

## Import GPS Control Points from GPX File

GPX (the GPS Exchange Format) is an XML data format for the interchange of GPS data (waypoints, routes, and tracks) between applications. Using the Georeference process in TNTmips you can import GPS points directly from GPX files to use as control points in georeferencing your spatial data objects.

Georeference

Choosing the Import option from the Control Points menu prompts you to select a GPX file containing GPS locations. (You can also select a file of control points exported from another object as a TXT or CSV file). If you select a GPX file, the Import from GPX window opens (see illustration above). This window lists the GPS points contained in

🛰 Import from GPX (9	2980)		x</th					
File: E:\test\Torrey	-9P							
CRS WGS84 / Geographic								
A Exclude points outs	<na< td=""></na<>							
-GPS Points	<de< td=""></de<>							
Nane	Longitude	Latitude 🔼	<bo< th=""></bo<>					
Cliffridge Pk 1	H 117 14 37.74 H	N 32 51 28,92						
Cliffridge Pk 2	H 117 14 35.28 H	N 32 51 26.76						
Crosswalk Moonridge	W 117 14 27.33 I	N 32 50 58.21	<wr< td=""></wr<>					
Coloded Peak	W 117 14 43,16 P	N 32 50 54.79	<na< td=""></na<>					
freesualk Gilman	H 117 14 45.25	N 32 50 56 37	< do					
Crosswalk Lange Ave	H 117 13 42.95 1	N 32 50 48.35	<ue< td=""></ue<>					
Villa Pk Playground	H 117 14 02.52 1	N 32 51 26.76	<sy< td=""></sy<>					
VLJP Electric Meter	H 117 14 06.06 H	N 32 51 26.82	<typ< td=""></typ<>					
Caminito Trail Bench	H 117 13 39.45 H	N 32 51 29,20						
		$\mathbb{N}[\leq]$						
		OK Cancel						

	xml version="1.0" encoding="UTF-16"?
le A 12 76 77 77 75 56 66	<pre><gpx creator="ExpertGPS 1.1.1 - http://www.topografix.com" version="1.0"> <name>Torrey Pines GPS Waypoints</name> <desc>GPS points for georeferencing IKONOS image</desc> <bounds maxlat="32.858112" maxlon="-117.227625" minlat="32.838075" minlon="-117.245323"> </bounds> <wpt lat="32.858033" lon="-117.243817"> <name>Cliffridge Pk 1</name> <desc>Center of pitchers mound, larger baseball diamond.</desc> <sym>Dot.</sym></wpt></gpx></pre>
12 M	<pre></pre> <pre></pre> <pre> </pre> <pre>  <pre>  <pre>   <pre>  <pre>  <pre>  <pre>   <pre>  <pre>  <pre>  <pre>   <pre>  <pre>  <pre>  <pre>   <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>  <pre>   <pre>  <!--</th--></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre>
	containing of 5 waypoints.

The Import from GPX window lists the point coordinates read from the GPX file you have selected to import. The Name column is populated using text from the <name> tag (if any) for each GPS point. If the toggle to Exclude points outside data extents is turned on, entries for such points are shown in color, as for the Soledad Peak point in this example.

the file and their latitude/longitude coordinates (GPX currently supports only WGS84 / Geographic coordinates). You have the option to exclude points outside the extents of your input object; such points are listed in a color in the Import from GPX window. During import the GPS point coordinates are converted (if necessary) to the reference system you have selected to use for your input object. The imported

🖏 Georeference (TorreyPines1ftOrthoColor.rvc / TorreyPines1ftOrthoColor) (92980)							_ 🗆 🛛		
File Control Points Options									
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Model Affine Reference to NAD83 / UTM zone 11N (CM 117W)									
	ID	Nane	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
$\checkmark$	1		0.00	0.00	476885,000	3635933.667	117,247056 W	32,861262 N	0,00
1	2		0.00	6253.00	476885.000	3634057,767	117,247009 W	32,844341 N	0,00
1	3		6310.00	6253.00	478778,000	3634057,767	117,226780 W	32,844379 N	0.00
1	4		6310.00	0.00	478778,000	3635933.667	117,226823 W	32,861300 N	0.00
1	5	Cliffridge Pk 1	1007.32	1195.61	477187.197	3635574,983	117,243817 W	32,858033 N	0.00
1	6	Cliffridge Pk 2	1220,14	1417,82	477251.042	3635508.321	117,243133 W	32,857433 N	0.00
1	- 7	Crosswalk Moonridge	1902,10	4349,37	477455.631	3634628,855	117,240925 W	32,849504 N	0.00
1	8	Crosswalk St Laurent	529,49	4697,26	477043.846	3634524,487	117,245323 W	32,848554 N	0.00
1	9	Crosswalk Gilman	3883,90	4542,66	478050.171	3634570,868	117,234570 W	32,848993 N	0.00
1	10	Crosswalk Lange Ave	5745,20	5370,42	478608,560	3634322.541	117,228597 W	32,846764 N	0.00
1	11	Yilla Pk Playground	4058,31	1424,23	478102.494	3635506.397	117,234033 W	32,857433 N	0.00
1	12	YLJP Electric Meter	3751,43	1417,27	478010.429	3635508,486	117.235017 W	32.857450 N	0.00
1	13	Caminito Trail Bench	6057,43	1177,69	478702,228	3635580,359	117.227625 W	32,858112 N	0.00

Control point list after import of GPS points (5 through 13; points 1 through 4 are corner points from the image's original affine georeference). If you have included a Name column in the point list (selected using Options / Columns), point names from the GPX file are shown. Map coordinates from the GPX file are automatically converted to the reference coordinate system if necessary. The previous control points and the selected residual model are automatically used to estimate image coordinates (shown in red) for the imported points. Switch to Edit mode to correctly position the imported points relative to the input image.

points are added to the control point list with their converted map coordinates.

If the input object is already nominally georeferenced prior to the GPX import, object coordinates are also estimated for each new control point. These estimated object coordinates are shown in red in the control point list (see illustration to the left). The prior georeferencing need not be highly accurate; it could be nominal georeference originally supplied with the geodata object, or a few points that you have manually entered using a reference object. The prior georeferencing should include sufficient control points to allow the selected residual model to be computed. (A message is shown in the Statistics panel at the bottom of the Georeference window if the number of control points is insufficient). If there is no georeference when you import the GPS points, the object coordinates for all imported points are set to 0,0.

After importing the GPS points, you should examine the

Row Easting Northing Longitude Latitude Residual (c)

position of each point relative to the input object. If you determine that a point is not accurately located (based on its description in the GPX file or other notes from the GPS survey), use the crosshairs tool in the Edit mode to move the point to the correct object coordinates. The illustration to the left shows an

Column

GPS control point in estimated						
image location after import						
(left), and relocated to its						
correct image position using						
Edit mode (right).						

example where a GPS point known to be at the center of the pitcher's mound of a baseball diamond is manually relocated

from its estimated position. Once you have checked and relocated all of the GPS control points, you should examine the residuals. If you believe the GPS points to be the most accurate control points, you may wish to disable the pre-existing control points to see if that produces a better fit to the georeference model (lower residual values) and if so, delete them.

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	1		0.00	0.00	476885.000	3635933.667	117,247056 W	32.861262 N	40,42	
	2		0.00	6253.00	476885.000	3634057.767	117,247009 W	32.844341 N	126,23	
	3		6310,00	6253.00	478778.000	3634057,767	117,226780 W	32.844379 N	124,72	
	- 4		6310,00	0.00	478778.000	3635933.667	117,226823 W	32.861300 N	42,15	
~	5	Cliffridge Pk 1	1007.02	1204,88	477187.197	3635574,983	117,243817 W	32.858033 N	0.44	
1	6	Cliffridge Pk 2	1218,76	1421,28	477251.042	3635508,321	117,243133 W	32.857433 N	0.61	
7	- 7	Crosswalk Moonridge	1887.33	4275,74	477455.631	3634628,855	117,240925 W	32.849504 N	0,17	
7	8	Crosswalk St Laurent	512,39	4613,88	477043.846	3634524,487	117,245323 W	32.848554 N	1,17	
7	9	Crosswalk Gilman	3870.00	4463,62	478050.171	3634570,868	117,234570 W	32.848993 N	0,93	
7	10	Crosswalk Lange Ave	5730.37	5271.03	478608.560	3634322,541	117,228597 W	32.846764 N	0.87	
1	11	Villa Pk Playground	4060.16	1427.70	478102,494	3635506,397	117,234033 W	32.857433 N	0,93	
1	12	VLJP Electric Meter	3754.66	1420,27	478010,429	3635508,486	117,235017 W	32.857450 N	0,96	
1	13	Caminito Trail Bench	6064.36	1186.24	478702,228	3635580,359	117,227625 W	32.858112 N	1.05	
7										15
05	lect	e Statistice Formul	20							
UDJECTS STATISTICS   FORMULAS							Control poi	nt list aft	er	
13 Control Points; 9 Enabled; 4 Disabled							ropositionir	a the CI	29 control	Į
Cell Size (meters): X = 0.2996 Y = 0.3081						repositionii	ig the Gr		I	
Projection Angle: 0.0009 Shear Angle: 0.2832 North Angle: -0.1277					0,1277	points and disabling the initial				
RMS Residual (Enabled, cells): X = 0.65 T = 0.55 XT = 0.85 RMS Residual (Disabled, cells): X = 17.47 Y = 91.76 XY = 93.41						= 93.41	four corner control nainte			
He	an I	bsolute Residual (Ena	bled, cell	Ls): X =	0.55 Y = 0.	.47	Tour comer	control	points.	
Mean Absolute Residual (Disabled, cells): X = 15,52 Y = 81,79								ļ		
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TD Name