



# **New Zealand MGCP Programme:**

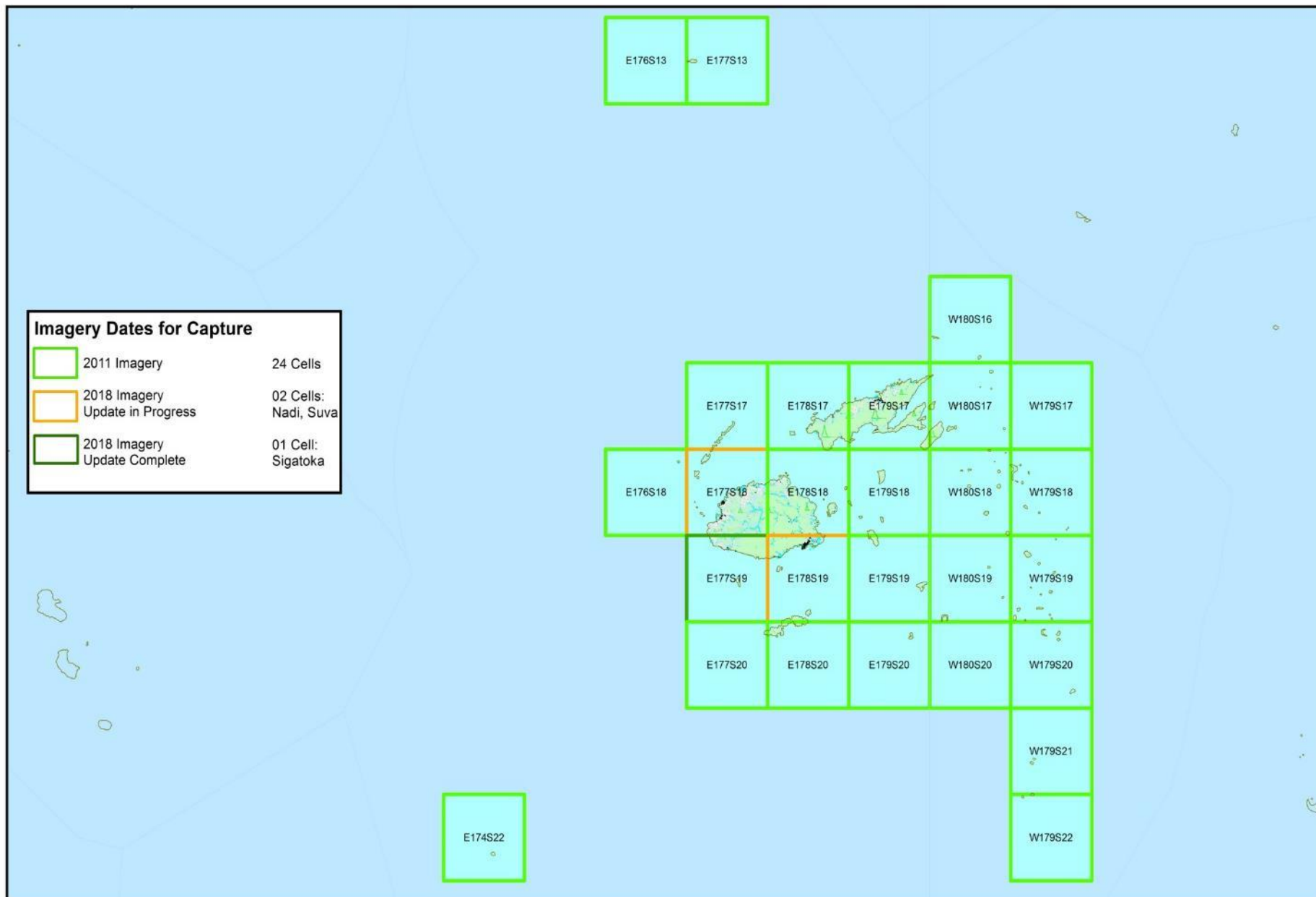
## **Topographic Data Revision Process over Fiji**

**February 2021**

**Auckland**



# Fiji 1:50K Vector Capture Status - 02 February 2021





# **Q: How do we update Topographic Data?**

## **A: Using a “Jigsaw” approach**

- A jigsaw approach uses existing capture workflow in ArcGIS
- Import previous TRD data into pre-formatted new TRD layers
- New capture occurs only on certain themes or amounts of change; and fits with new TRD requirements
  - Urban growth, road network, land-use change OR
  - Shift of > 15m from previous vectors against new imagery OR
  - New feature types available in the new TRD (Settlements, Facilities)
- Lower focus & therefore higher retention of previous captured data for natural/physical geography.
- Geometry updates using select ‘Editor’ tools available
  - Topology modify and reshape.



# Fiji Revision Process Summary

- Set-up Work to support Revision Efficiency involved 3 staff focusing on a specific task/theme:
  - Land vs Sea areas - 1 staff member developed semi-automated feature capture using Normalised Difference Water Index (NDWI): raster indexing to extract land areas and water-body areas using ENVI
  - Rivers and Coastline - 1 staff member assessed visual shift (imagery) and data shift (MLMR against original MGCP vectors) for rivers and coastal areas.
  - Significant urban features - 1 staff member assessed visual shift and data shift for all significant urban features: roads, important building points (health centres, hotels/resorts, police stations, education centres).

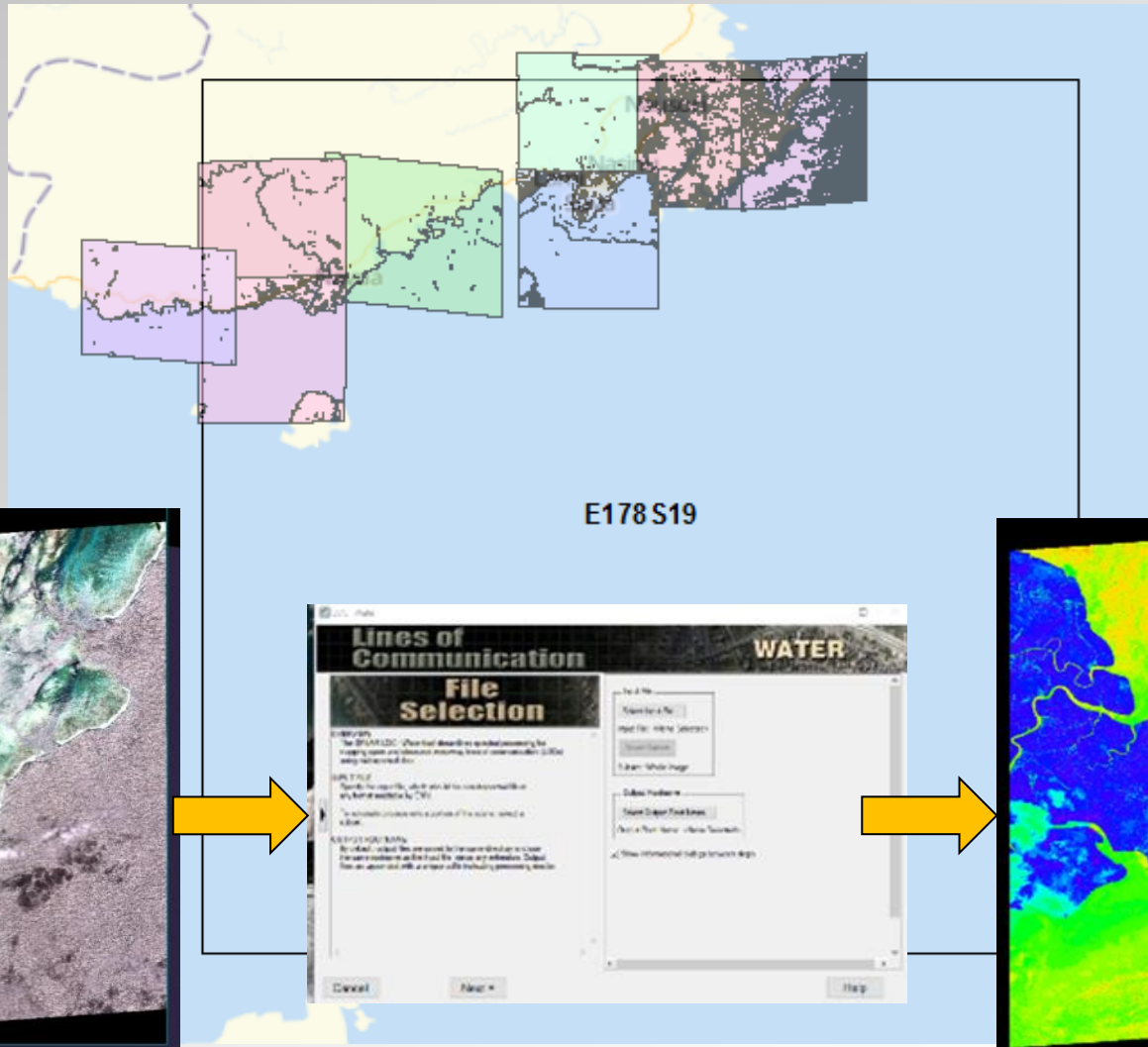


# Land-Water Boundary Update

- Our MGCP team developed the following process used successfully as part of Fiji Vector Revision
  - In ENVI: Satellite images are converted to 'rasters' to classify water areas using an NDWI toolset; the classes are then used to create vector files
  - In ESRI: the vector shapefiles are cartographically smoothed and simplified (Toolbox)
  - MGCP production: the smoothed simplified vectors then used to topologically align the old features to the new geometry.



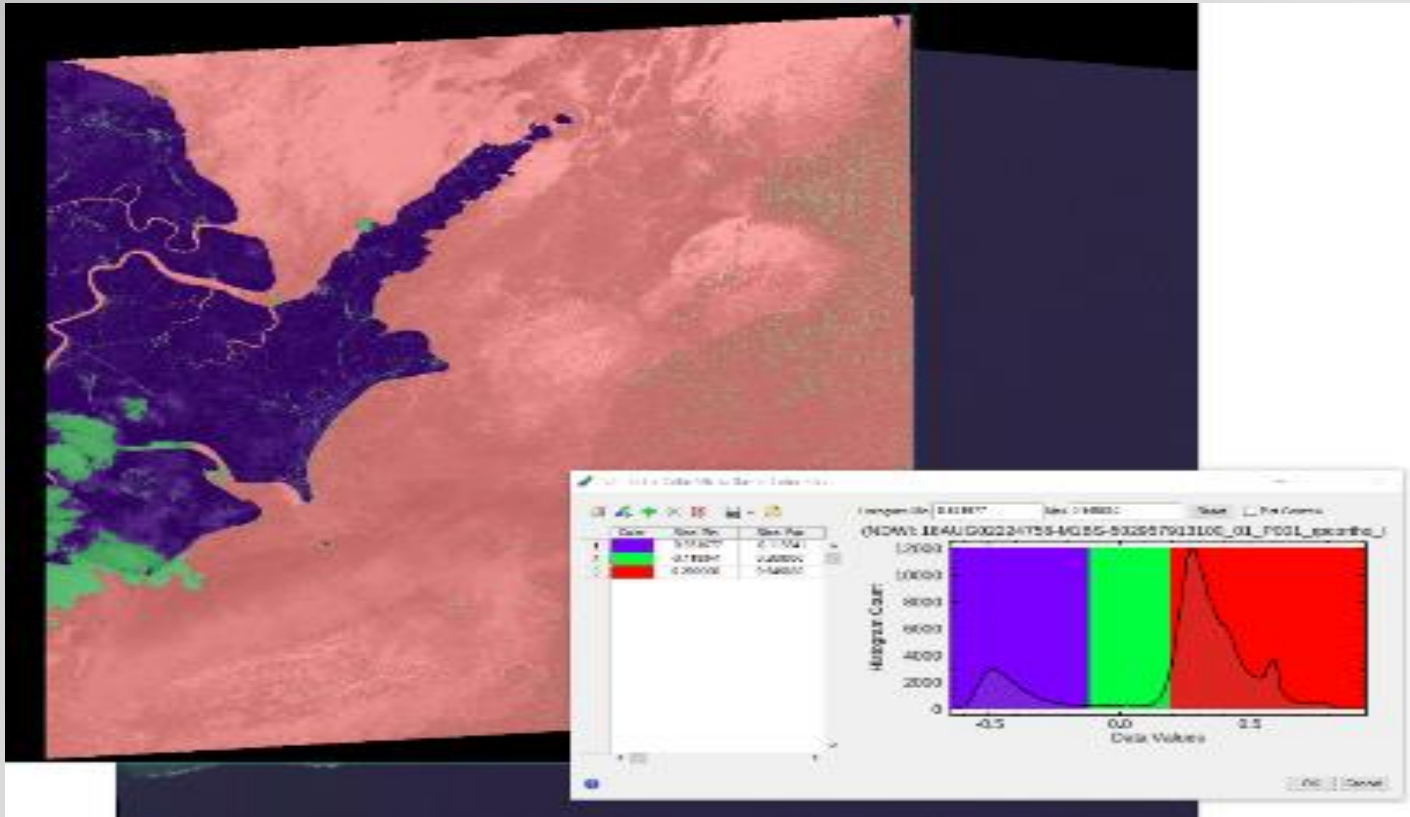
# Land-Water Boundary Update: Overview for E178S19







# Land-Water Boundary Update: ENVI



Raster Slice using '3' value ranges to separate: Land, Water, Cloud into distinct 'areas'.



# Land-Water Boundary Update: ArcGIS

Start 'raw' red ENVI output vector



End 'pure' state green vectors ready for MGCP



Two processes run: Smooth and Simplify

### Smooth Polygon

Input Features  
Land\_merged\_E178S19\_110Kover

Output Feature Class  
E:\Fiji\_Reviewing\E178S19\ENVI\_Merges\Smooth\_Land\_E178S19.shp

Smoothing Algorithm  
PAEK

Smoothing Tolerance  
10 Meters

☐ Preserve endpoint for rings (optional)

Handling Topological Errors (optional)  
FLAG\_ERRORS

### Smooth Polygon

Smooths sharp angles and outlines to improve cartographic quality

### Simplify Polygon

Input Features  
E:\Fiji\_Reviewing\E178S19\ENVI\_Merges\Smooth\_LVS\_merged\_E178S19.shp

Output Feature Class  
E:\Fiji\_Reviewing\E178S19\ENVI\_Merges\Simplified\_LVS\_merged\_E178S19.shp

Simplification Algorithm  
BEND\_SIMPLIFY

Simplification Tolerance  
Reference Baseline  
10 Meters

Minimum Area (optional)  
1000 Square Meters

Handling Topological Errors (optional)  
NO\_CHECK

☒ Keep collapsed points (optional)

### Handling Topological Errors (optional)

Specifies how the topological errors (possibly introduced in the process, including line crossing, line overlapping, and collapsed zero-length lines) will be handled.

- NO\_CHECK—Specifies not to check topological errors. This is the default.
- FLAG\_ERRORS—Specifies to flag topological errors if any are found.
- RESOLVE\_ERRORS—






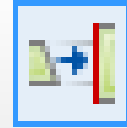
# Land-Water Boundary Update: Align Edge topology tool




## Align Edge Tool

Match one edge to another so they are coincident. Click the edge to be aligned, click the edge to align it to, and the first edge is updated to match the second edge.

 Press F1 for more help.



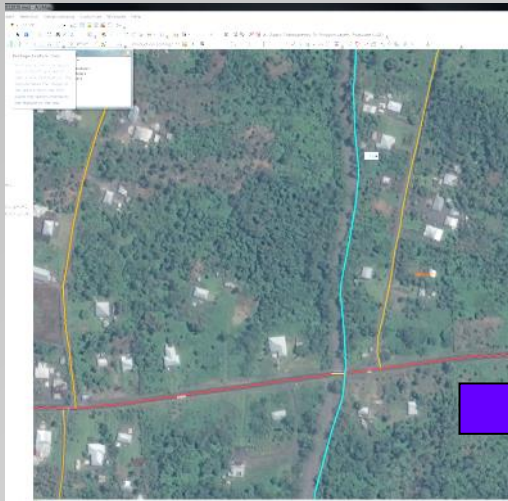
## Measure

  
Line measurement (Geodesic)  
Segment: 49.145258 Meters  
Length: 49.145258 Meters

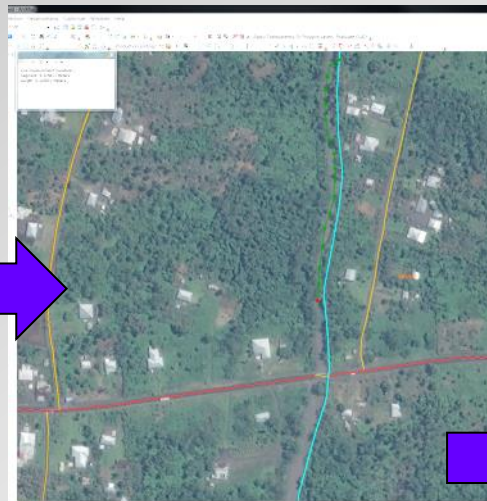


# Reshape Feature/Reshape Topology Tools

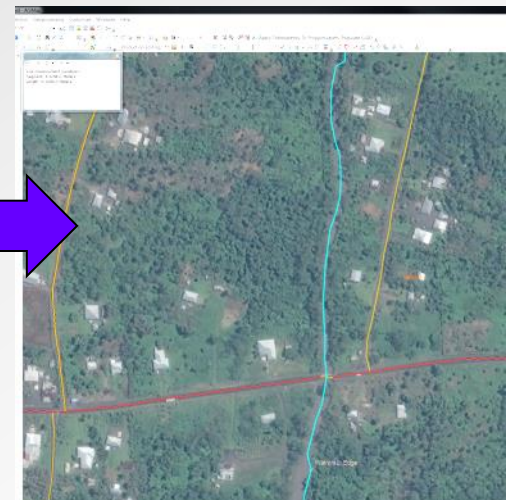
Select feature > Select tool



Re-draw feature between nodes: green dotted line indicating 'current' mode



Double click when finished to complete an update based on redraw



Advantage:

No need to rely on contiguous node per node replacing, simply click as required ensuring return point is on part of feature already existing.



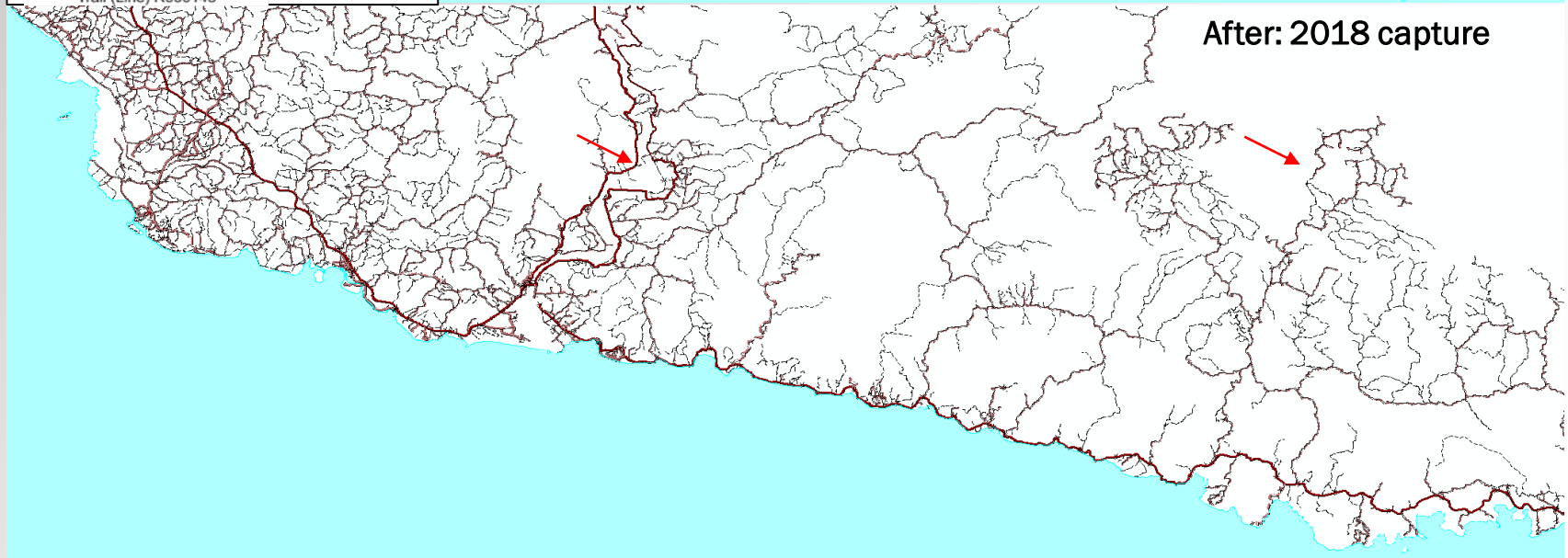


# Transportation Update in E177S19

Original capture



After: 2018 capture





# River Network Update in E177S19



## Legend

### Rivers Before

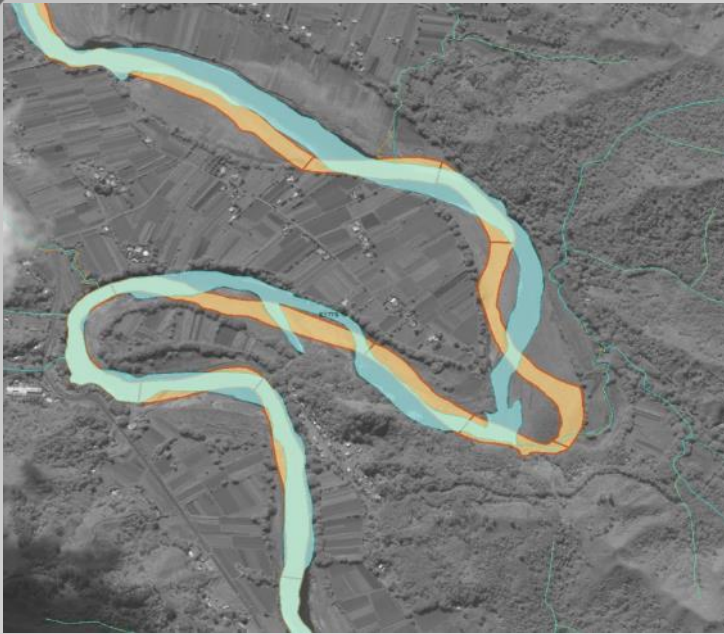
- BH030\_Ditch\_Line, Perennial
- BH140\_River\_Line, Perennial
- BH140\_River\_Line, Intermittent

### Rivers After

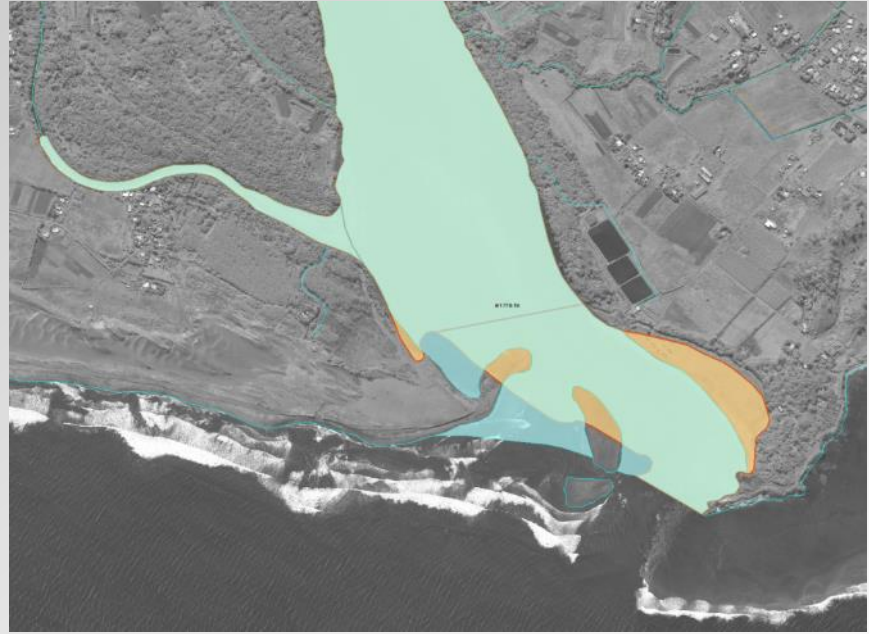
- BH030\_Ditch\_Line, Perennial
- BH140\_River\_Line, Perennial
- BH140\_River\_Line, Intermittent



# River Network Update in E177S19



Sigatoka River  
177.555456 -18.017077



Sigatoka River mouth  
177.518685 -18.172428

River Before

River After



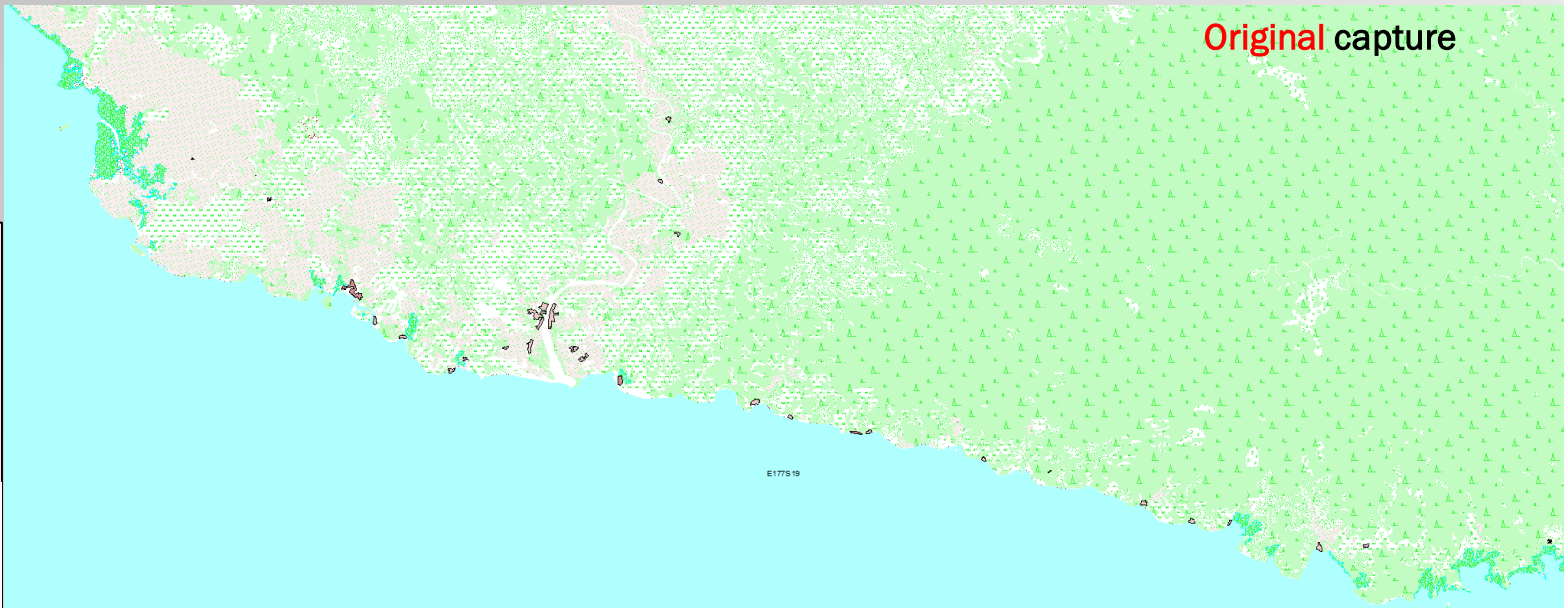
Tuva River  
177.364555 -18.078614



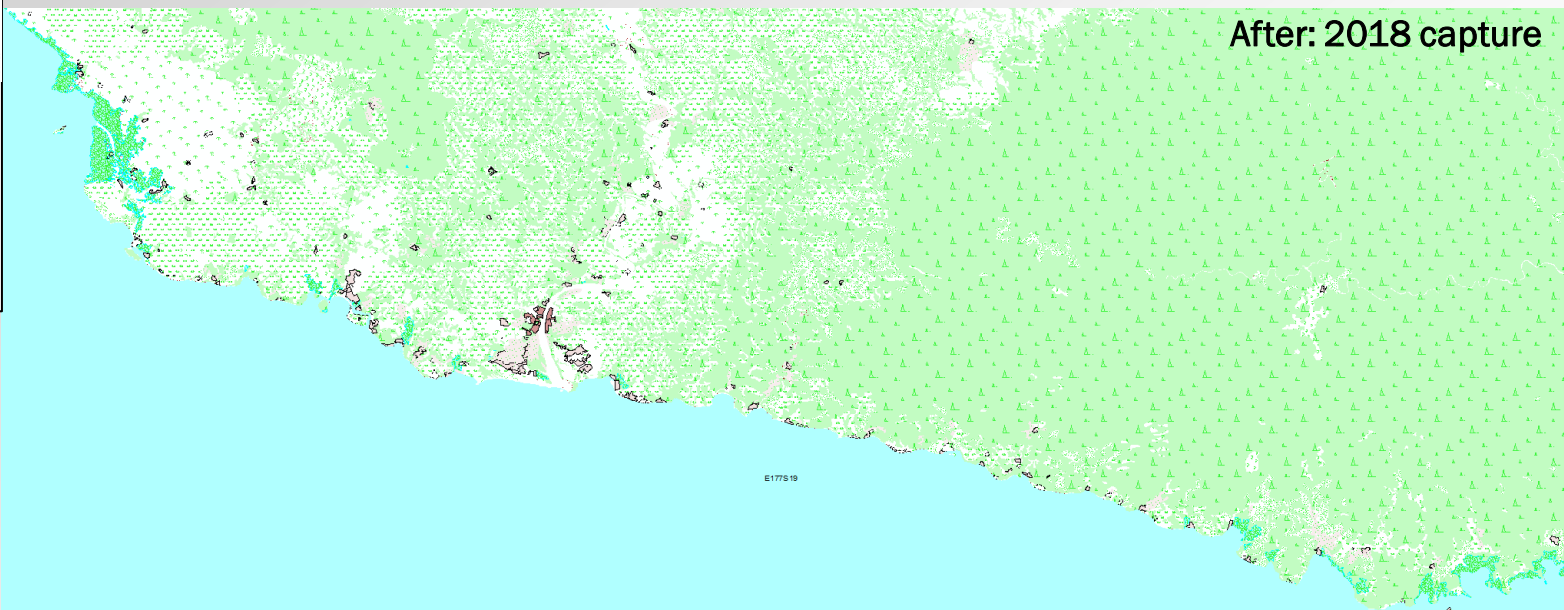


# Landcover Update in E177S19

Original capture



After: 2018 capture



## Legend

- Built-Up Area / Dense (Area) R000286
- Built-Up Area / Sparse (Area) R000287
- Crop Land / Dry Crops (Area) R000094
- Crop Land / Orchard (Area) R000095
- Quarry (Area) R000008
- Grassland (Area) R000097
- Thicket (Area) R000098
- Soil Surface Region / Sand (Area) R000081
- Reservoir (Area) R000067
- Marsh (Area) R000106
- Swamp (Area) R000107
- Wood / Deciduous (Area) R000101



# Summary of Revision Processes in E177S19

- E177S19 Feature counts
  - 15, 387 features in 2018 > 14, 700 from 2010
  - 39 new types of features overall

2018 Vectors					2010 Vectors				
PierL	PierL	0	AK190_Recreational_Pier_Line	4	PierL	PierL	0	AK190_Recreational_Pier_Line	0
PierL	PierL	1	BB190_Berthing_Structure_Line	3	PierL	PierL	1	BB190_Berthing_Structure_Line	4
Pipel	Pipel	0			Pipel	Pipel	0		
Pipel	Pipel	0	AQ113_Pipeline_Line	0	Pipel	Pipel	0	AQ113_Pipeline_Line	0
PowerL	PowerL	2			PowerL	PowerL	0		
PowerL	PowerL	0	AT030_Power_Line_Line	2	PowerL	PowerL	0	AT030_Power_Line_Line	0
PowerL	PowerL	1	AT041_Cableway_Line	0	PowerL	PowerL	1	AT041_Cableway_Line	0
RailrdL	RailrdL	10			RailrdL	RailrdL	57		
RailrdL	RailrdL	0	AN010_Railway_Line	10	RailrdL	RailrdL	0	AN010_Railway_Line	57
RailrdL	RailrdL	1	AN050_Railway_Sidetrack_Line	0	RailrdL	RailrdL	1	AN050_Railway_Sidetrack_Line	0
RapidstL	RapidstL	2			RapidstL	RapidstL	0		
RapidstL	RapidstL	0	BH120_Rapids_Line	2	RapidstL	RapidstL	0	BH120_Rapids_Line	0
RapidstL	RapidstL	1	BH180_Waterfall_Line	0	RapidstL	RapidstL	1	BH180_Waterfall_Line	0
RoadL	RoadL	708			RoadL	RoadL	499		
RoadL	RoadL	0	AP030_Road_Line	708	RoadL	RoadL	0	AP030_Road_Line	499
RunwayL	RunwayL	0			RunwayL	RunwayL	0		
RunwayL	RunwayL	0	GB050_Aircraft_Revetment_Line	0	RunwayL	RunwayL	0	GB050_Aircraft_Revetment_Line	0
Seastrtl	Seastrtl	25			Seastrtl	Seastrtl	18		
Seastrtl	Seastrtl	0	BB041_Breakwater_Line	2	Seastrtl	Seastrtl	0	BB041_Breakwater_Line	1
Seastrtl	Seastrtl	1	BB043_Groin_Line	6	Seastrtl	Seastrtl	1	BB043_Groin_Line	2
Seastrtl	Seastrtl	2	BB140_Training_Wall_Line	0	Seastrtl	Seastrtl	2	BB140_Training_Wall_Line	0
Seastrtl	Seastrtl	3	BB230_Seawall_Line	23	Seastrtl	Seastrtl	3	BB230_Seawall_Line	15
ShedL	ShedL	0			ShedL	ShedL	0		
ShedL	ShedL	0	AL210_Protection_Shed_Line	0	ShedL	ShedL	0	AL210_Protection_Shed_Line	0
TeleL	TeleL	0			TeleL	TeleL	0		
TeleL	TeleL	0	AT060_Communication_Line_Line	0	TeleL	TeleL	0	AT060_Communication_Line_Line	0
TrackL	TrackL	796			TrackL	TrackL	307		
TrackL	TrackL	0	AP010_Cart_Track_Line	796	TrackL	TrackL	0	AP010_Cart_Track_Line	307
TrailL	TrailL	202			TrailL	TrailL	56		
TrailL	TrailL	0	AP050_Trail_Line	202	TrailL	TrailL	0	AP050_Trail_Line	56
TransL	TransL	0			TransL	TransL	0		
TransL	TransL	0	AL060_Dragon's_Teeth_Line	0	TransL	TransL	0	AL060_Dragon's_Teeth_Line	0
TreestL	TreestL	8			TreestL	TreestL	9		
TreestL	TreestL	0	EA020_Hedgerow_Line	8	TreestL	TreestL	0	EA020_Hedgerow_Line	9
TreestL	TreestL	1	EC030_Wood_Line	0	TreestL	TreestL	1	EC030_Wood_Line	0
Tunnell	Tunnell	0			Tunnell	Tunnell	0		
Tunnell	Tunnell	0	AQ130_Tunnel_Line	0	Tunnell	Tunnell	0	AQ130_Tunnel_Line	0
WatcrsL	WatcrsL	4273			WatcrsL	WatcrsL	4783		
WatcrsL	WatcrsL	0	BH020_Canal_Line	0	WatcrsL	WatcrsL	0	BH020_Canal_Line	0
WatcrsL	WatcrsL	3	BH030_Ditch_Line	36	WatcrsL	WatcrsL	1	BH030_Ditch_Line	25
WatcrsL	WatcrsL	2	BH140_River_Line	4243	WatcrsL	WatcrsL	2	BH140_River_Line	4758
AerofacA	AerofacA	1			AerofacA	AerofacA	1		
AerofacA	AerofacA	0	GB005_Land_Aerodrome_Area	1	AerofacA	AerofacA	0	GB005_Land_Aerodrome_Area	1

- Total time to complete revision
  - 558 hours or 93 days (6 hour days) or 19 weeks (5 day weeks)



# Conclusions

- Revision of Topographic Vector data to improve coverage
- More time-efficient to utilise a “jigsaw approach”:
  - Re-using previous data and updating only where required to fit current imagery
- ArcGIS ‘Editing’ suite and ‘Topology’ tools vastly improve revision process while maintaining geometric contiguity
- Incorporating imagery processing methods to segment raster images and create vector outputs is useful method



# Questions?

For further information or technical details please contact me anytime:

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