PaveM Grouping Algorithm

**Preprocessing**

**Identify Administrative Boundaries**

* Route/ Direction
* Districts/ County
* Pavement Class (NHS/ non-NHS)

**Building a Map of Segments**

* Determine odometer values at all segment boundaries (both in the master list and in the project list).
* Determine number of lanes at all segment boundaries.
* Create a map of segments for each lane and segment boundaries.
* The odometer values and lane numbers respectively form the x- and y-axis of the map.

**Main Grouping Algorithm (four successive procedures)**

* Section Splitting
* Unknown Segment Removal
* Simple Grouping of Segments
* Statistical Merging and Growing of Segments

**Treatment Selection**

* Compute total lane miles and original total budget.
* Compute lane miles and budget for each original treatment with the group.
* Compute cost per mile and determine which treatment is closest in terms of cost.
* If final treatment is ‘Do Nothing’, then remove the segment.
* Loop over all grouped segments.

**Section Splitting**

* Introduce section breaks where the pavement surface type changes.

Surface type differs between lanes?

Mark the area as requiring lane-based project

Number of lanes changes in the area?

Introduce hard boundaries where there are lane count changes

Go to the next procedure

Yes

No

No

Yes

Surface type of any lanes in the area is unknown?

Set the surface type from either inside or outside lane that has a known surface type.

Unknown surface types of all lanes?

Set the surface type for all lanes based on the neighboring segment (before or after the segment), depending on if the neighboring segment is available and has the same number of lanes.

Go to the next procedure

**Unknown Segment Removal**

* There are sometimes segments (typically small isolated segments) with unknown pavement surface type.
* Small segment removal changes the unknown surface type to match that of the surrounding pavements

No

No

Yes

Yes

Is the final merged segment small (< 0.5 mi.)?

Or

> 50% bridge?

Flip the pavement type to that of the surrounding segments

(by clearing the segment’s pavement type and re-run the small segment removal step).

Go to the next procedure

Yes

**Simple Grouping of Segments**

* Merge all segments with a common attribute.
* Start with a seed segment and extend to any direction until all segments are considered without any merges.
* Do not cross a hard break except between lanes for lane based projects.

No

Another opportunity of growing/merging projects exists?

Compute the probability of merging two projects based on:

* Similarity of the recommended treatments
* Time difference between the recommended treatments
* Total lane miles of the combined project

Go to the next procedure

**Statistical Merging and Growing of Segments**

* Determine the possibilities of growing a seed segment along a lane if there is no project in the adjacent segment, or joining two segments if there is a project in the adjacent section.

For growing of a project into an adjacent segment, consider all of the projects between the seed segment and the nearest hard boundary.

Each project is compared to the seed project based on:

* Similarity of the recommended treatment
* Time difference between the recommended treatments
* Total lane miles of the combined project
* Number of lanes separating the projects
* Absolute distance between the closest two odometer values of the projects

No

Yes