

Tailoring marine sampling to local biotic and abiotic diversity: example from Point Addis Marine National Park

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Underwater tow video was collected to facilitate mapping biotic and abiotic distributions on the seafloor in Point Addis Marine National Park as part of the CRC Parks Victoria Joint Venture. Once the video transects were recorded, methods needed to be designed for how to classify the video and produce a reliable, classified dataset of substrate and biological features that could be used for constructing models of the system, and ultimately for mapping the seafloor. We accomplished this using two phases of video interpretation and classification: (1) coarse classification of transitions, and (2) detailed observation of single georeferenced video frames.

The basic plan driving the layout of the planned video transects has been described elsewhere (see CB 6.02: Video sampling plan, Point Addis). Transects were run primarily perpendicular to the coastline to capture the hypothesized strong ecological gradient with increasing water depth and changing hydrodynamic conditions (**Figure 1**). A smaller percentage of transects oriented parallel to shore, along which lower variability was expected. The planned video transects were prioritized for the field crew, and all areas marked as first priority plus some of second priority were collected (**Figure 2**).

Video footage is collected continuously along each transect, but in order to link observations from the video with other datasets, such as the bathymetry or backscatter produced by the hydroacoustic survey, this information must be tied to well georeferenced point locations. By using a USBL georeferencing system with the video camera, GPS time stamps were linked to video frames approximately once every second, which translates spatially to one point every 1 to 2 meters along the transects. At Point Addis, more than 80,000 georeferenced video frames were recorded, a prohibitively high number to attempt to make observations on every georeferenced frame, thus requiring some means of subsampling the video.

The first phase of video interpretation involved identifying the major substrate and biological classes present at Point Addis to assist in designing a video interpretation

data entry form, and tagging homogeneous and heterogeneous areas within the study area by marking major transitions in bottom type. This resulted in five major categories: reef, rhodoliths, sediments, mixed sediments and reef, and coarse sediments (**Figure 3**). All combinations of the major categories were also noted. This seafloor classification was generalized to two categories: high and low variability (**Figure 4**). The amount of variability was determined based on the distance between transitions in substrate type observed, and the number of different types of substrate in mixed transects. Out of 58 km of video footage, 34 km (57% were categorized as highly variable, and 24 km (41%) as low variability.

Selection of video frames for interpretation was weighted according to the expected variability. High variability transects were subsampled regularly at approximately 1 frame per 20 m, with a randomly determined start point. Low variability transects were sampled at one frame per 60 m. A total of approximately 2000 point sample locations were selected.

The regular sampling ensures that there is some information for every portion of the study area where video footage was collected, but does not provide any information about variability over distances shorter than 20 m or 60 m in the two classes of variability. In order to correct for this, some nested or clustered sampling of video frames was planned to supply information about changes over shorter distances. A frame was selected as a cluster starting point, then at each location 10 additional video frames were interpreted at 4 m intervals. The 4-m interval was selected to be sure that no interpreted video frames were overlapping, thus providing duplicate information in the final dataset. The cluster start points were partitioned according to the variability class divisions, thus 57 clusters were selected in high variability areas, and 43 in low variability areas. The cluster start points were randomly selected.

A total of 2862 georeferenced video frames were interpreted and entered into a database for further assessment and modeling (**Figure 5**). By using the coarse level classification to drive final data point selection, we were able to stratify the video data based on hypothesized substrate and associated biological diversity at multiple spatial scales.

Figure 1: Planned video transects for Point Addis

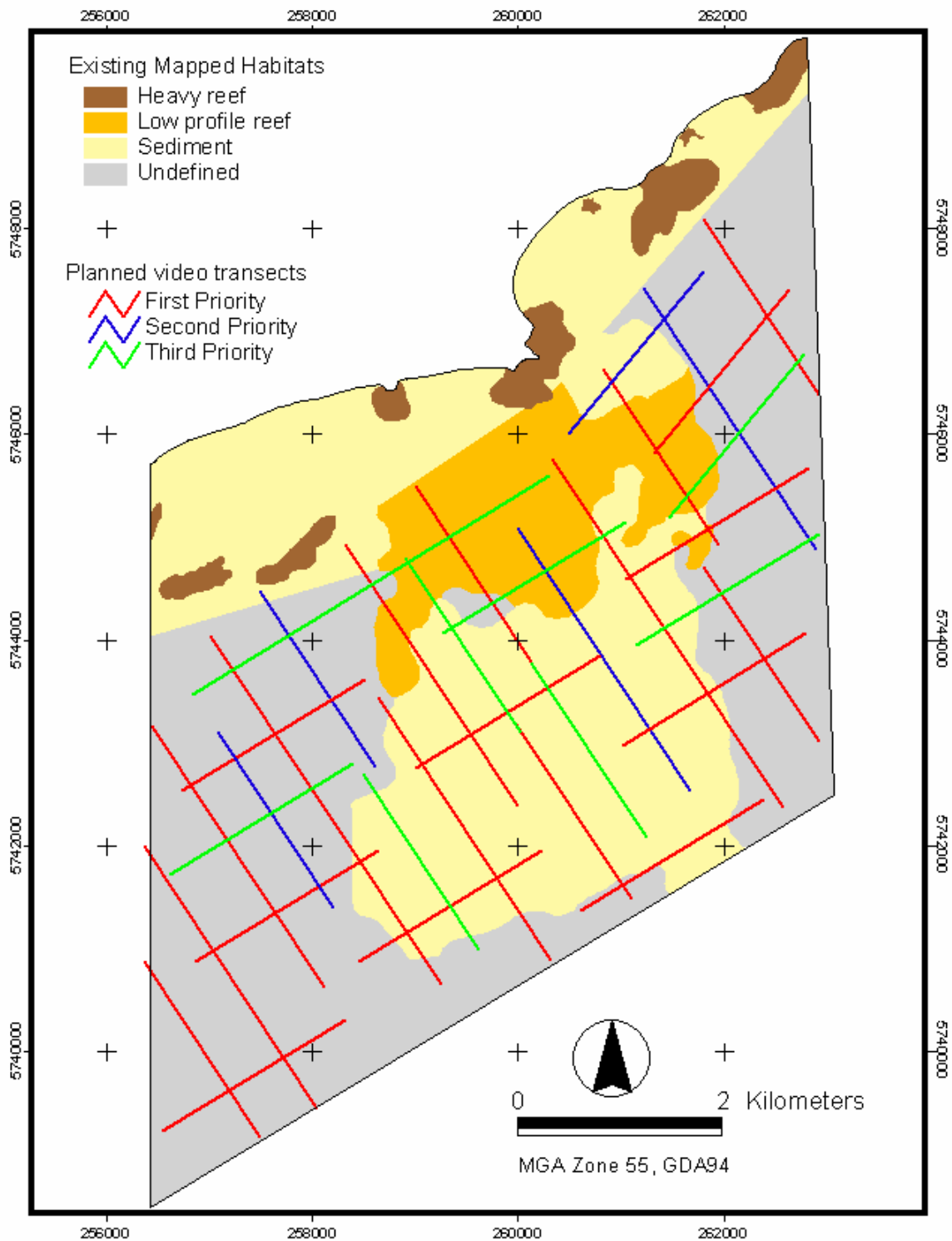


Figure 2: Actual video coverage collected at Point Addis (black lines).

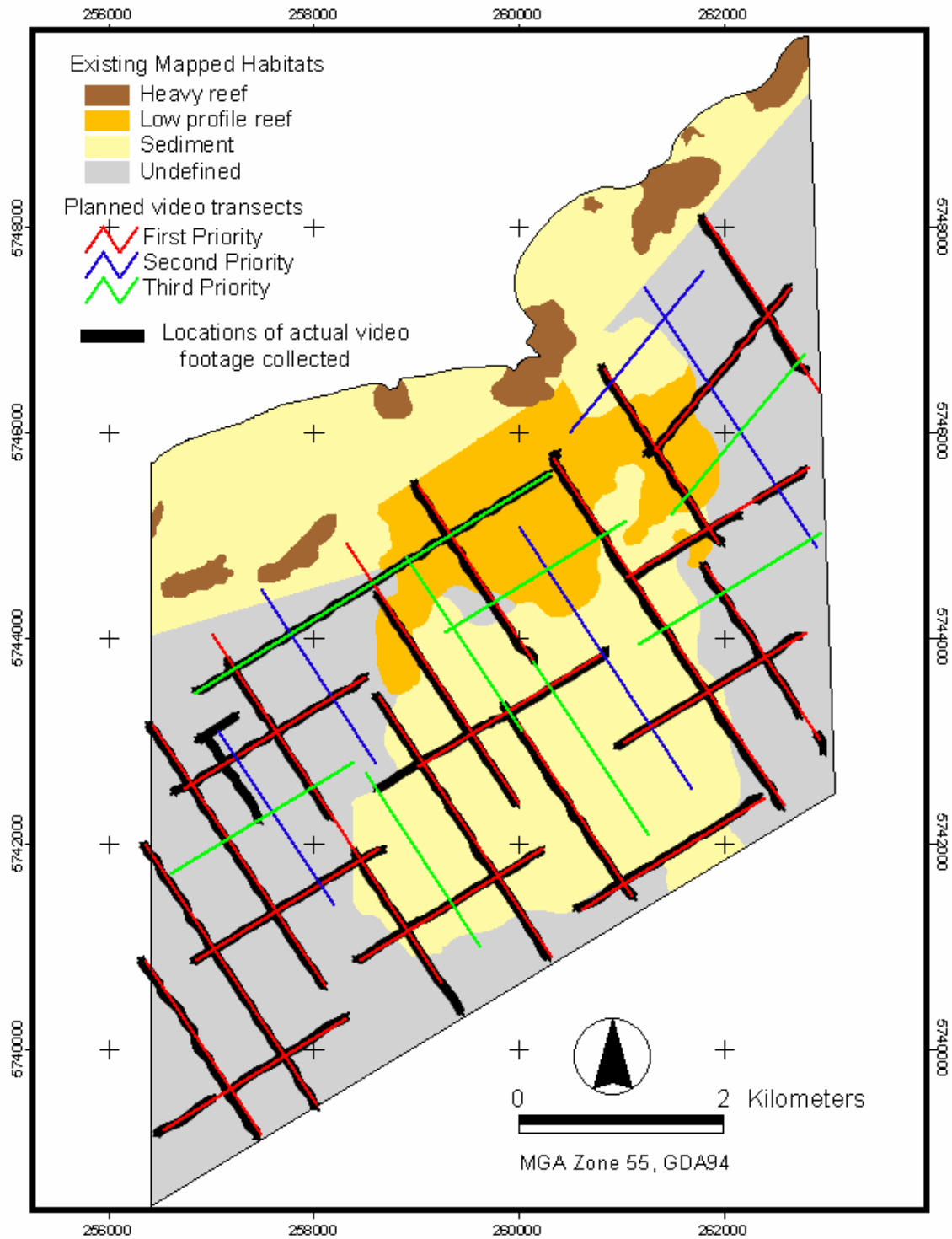


Figure 3: Coarse level classification of Point Addis video footage, done by identifying major transitions, and assigning all video frames between transitions to a single class.

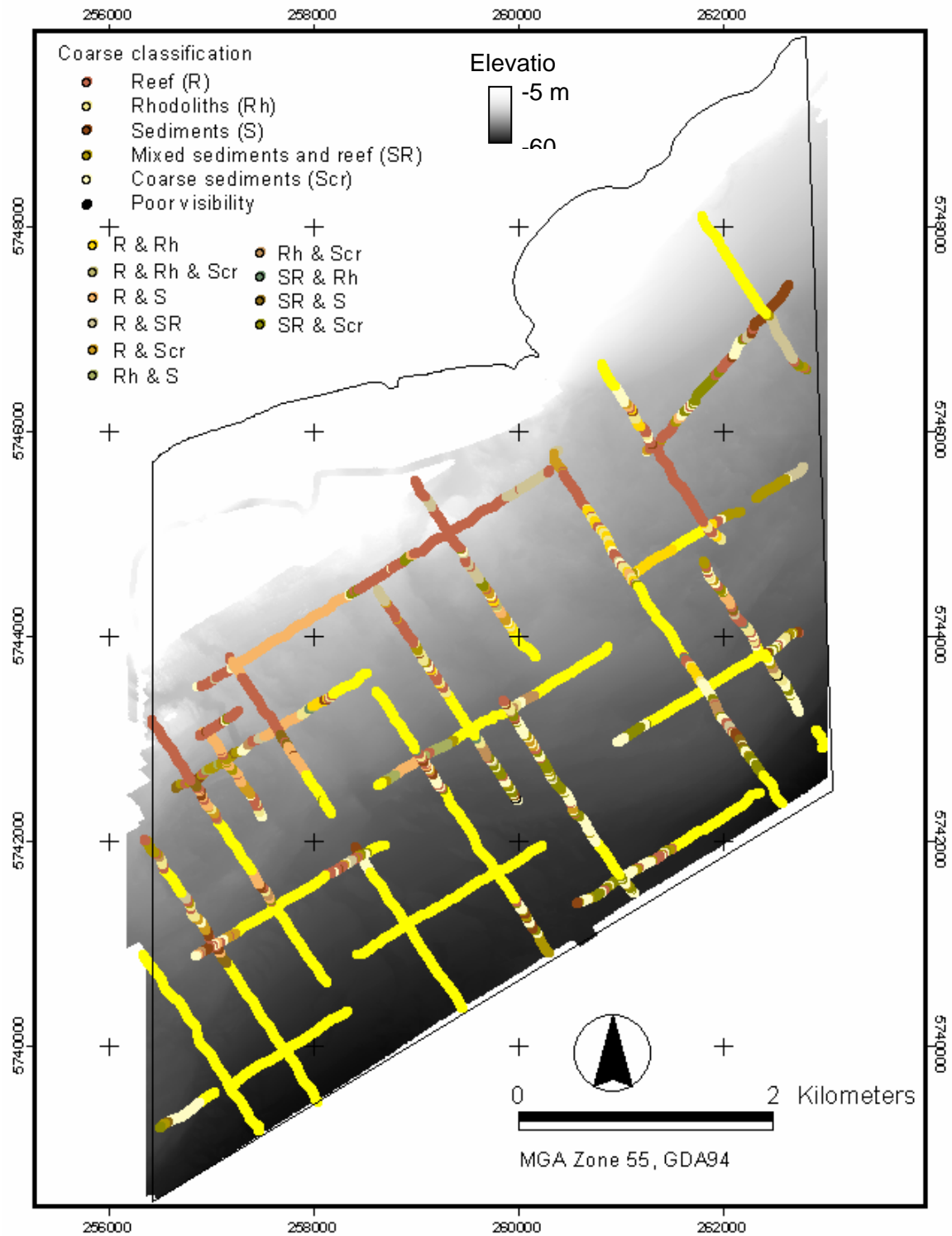


Figure 4: Re-classification of the coarse-level video classification into two categories: Highly variable and less variable.

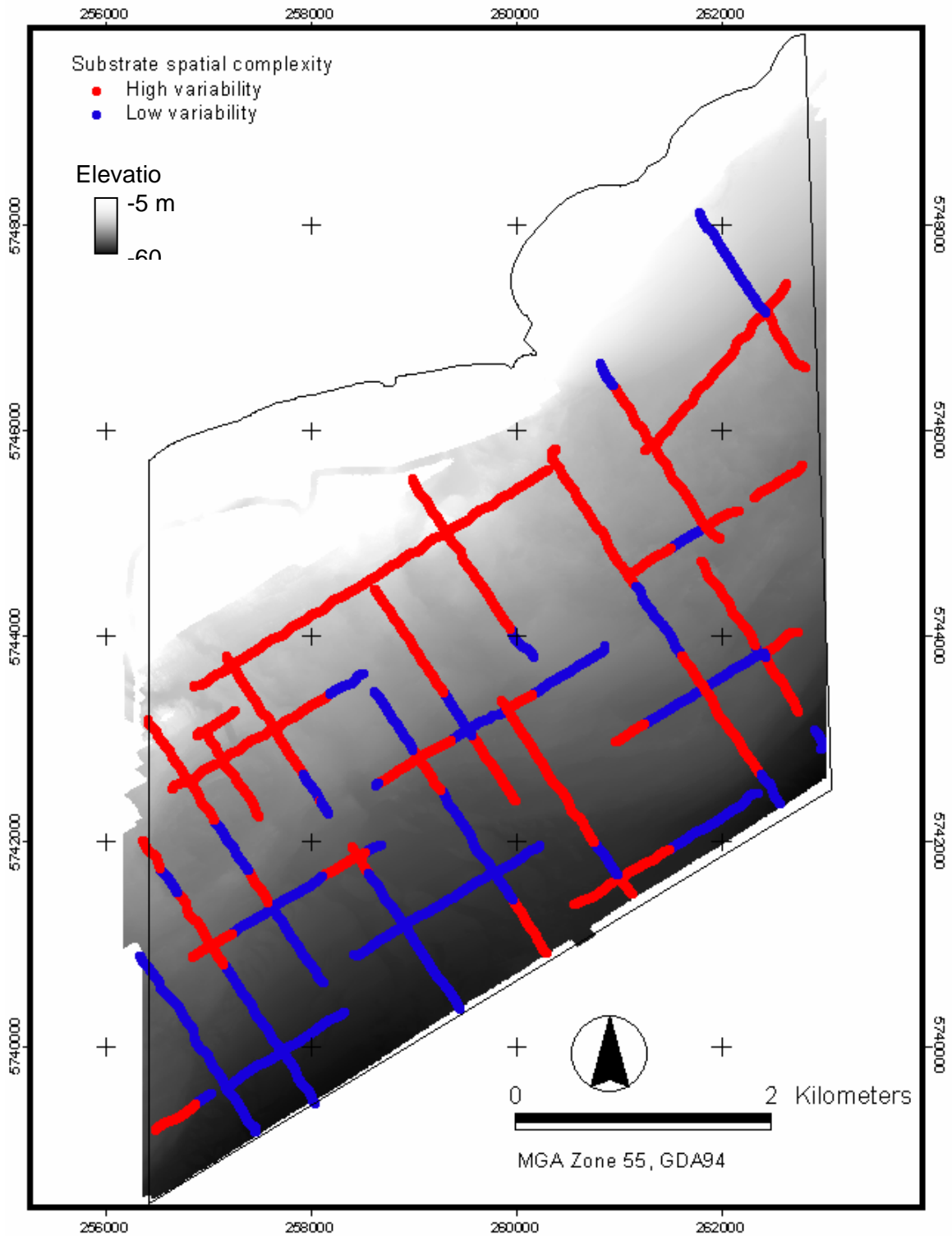


Figure 5: Final point (single video frame) locations chosen for detailed classification

