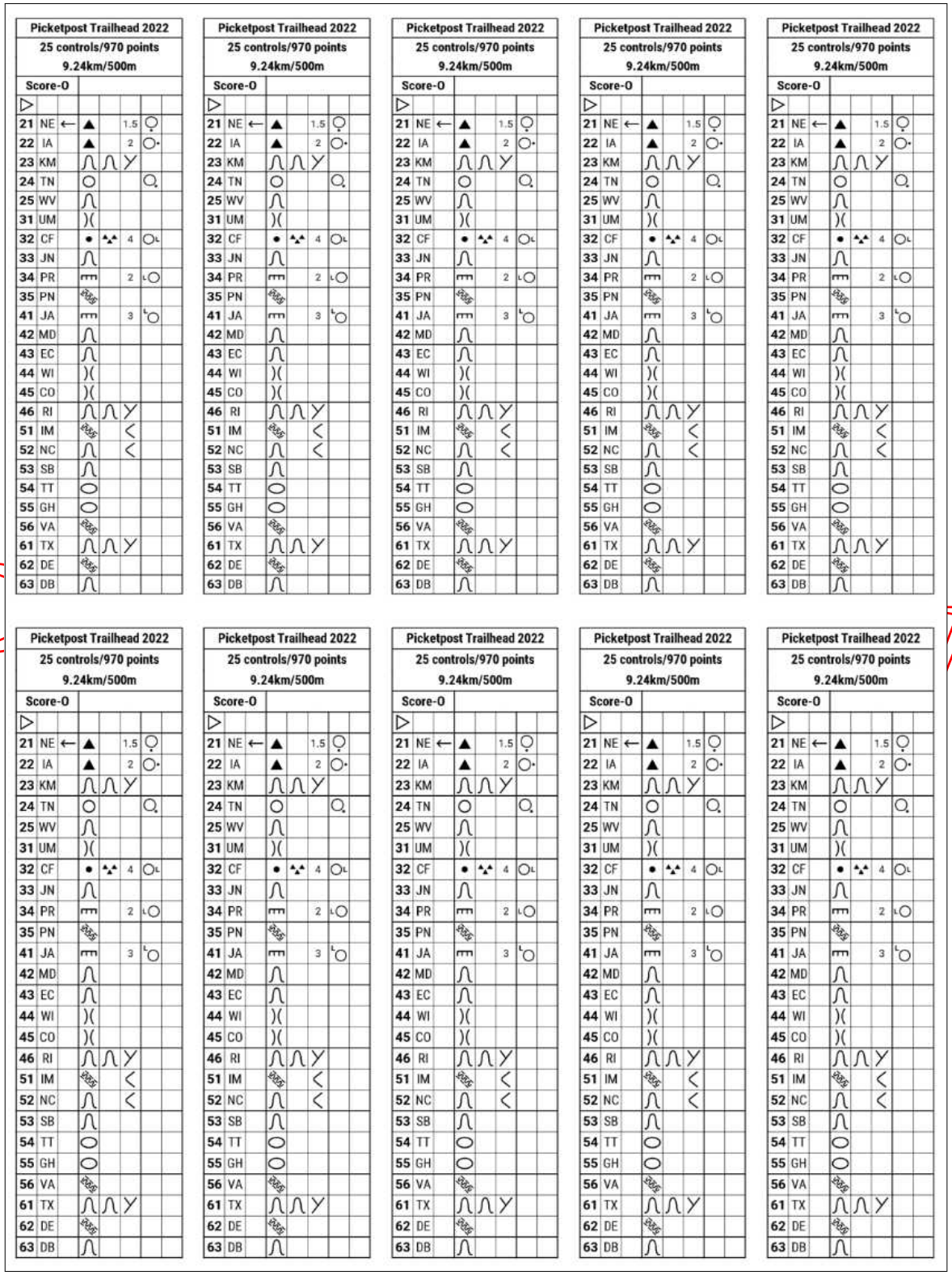

Test - Purple Pen
File Edit View Add Event Course Item Reports Help
Add Start Add Control Add Finish Add Descriptions Add Map Exchange Add Variation Add Special Item
All controls Night-O
Sophie's Flat
6.73km, 304m
13 Controls, 280 Points
Night-O 301 points
10 N01
11 N13
12 N10
20 N02
21 N12
22 N11
23 N09
24 N04
25 N05
30 N07
31 N03
32 N08
40 N06
Descriptions Ordering
Control N09
Location:
(109.8, 132.7)
Used in courses:
0 100 200 300 400 m
1:10,000
N07(30)
N08(32)
N06(40)
N05(25)
N10(12)
N09(23)
N03(31)
N11(22)
N04(24)
N02(20)
N12(21)
N13(11)
N01(10)
Sophie's Flat
Night-O
Saturday, October 27, 2018
Left mouse button: select object; Right mouse button: move map; Scroll wheel: zoom in/out
Zoom: 68%

[Event]_Descriptions.pdf:

Note: The PDF file was post-processed with PDFXChangeViewer v. 2.5 to overwrite the "301 Points" (text to the right of Night-O) with a white box.

Sophie's Flat							
6.73km, 304m 13 Controls, 280 Points							
Night-O							
▷			■				
10	N01		∩				
11	N13		∩				
12	N10		×				
20	N02		≈		<		
21	N12		∩				
22	N11		⌐				
23	N09		∩				
24	N04		○			◎	
25	N05		≈				
30	N07		○			◎	
31	N03		∩				
32	N08		)(				
40	N06		○			◎	

Use Inkscape to create [Events]_DescriptionsSheet.pdf.

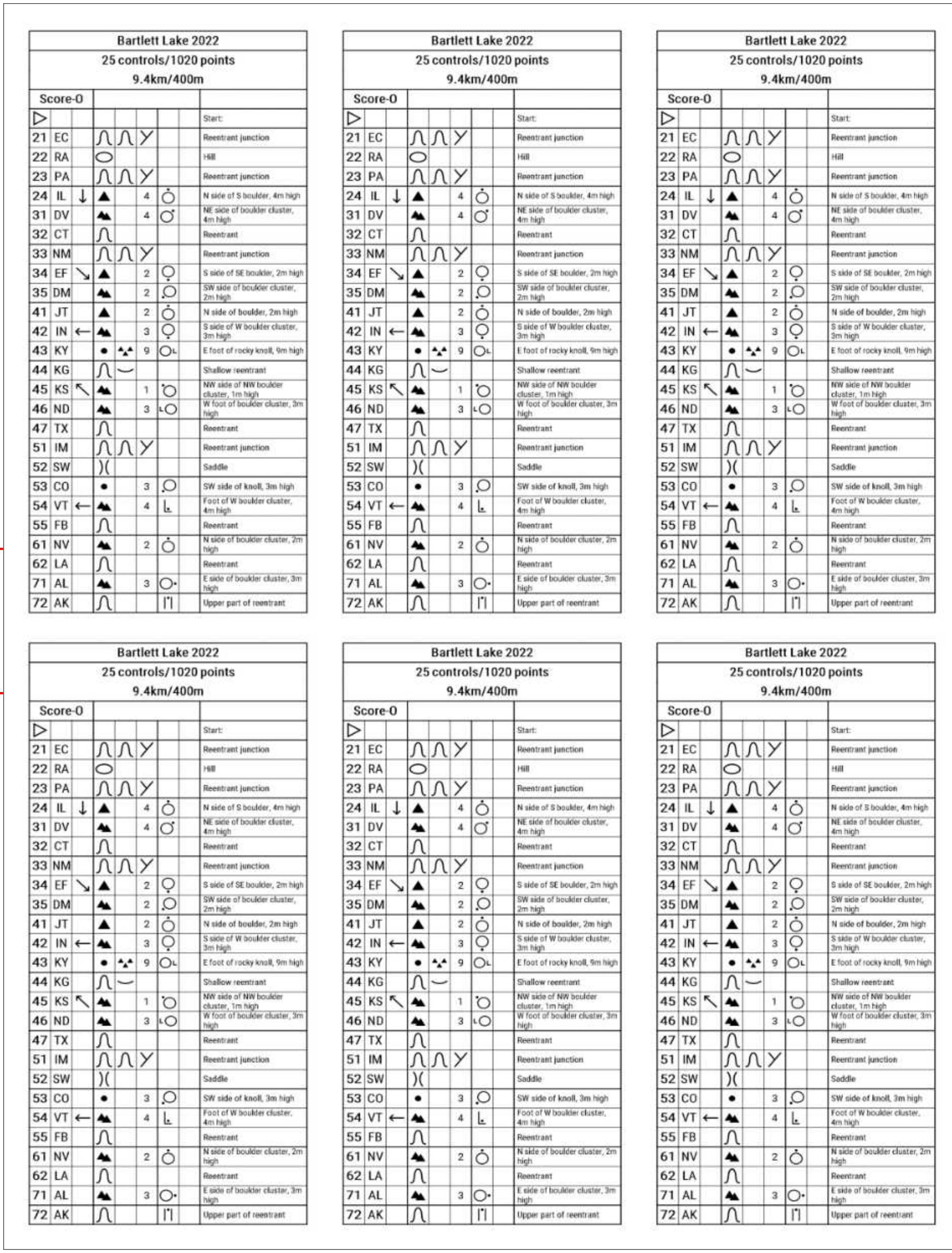


Preliminary

[Event]_Clues.pdf

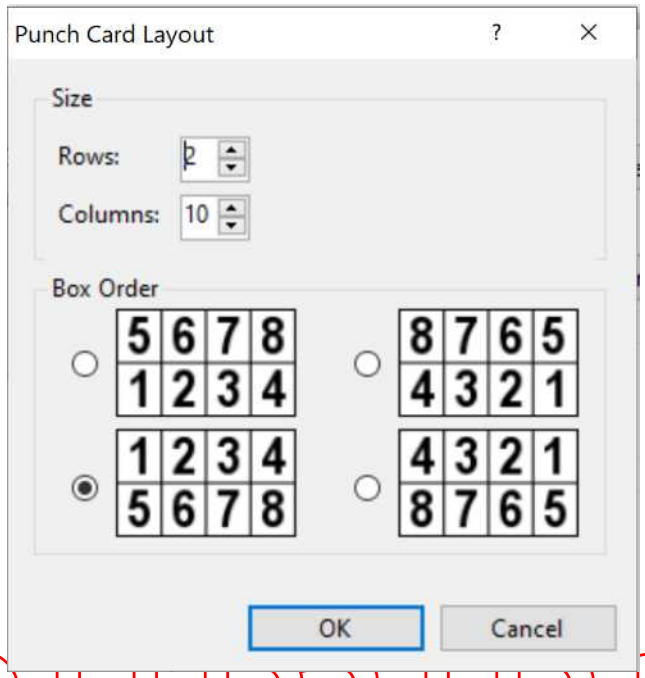
Bartlett Lake 2022								
25 controls/1020 points 9.4km/400m								
Score-O								
▷								Start:
21	EC		∩	∩	Y			Reentrant junction
22	RA		⬭					Hill
23	PA		∩	∩	Y			Reentrant junction
24	IL	↓	▲		4	○		N side of S boulder, 4m high
31	DV		▲		4	○		NE side of boulder cluster, 4m high
32	CT		∩					Reentrant
33	NM		∩	∩	Y			Reentrant junction
34	EF	↘	▲		2	○		S side of SE boulder, 2m high
35	DM		▲		2	○		SW side of boulder cluster, 2m high
41	JT		▲		2	○		N side of boulder, 2m high
42	IN	←	▲		3	○		S side of W boulder cluster, 3m high
43	KY		●	▲▲	9	○		E foot of rocky knoll, 9m high
44	KG		∩	⌣				Shallow reentrant
45	KS	↖	▲		1	○		NW side of NW boulder cluster, 1m high
46	ND		▲		3	○		W foot of boulder cluster, 3m high
47	TX		∩					Reentrant
51	IM		∩	∩	Y			Reentrant junction
52	SW		)(					Saddle
53	CO		●		3	○		SW side of knoll, 3m high
54	VT	←	▲		4	∟		Foot of W boulder cluster, 4m high
55	FB		∩					Reentrant
61	NV		▲		2	○		N side of boulder cluster, 2m high
62	LA		∩					Reentrant
71	AL		▲		3	○		E side of boulder cluster, 3m high
72	AK		∩					Upper part of reentrant

[Event]_CluesSheet.pdf



Bartlett Lake 2022			
25 controls/1020 points			
9.4km/400m			
Score-O			
			Start
21	EC		Reentrant junction
22	RA		Hill
23	PA		Reentrant junction
24	IL	4	N side of S boulder, 4m high
31	DV	4	NE side of boulder cluster, 4m high
32	CT		Reentrant
33	NM		Reentrant junction
34	EF	2	S side of SE boulder, 2m high
35	DM	2	SW side of boulder cluster, 2m high
41	JT	2	N side of boulder, 2m high
42	IN	3	S side of W boulder cluster, 3m high
43	KY	9	E foot of rocky knoll, 9m high
44	KG		Shallow reentrant
45	KS	1	NW side of NW boulder cluster, 1m high
46	ND	3	W foot of boulder cluster, 3m high
47	TX		Reentrant
51	IM		Reentrant junction
52	SW		Saddle
53	CO	3	SW side of knoll, 3m high
54	VT	4	Foot of W boulder cluster, 4m high
55	FB		Reentrant
61	NV	2	N side of boulder cluster, 2m high
62	LA		Reentrant
71	AL	3	E side of boulder cluster, 3m high
72	AK		Upper part of reentrant

[Event]_ControlCard.pdf



Score-O

21 (NE)	22 (IA)	23 (KM)	24 (TN)	25 (WV)	31 (UM)	32 (CF)	33 (JN)	34 (PR)	35 (PN)
41 (JA)	42 (MD)	43 (EC)	44 (WI)	45 (CO)	46 (RI)	51 (IM)	52 (NC)	53 (SB)	54 (TT)
55 (GH)	56 (VA)	61 (TX)	62 (DE)	63 (DB)					

Use inkscape to create **[Event]**_ControlCardSheet.pdf

Picketpost Trailhead 2022
Saturday, December 10, 2022

25 controls/970 points
9.24km/500m

Start: _____
Finish: _____
Points: _____

Name: _____

21 (NE)	22 (IA)	23 (KM)	24 (TN)	25 (WV)	31 (UM)	32 (CF)	33 (JN)	34 (PR)	35 (PN)
41 (JA)	42 (MD)	43 (EC)	44 (WI)	45 (CO)	46 (RI)	51 (IM)	52 (NC)	53 (SB)	54 (TT)
55 (GH)	56 (VA)	61 (TX)	62 (DE)	63 (DB)					

Picketpost Trailhead 2022
Saturday, December 10, 2022

25 controls/970 points
9.24km/500m

Start: _____
Finish: _____
Points: _____

Name: _____

21 (NE)	22 (IA)	23 (KM)	24 (TN)	25 (WV)	31 (UM)	32 (CF)	33 (JN)	34 (PR)	35 (PN)
41 (JA)	42 (MD)	43 (EC)	44 (WI)	45 (CO)	46 (RI)	51 (IM)	52 (NC)	53 (SB)	54 (TT)
55 (GH)	56 (VA)	61 (TX)	62 (DE)	63 (DB)					

Picketpost Trailhead 2022
Saturday, December 10, 2022

25 controls/970 points
9.24km/500m

Start: _____
Finish: _____
Points: _____

Name: _____

21 (NE)	22 (IA)	23 (KM)	24 (TN)	25 (WV)	31 (UM)	32 (CF)	33 (JN)	34 (PR)	35 (PN)
41 (JA)	42 (MD)	43 (EC)	44 (WI)	45 (CO)	46 (RI)	51 (IM)	52 (NC)	53 (SB)	54 (TT)
55 (GH)	56 (VA)	61 (TX)	62 (DE)	63 (DB)					

5.9 Step 9: Create Control Card/Clues/Descriptions

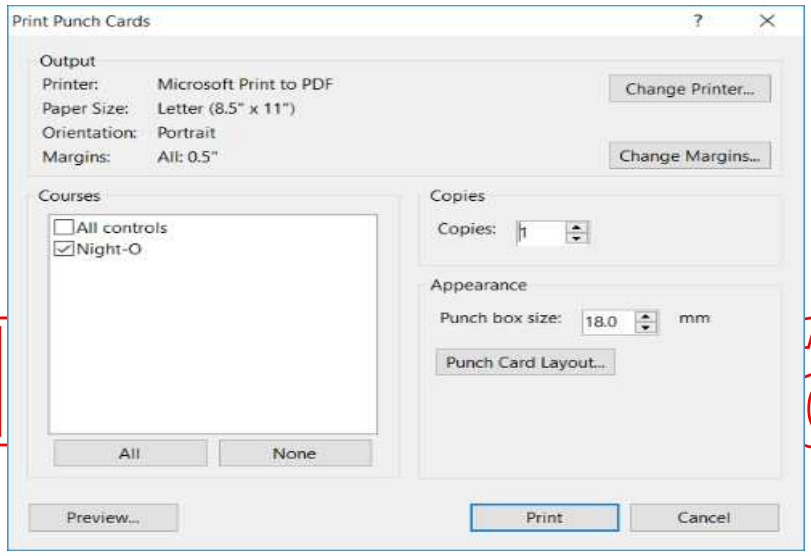
We use Purple Pen to generate simple control cards. Purple Pen also creates the descriptions (symbols only) and The control card is used with our manual punch system.

The club also uses a more customized control card that includes clues on the card itself. We currently create the customized control card using Excel.

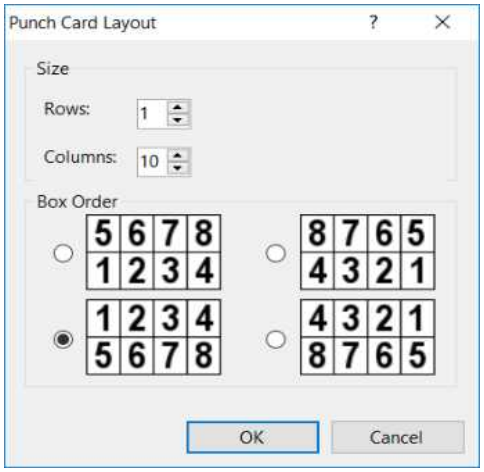
5.9.1 Purple Pen: Create a Simple Control Card

To create a simple control card in Purple Pen:

- Select [File][Print Punch Cards]
- Select the course then press [Punch Card Layout]



- Select the desired layout. We use 10 columns for our control cards. Select 1 row if you need a card for 1-10 controls, 2 rows for 11-20 controls, 3 rows for 21-30 controls, etc.



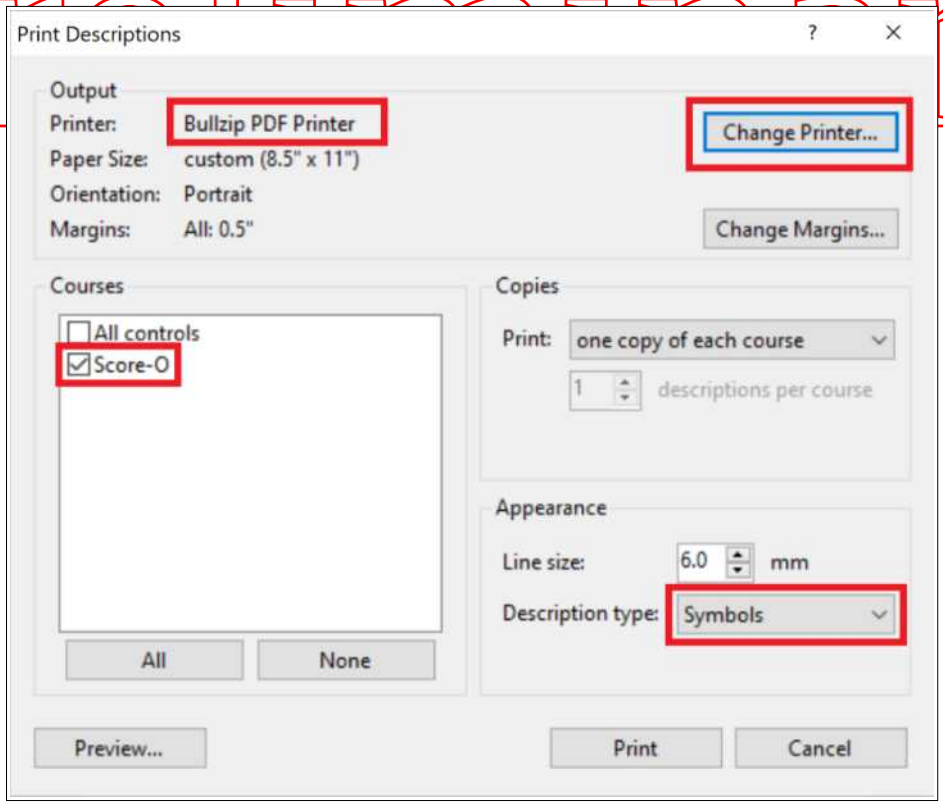
- Select [Print] and save to [Event]_ControlCard.pdf

Night-O									
10 (N01)	*11* (N13)	*12* (N10)	*20* (N02)	*21* (N12)	*22* (N11)	*23* (N09)	*24* (N04)	*25* (N05)	*30* (N07)
31 (N03)	*32* (N08)	*40* (N06)							

5.9.2 Purple Pen: Create Descriptions and Clues

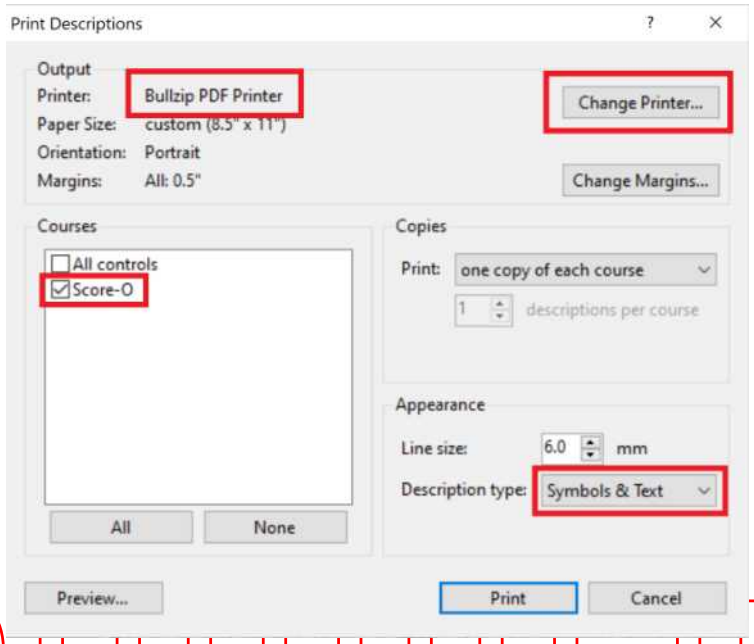
We use Purple Pen to create descriptions for an event (symbols only) and clues (symbols and text). To create the descriptions:

- Select [File][Print Descriptions]
- Select the course, select a print to PDF option, and set "Description Type" = "Symbols".
- Press to create a PDF file with the name **[Event]**_Descriptions.pdf.



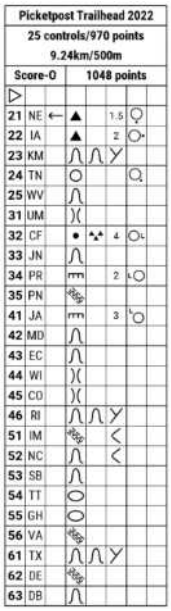
To create the clues:

- Select [File][Print Descriptions]
- Select the course, select a print to PDF option, and set "Description Type" = "Symbols and Text".
- Press to create a PDF file with the name **[Event]**_Clues.pdf.



Examples of the final descriptions and clues:

20221210_PicketpostTrailhead_Descriptions.pdf	**20221105_BartlettLake**_Clues.pdf



5.9.3 Excel: Create a Customized Control Card/Clue Sheet (Obsolete)

The instructions in this section are obsolete and no longer used. They are maintained here in case we decide to resurect the Excel spreadsheet in the future. Purple Pen provides a much simpler way of creating the control card, clue sheet, and descriptions sheet.

- Obtain a copy of "ControlCard_Template.xls".
- Rename the file as **[Event]**_ControlCard.xls.
- On the "Data" sheet, include the Location, Day, and Date
- Determine the number of lines you want on your control card. In this example, we'll create a control card with two lines.
- Complete the Course Name, Distance, and Elevation for each line used.

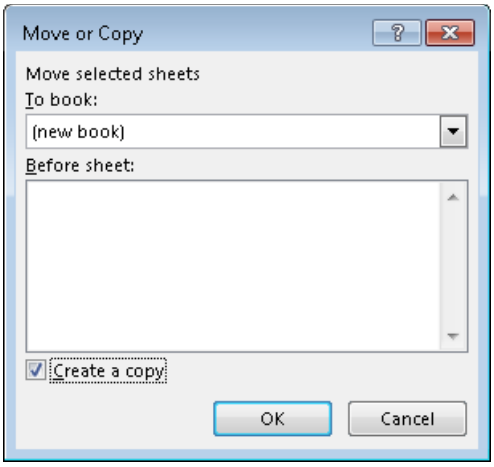
Location		Sophie's Flat	
Day		Saturday	
Date (Mmm DD, YYYY		Oct 27, 2018	

Course Name	Distance	+ Elevation	Notes	Start Control	End Control	Valid?
Night-O	6.73	304		1	10	OK
Night-O	6.73	304		11	20	OK
				21	30	OK
				31	40	OK
				41	50	OK

- Enter the point value (for Score-O), Displayed Code, and Points (for Score-O).
- Select the correct symbols from the drop down menu. (Follow IOF standards for control symbols).

			Hidden Code	#	Displayed Code	Clear All Points	Clr C C	Clr D D	Clr E E	Clr F(1) F	Clr F(2) F	Clr G G	Clr H H
Ctl Num	Course												
01	Night-O			10	N01	10							
02	Night-O			11	N13	10							
03	Night-O			12	N10	10							
04	Night-O			20	N02	20							
05	Night-O			21	N12	20							
06	Night-O			22	N11	20							
07	Night-O			23	N09	20							
08	Night-O			24	N04	20							
09	Night-O			25	N05	20							
10	Night-O			30	N07	20							
11	Night-O			31	N03	30							
12	Night-O			32	N08	30							
13	Night-O			40	N06	40							
14	Night-O												

- Right Click on Clue Sheet 1, select [Move/Copy], and check [Create a Copy] to a new book.



- Do the same for Control Card 1

  The Clue Sheet and Control Card sheets are particularly susceptible to problems with Excel. To avoid problems, the user needs to manipulate the sheets from a new worksheet.

New Clue Sheet:

- On the new Clue Sheet sheet, remove excess lines.

  Close any resulting Visual Basic debug windows that appear. To avoid the error windows, we will replace this Excel spreadsheet with something else in the future.
- Make any changes to the clue sheet text.
- Save the Clue Sheet as **[Event]**_ClueSheet.xls.
- Print the Clue Sheet to **[Event]**_ClueSheet.pdf.

New Control Card:

The control card is double sided.

- Remove unused rows for both sides of the sheet.
- Save the Control Card as **[Event]**_ControlCard.xls,
- Print the Control Card as **[Event]**_ControlCard.pdf.
- Advanced Topic: Open the PDF Control Card in Inkscape. Open page 1 to include more than 2 cards per sheet. Do the same with page 2. Note: You can set each copy of the control card at a specific X,Y location. Place the copies at the same location on page 1 and 2 to get the Control Card to line up as a two-sided sheet.

Sophie's Flat

Saturday, Oct 27, 2018

Course	Distance	Elevation	Notes
Night-O	6.73 km	304 m	
Night-O	6.73 km	304 m	

Course	#	Code	Pts.	C	D	E	F	G	H	Description
Night-O	10	N01	10							re-entrant
Night-O	11	N13	10							re-entrant
Night-O	12	N10	10							special item
Night-O	20	N02	20							minor water channel, bend
Night-O	21	N12	20							re-entrant
Night-O	22	N11	20							fence
Night-O	23	N09	20							re-entrant
Night-O	24	N04	20							hill, northeast side
Night-O	25	N05	20							minor water channel
Night-O	30	N07	20							hill, southwest side
Night-O	31	N03	30							re-entrant
Night-O	32	N08	30							saddle
Night-O	40	N06	40							hill, northwest side

Sophie's Flat, Saturday, Oct 27, 2018

Entry Name: _____ Start Time: ____ : ____ : ____ End Time: ____ : ____ : ____

Points: _____ - _____ = Total Points _____ Elapsed Time: ____ : ____ : ____

Night-O	10 N01	11 N13	12 N10	20 N02	21 N12	22 N11	23 N09	24 N04	25 N05	30 N07
Night-O	31 N03	32 N08	40 N06							

Sophie's Flat, Saturday, Oct 27, 2018

30 N07	25 N05	24 N04	23 N09	22 N11	21 N12	20 N02	12 N10	11 N13	10 N01	Night-O
20	20	20	20	20	20	20	10	10	10	
							40 N06	32 N08	31 N03	Night-O
							40	30	30	

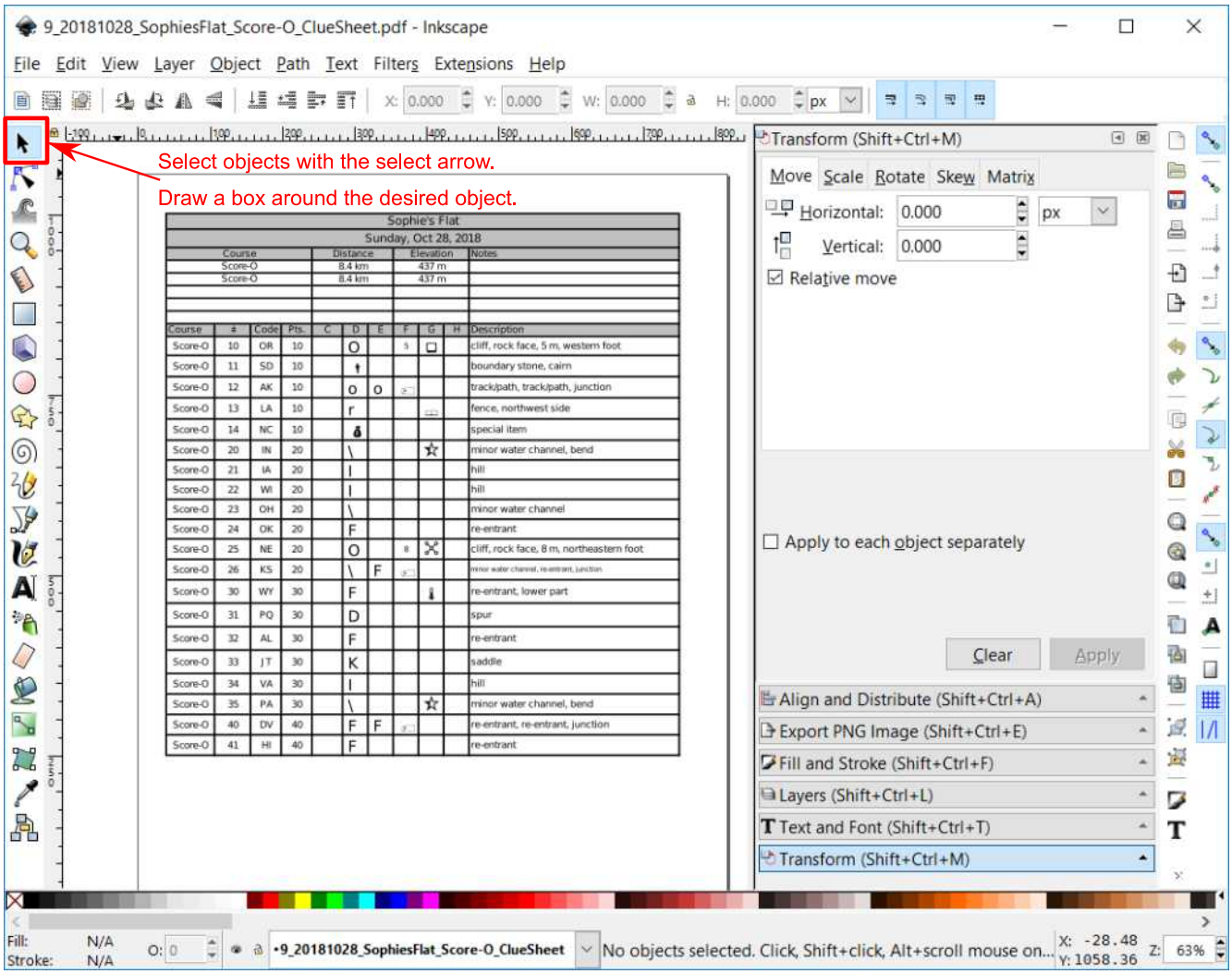
5.10 Step 10: Inkscape - Create Final Control Sheets

The clue sheet, description sheet, and control card created in the previous Purple Pen step do not fill an entire sheet of paper. We can use Inkscape to modify the pdf output to better use the space on the paper.

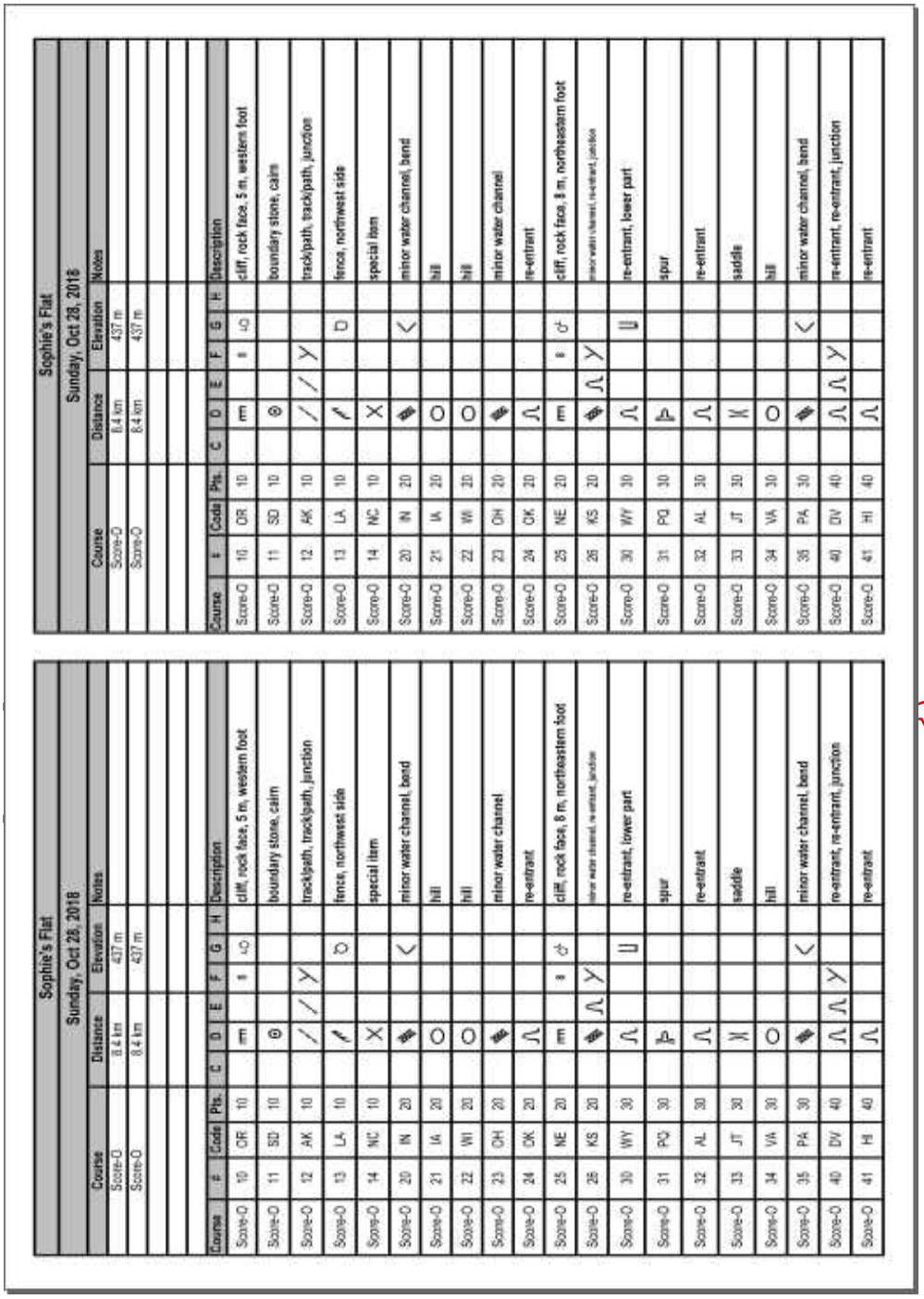
Since the clue sheet, description sheets, and control cards vary from event to event, this section does not provide complete details how to use Inkscape. It's left to the user to learn procedures to manipulate images with this powerful (and free!) vector graphics software.

5.10.1 Clue Sheet

- Open [Event]_ClueSheet.pdf in Inkscape. Use the import setting "Poppler/Cairo import".
- Draw a box around the clue sheet table.



- Change the clue sheet as desired. In this example, we rotate the clue sheet counterclockwise 90 degrees, scale it to fit on half a sheet of paper, and copy and paste it to create 2 clue sheets per sheet of paper.



Sophie's Flat

Sunday, Oct 28, 2018

Course	Distance	Elevation	Notes
Score-O	8.4 km	437 m	
Score-O	8.4 km	437 m	

Course	#	Code	Pts.	C	D	E	F	G	H	Description
Score-O	10	OR	10							cliff, rock face, 5 m, western foot
Score-O	11	SD	10							boundary stone, cairn
Score-O	12	AK	10							track/path, track/path, junction
Score-O	13	LA	10							fence, northwest side
Score-O	14	NC	10							special item
Score-O	20	IN	20							minor water channel, bend
Score-O	21	IA	20							hill
Score-O	22	WI	20							hill
Score-O	23	OH	20							minor water channel
Score-O	24	OK	20							re-entrant
Score-O	25	NE	20							cliff, rock face, 8 m, northeastern foot
Score-O	26	KS	20							minor water channel, re-entrant, junction
Score-O	30	WY	30							re-entrant, lower part
Score-O	31	PQ	30							spur
Score-O	32	AL	30							re-entrant
Score-O	33	JT	30							saddle
Score-O	34	VA	30							hill
Score-O	35	PA	30							minor water channel, bend
Score-O	40	DV	40							re-entrant, re-entrant, junction
Score-O	41	HI	40							re-entrant

Sophie's Flat

Sunday, Oct 28, 2018

Course	Distance	Elevation	Notes
Score-O	8.4 km	437 m	
Score-O	8.4 km	437 m	

Course	#	Code	Pts.	C	D	E	F	G	H	Description
Score-O	10	OR	10							cliff, rock face, 5 m, western foot
Score-O	11	SD	10							boundary stone, cairn
Score-O	12	AK	10							track/path, track/path, junction
Score-O	13	LA	10							fence, northwest side
Score-O	14	NC	10							special item
Score-O	20	IN	20							minor water channel, bend
Score-O	21	IA	20							hill
Score-O	22	WI	20							hill
Score-O	23	OH	20							minor water channel
Score-O	24	OK	20							re-entrant
Score-O	25	NE	20							cliff, rock face, 8 m, northeastern foot
Score-O	26	KS	20							minor water channel, re-entrant, junction
Score-O	30	WY	30							re-entrant, lower part
Score-O	31	PQ	30							spur
Score-O	32	AL	30							re-entrant
Score-O	33	JT	30							saddle
Score-O	34	VA	30							hill
Score-O	35	PA	30							minor water channel, bend
Score-O	40	DV	40							re-entrant, re-entrant, junction
Score-O	41	HI	40							re-entrant

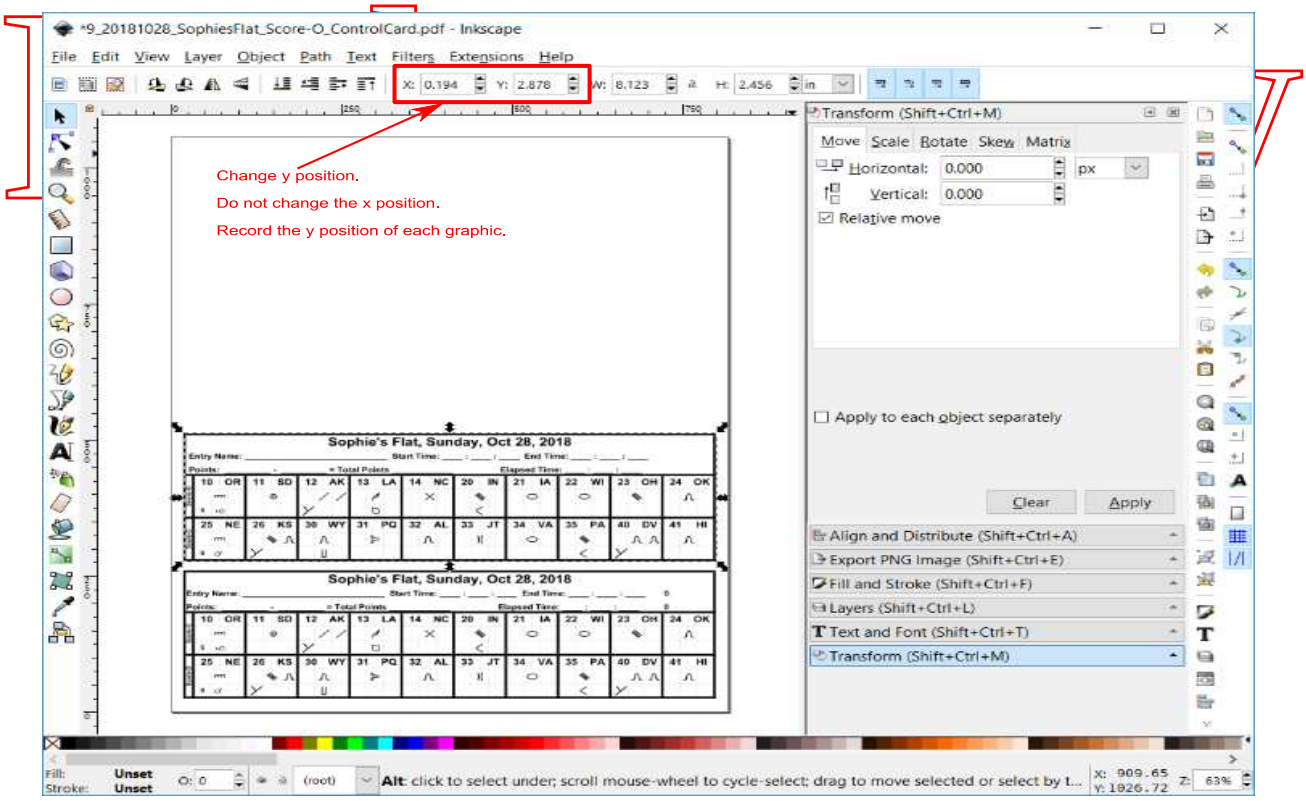
- Save the updated clue sheet as [Event]_ClueSheetSheet.svg.
- Save the updated clue sheet as [Event]_ClueSheetSheet.pdf.

5.10.2 Control Card

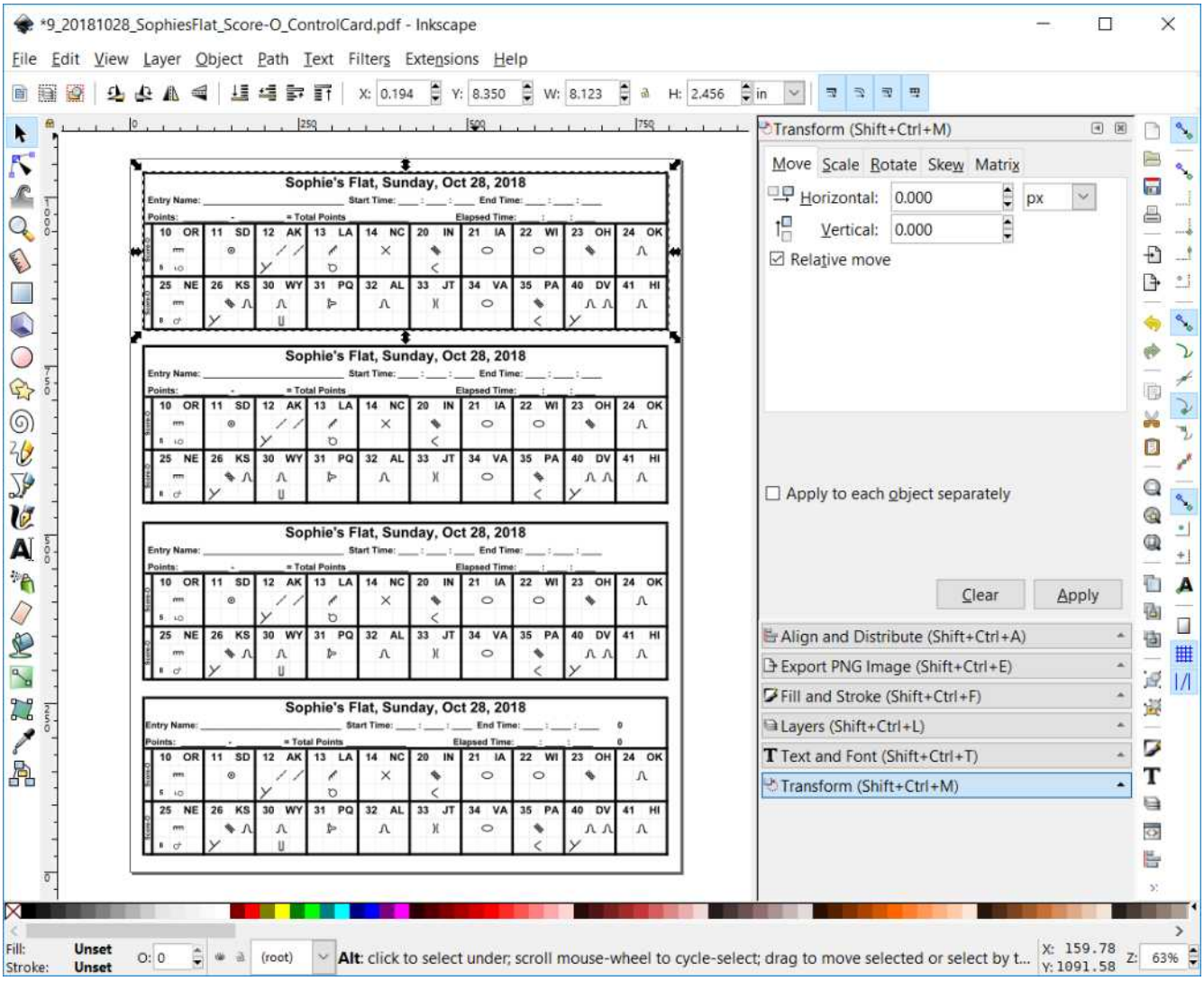
The best way to make multiple copies of the control card is to copy and paste in place several copies of a single card, then use y coordinates to place the copies at different places on the page. The original Excel spreadsheet placed copies on the two pages so that the pages are aligned for double-sided printing. The x coordinates should remain as they originally appear on the sheet.

Repeat the following steps for each page of the control sheet. Import page 1, manipulate the page, then repeat for page 2.

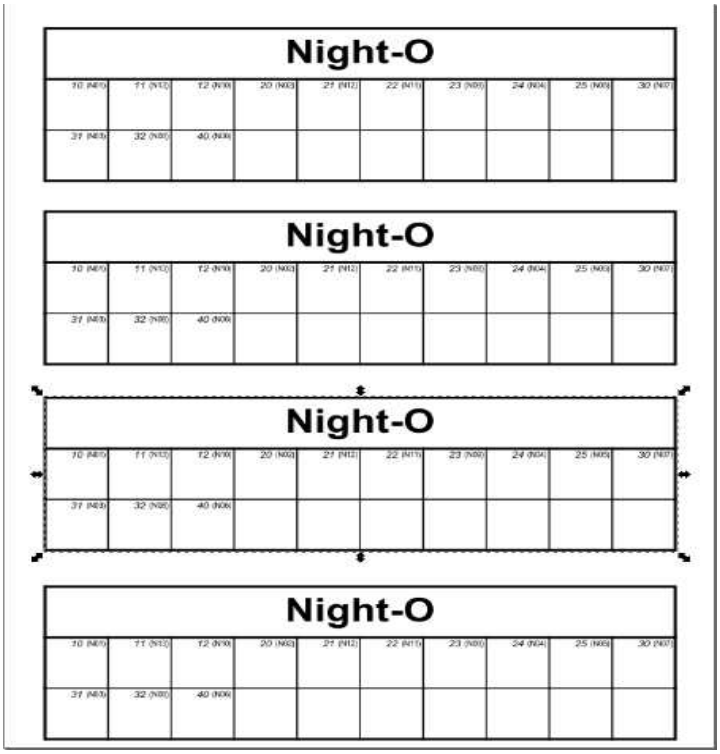
- Import the PDF into Inkscape. Use the import setting "Poppler/Cairo import". Select page 1 or page 2 as appropriate.
- Select the entire graphic, then use cntrl-shift-G to break the graphic into two control sheets.
- Re-select each single control sheet one at a time and press cntrl-G to combine each one as a single graphic.
- Move the lower graphic to y = 0.25 inches.
- Move the second graphic to a y location just above the first. Do not change the x positions.



- In this example, the graphics are at y = 0.25, 2.95, 5.675, and 8.35. The x location of each graphic is x = 0.194. Do not change the default x location.



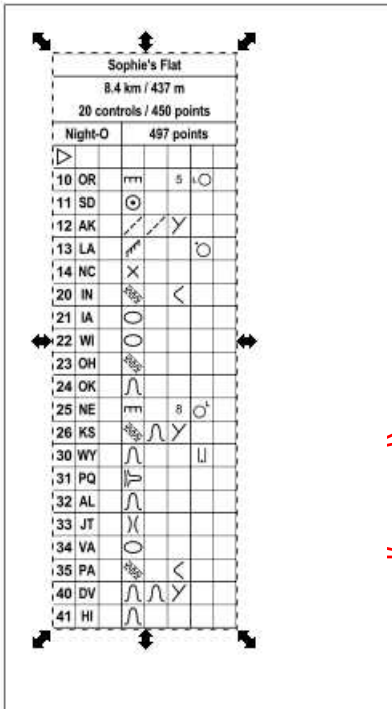
- Save the page as 10_[Event]_ControlCard_PageX.svg. (X is either 1 or 2)
- Save the page as 10_[Event]_ControlCard_PageX.pdf. (X is either 1 or 2)
- Use PDFill to combine page 1 and page 2. Save as [Event]_ControlCardSheet.pdf.
- Advanced Topic: Use Inkscape to create a sheet with multiple control cards on one page.
  - Open the pdf in Inkscape,
  - Use Import Settings = "Poppler/Cairo import".
  - Select the control card as a single block and copy the block.
  - Paste the card multiple times as desired.
  - Save the page of cards as **[Event]**_ControlCardSheet.pdf

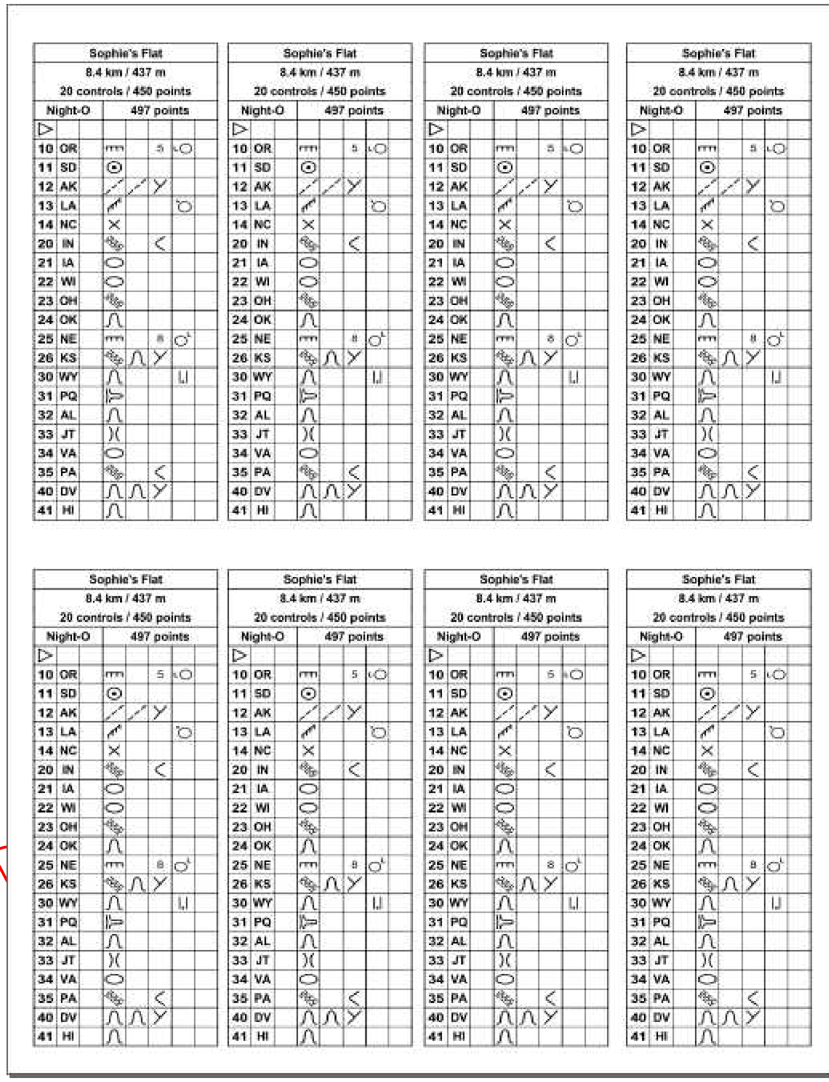


5.10.3 Descriptions

As above, copy the individual description graphic and paste it multiple times onto the sheet. Use the x:y coordinates to place the copies at different locations.

- Open 8_[Event]_Descriptions.pdf in Inkscape. Use the import setting "Poppler/Cairo import".
- Cut/paste/rotate as appropriate.
- Save as 10_[Event]_DescriptionsSheet.svg.
- Save as [Event]_DescriptionsSheet.pdf.





Appendix A: Output Example

Papago Park, January 2023

Example Folder Structure: Windows

Note: Filenames start with [20230107_PapagoPark]

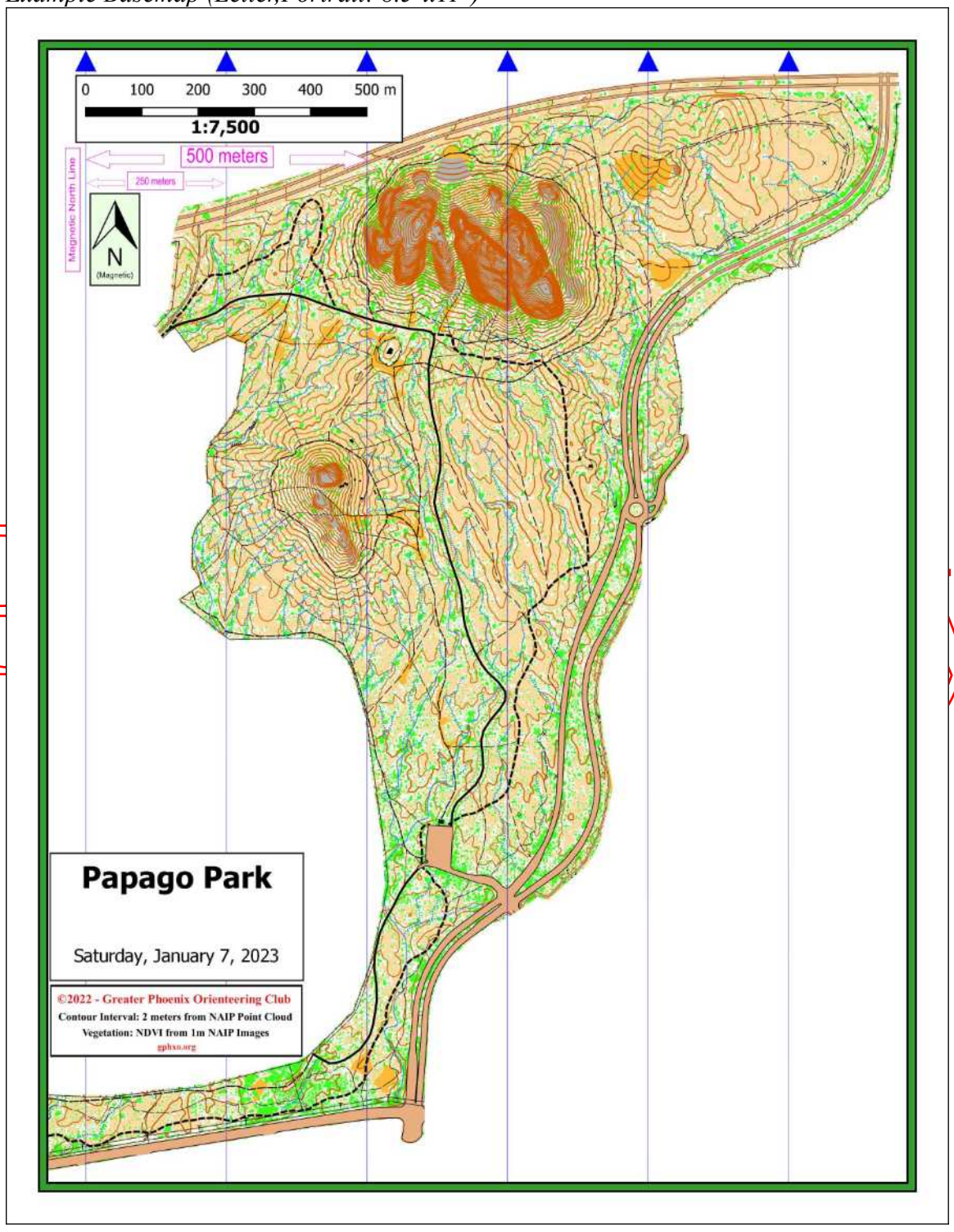
```
D:\
    20230107_PapagoPark\
                        Controls\
                        GoogleEarth\
                                    SuperOverlay\
                                                                []_GoogleEarthNumber.kmz    Google Earth splits the .tif basemap into
                                                                                            multiple .kmz files.
                                                                ...
                                    []_Sprint3_Controls.kmz     KMZ file containing the 10 controls from GE.
                                    []_Sprint3_Track.kmz        KMZ containing the straight-line track between
                                                                points.

                        Maps\
                                    []_Basemap.jpg
                                    []_Basemap.jgw
                                    []_Basemap.tif
                                    []_Basemap.tfw
```

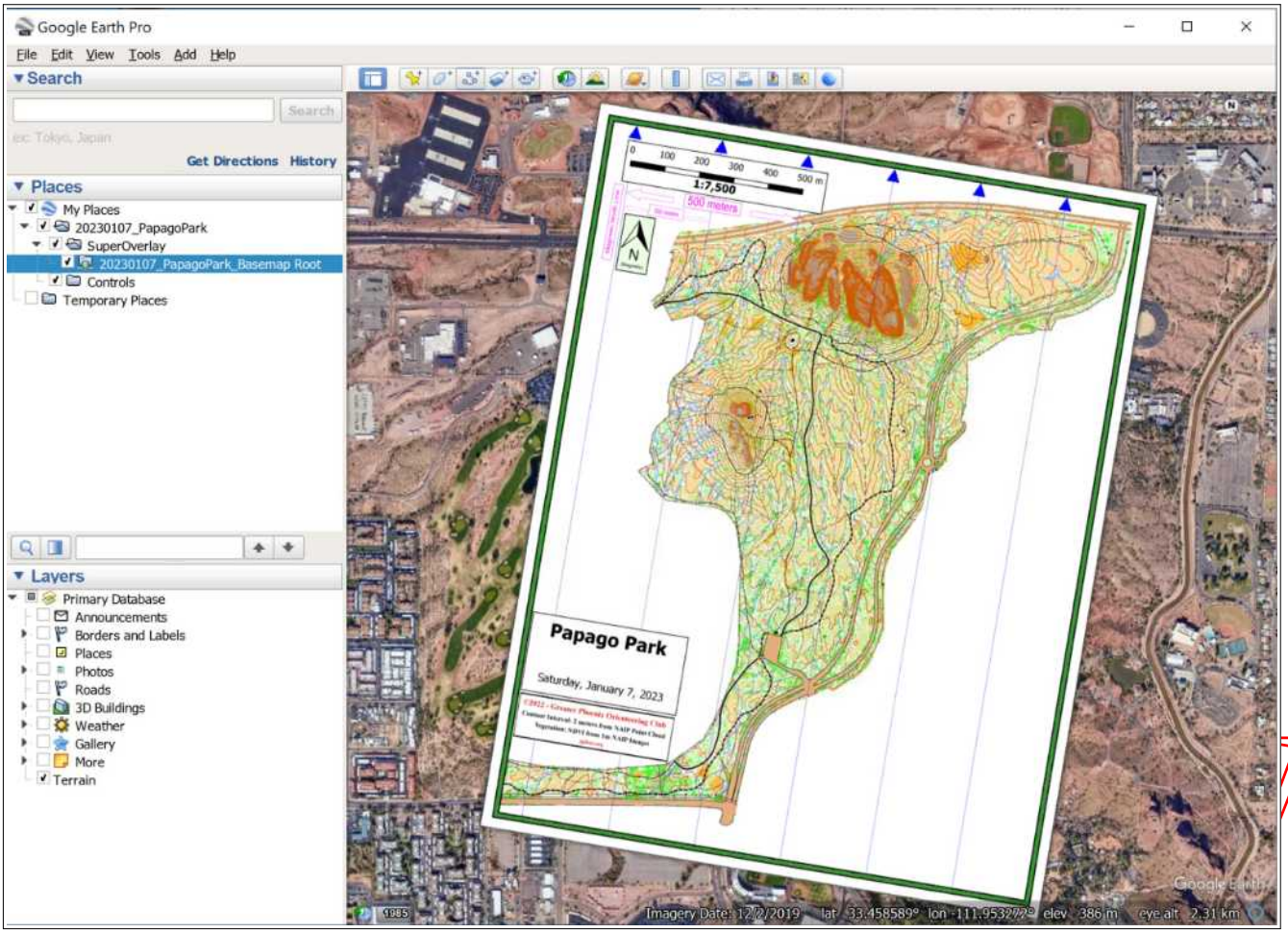

Example Folder Structure: Google Earth

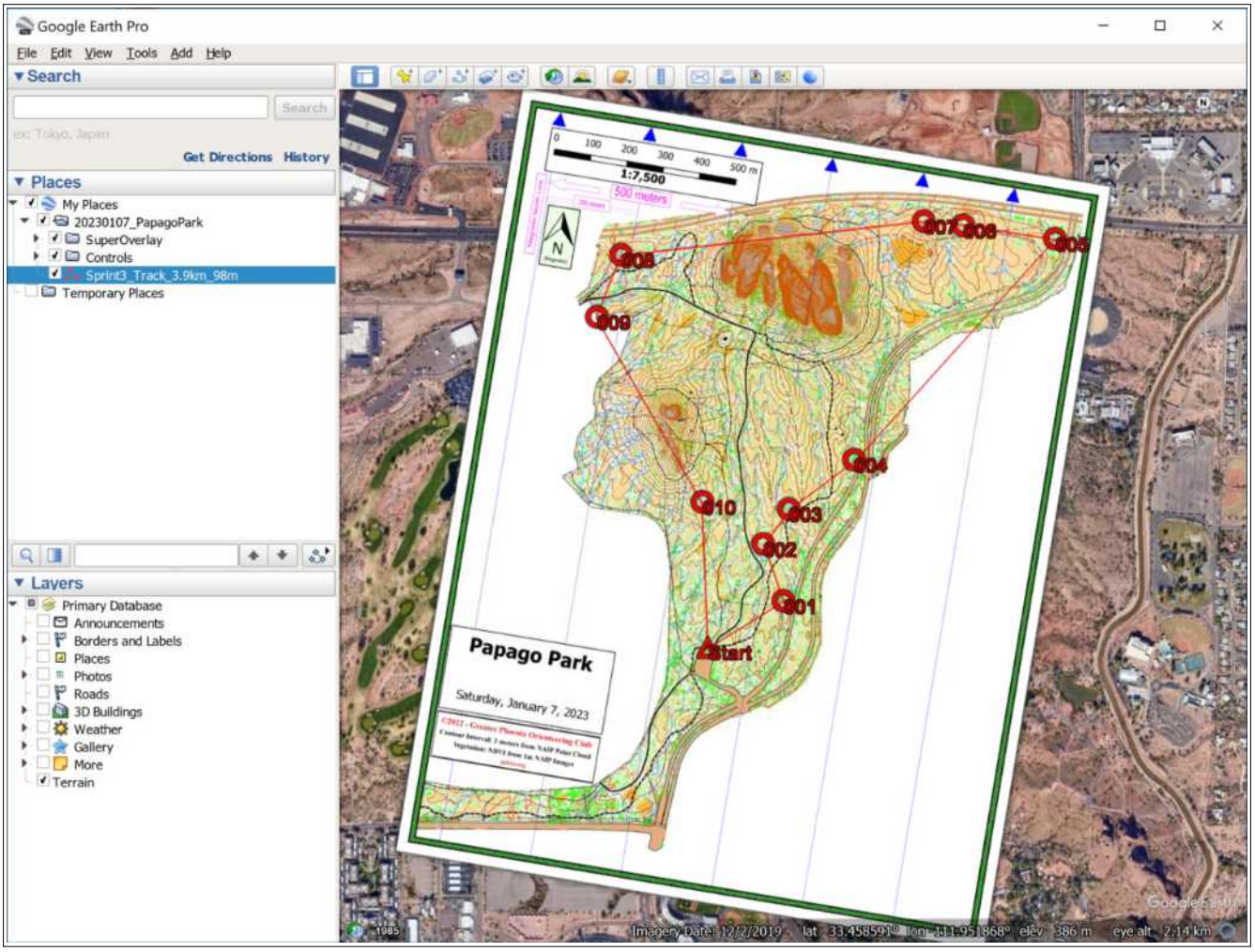
```
My Places
            20230107_PapagoPark
                                SuperOverlay

                                Controls
                                                    101     The controls that were added to the Google Earth map.  Ten controls were added.
                                                    102
                                                    ...
                                                    110
                                Sprint3_Track_3.9km_98m     This is the track for the Sprint 3 example.  The distance/climb is determined by right-
                                                            clicking on the track and selecting "Show Elevation Profile".
```

Step 1: Obtain Basemap

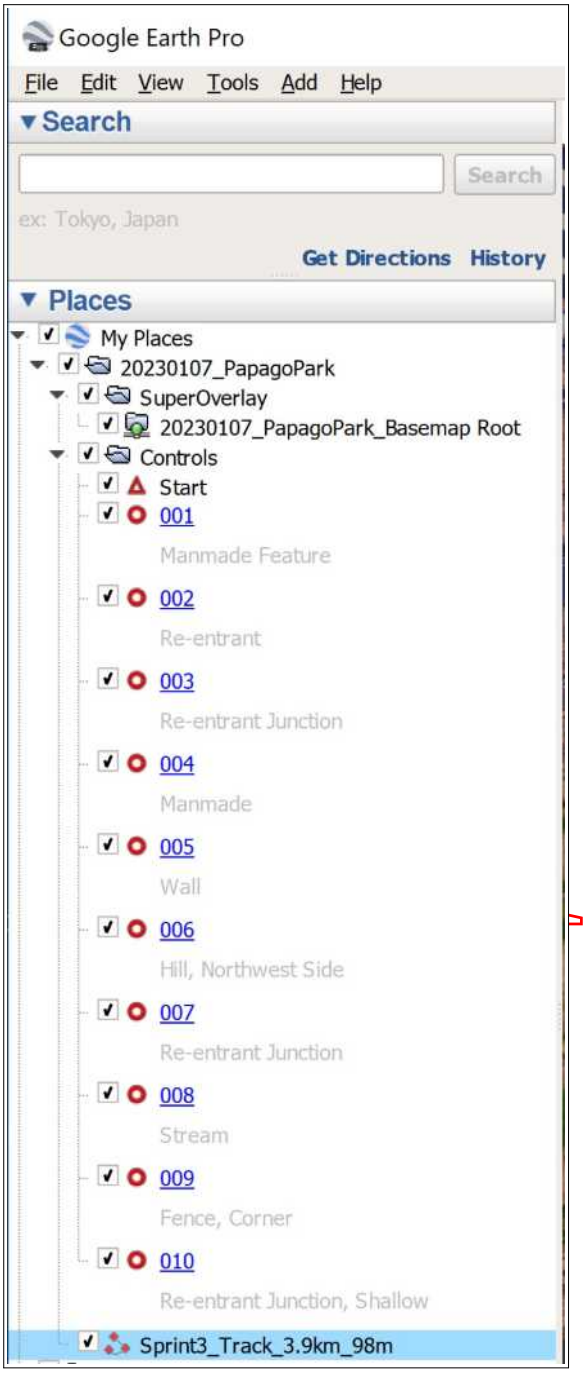
Example Basemap (Letter,Portrait: 8.5"x11")




Google Earth Pro
File Edit View Tools Add Help
Search
Get Directions History
Places
My Places
20230107_PapagoPark
SuperOverlay
20230107_PapagoPark_Basemap Root
Controls
Temporary Places
Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
1:7,500
Papago Park
Saturday, January 7, 2023
Imagery Date: 12/2/2019 lat 33.458589° lon -111.953277° elev 386 m eye alt 2.31 km


Google Earth Pro
File Edit View Tools Add Help
Search
Get Directions History
Places
My Places
20230107_PapagoPark
SuperOverlay
Controls
Sprint3_Track_3.9km_98m
Temporary Places
Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
1:7,500
500 meters
Papago Park
Saturday, January 7, 2023
Start
01
02
03
04
05
06
07
08
09
10


Graph: Min, Avg, Max Elevation: 379, 396, 433 m
Range Totals: Distance: 3.9 km Elev Gain/Loss: 98.3 m, -98.3 m Max Slope: 22.8%, -31.1%Avg Slope: 4.6%, -5.3%
433 m
420 m
410 m
400 m
390 m
379 m
379 m
1.1%
0 m
0.5 km
1 km
1.5 km
2 km
2.5 km
3 km
3.5 km
3.9 km


Google Earth Pro
File Edit View Tools Add Help
Search
Search
ex: Tokyo, Japan
Get Directions History
Places
My Places
20230107_PapagoPark
SuperOverlay
20230107_PapagoPark_Basemap Root
Controls
Start
001
Manmade Feature
002
Re-entrant
003
Re-entrant Junction
004
Manmade
005
Wall
006
Hill, Northwest Side
007
Re-entrant Junction
008
Stream
009
Fence, Corner
010
Re-entrant Junction, Shallow
Sprint3_Track_3.9km_98m