POLICY, PLANNING, & INTERMODAL DEVELOPMENT DIVISION

Research & Development Section

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April 26, 2017 **FIELD REPORT** **U2017-1**

Site Visit for RAS Surface Aggregate Blend
Brookfield – VT Route 65

EA: Experimental Features - SPR 352

Work Plan: WP 2016 R-1

Date: Friday, April 14, 2017

Time: 12:45 PM to 2:30 PM

Weather: 56˚F, Sunny

A field visit was conducted on VT Route 65 in the town of Brookfield after the 2016/2017 winter season. The weather was clear and sunny with the temperature around 56°F and no antecedent rain. Two VTrans pavement design engineers and I inspected the length of VT route 65 from mile marker 3.2 to 0.0. A quick pass through the site and more detailed inspections throughout the site were conducted. The objective of the field visit was to document the condition and determine if the Recycled Asphalt Shingles (RAS) Surface Aggregate blend performed well after its first winter season. The report accomplishes this by directly comparing photographs taken during the 10/26/17 and 4/14/17 field visits. Photographs were taken at the same locations and arranged side-by-side, Figures (1 - 6). A quick visual analysis of the figures show that the surface condition associated with the RAS surface aggregate blend on VT Route 65 appeared to have improved performance over the period between the late fall 2016 through early spring 2017. The roadway appeared to have performed better over the 2016/2017 winter, after the last scheduled grading on November 8 and 9, 2016, then the initial performance period after construction on 8/31/2016.

Background Information:

The contractor who installed the RAS Surface Aggregate blend on the VT 65 Brookfield STP 2960 (1) project was Kubricky Construction from Wilton NY. The three-inch lift of RAS Aggregate Surface Course blend was laid down on 8/31/16 and 9/1/16. The RAS was bought from Myers Corp. and mixed at Northeast Materials in Barre, VT. Observations, photos, and notes were taken during the installation and are referenced within the 9-9-16 field report (Razinger, 2016). VT 65 was graded on September 16th, 19th and 20th right after construction, because aggregate was not dispersed homogeneously throughout certain sections of the roadway. The road was graded for the second time after the 10/26/16 site visit and before

the winter season, on November 8th and 9th. All work regarding the implementation of RAS refers to the WP 2016 R-1 Work Plan (Razinger, 2016)

Vermont's Special Provision (Surface Aggregate, RAS) specification states that an aggregate blend with RAS shall consist of crushed gravel or crushed stone, reasonably free from silt, loam, clay, organic matter or other deleterious materials and shall contain 20%, by weight, Recycled Asphalt Shingles (RAS). The optimal percentage of RAS was determined through material testing, which is outlined in the WP 2016 R-1 Work Plan (Razinger, 2016). Virgin crushed stone or crushed gravel, and the blended Surface Aggregate material at 20% RAS shall meet the requirements of VTrans Subsection 704.12.

RAS shall be produced at a properly permitted facility and meet the requirements of AASHTO MP 23.

Notes:

Figures (1 – 6) compare the roadway conditions at certain locations along VT route 65 in Brookfield after the 2016/2017 Vermont winter season with the post-construction conditions before the winter season. A quick visual analysis of the figures show that the performance of the VT 65 roadway surface with RAS Surface Aggregate had improved after the 2016/2017 winter season. Figures (1 & 7) compare the roadway condition, on or near VT 65, where RAS was not incorporated into the surface course. Figure (1) was taken at mile marker 3.2 before the Brookfield village and Figure (7) was taken on Bear Hill Road, south of the intersection with route VT 65. Figure (8) compares potholes that formed during the winter season on Bear Hill Road south of the intersection with route VT 65 (Left) and on route VT 65 east of Bear Hill Road near Mile Marker 2.1 (Right). Close attention should be taken regarding the geometry of the aggregate in these potholes. The aggregate within the pothole on Bear Hill road (no RAS) was more elongated and irregular, while the aggregate within the pothole on VT 65 was more cubic and rounded. Figure (9) shows the potholes that formed near the entrance to the Allis State Park at mile marker 1.4. The entrance to the park is of great interest because the condition of the roadway declines during the summer months, due to the increased seasonal traffic volumes that are observed on this segment of VT 65. Figure (10) shows the segment of VT 65 west of the I-89 overpass and floating bridge. Figure (11) depicts the steep decline on VT 65 near the intersection with VT 12, at mile marker 0.8. This section was in relatively good condition, but the figure shows some rutting occurring on the left lane. Figure (12) shows the extent of road cracking, rutting, depressions and potholes on the nearby town road, Stone Road, which runs between Brookfield and Williamstown. The section of Stone Road depicted in the figure was on a hill near the intersection with VT 64 and no RAS was mixed into the surface aggregate along the length of the road.

Summary:

From the visual analysis of Figures (1 – 6), the overall condition of the VT 65 roadway seemed to have improved. During the 5 months when the roadway was not being monitored, certain factors might have contributed to the perceived condition of the roadway. This includes: traffic volumes, roadway maintenance and the freezing and thawing of the roadway.

In general, traffic volumes through VT 65 decrease as winter approaches. This is due to the closure of the Historic Brookfield Floating Bridge before Sunset Lake freezes over and the decrease in visitors to the Allis

State Park. The decrease in traffic coupled with the last scheduled roadway grading before the winter months (November) were major contributing factors in improving the roadway conditions after the winter, compared to the conditions observed during the fall site visits. There are a few farms along VT 65 and it was brought to our attention that large farm equipment traveled on the road during harvesting activities during the fall months after construction. The driving of the farm equipment on the road along with the dry 2016 fall season most likely contributed to the roadway deterioration that was observed during the 9/9/16 and 10/26/16 VT 65 site visits. This includes the wash boarding that is evident in the top photos of Figures (2 - 4), around the inclined sections near the intersections with West Street and Bear Hill Road.

It is also evident in Figures (1 – 6) that the amount of aggregate on the roadway surface had decreased after the winter season. This is most likely due to the grading done in September and November 2016 before the first snowfall, which mixed the aggregate more homogeneously throughout the depth of the surface course and pushed the larger aggregate off the roadway surface and onto the shoulder. Snow plowing during the winter months could also have contributed to movement of the aggregate to the shoulders. It was also theorized that the size, shape and amount of aggregate on the roadway surface along with the low percentage of fines caused the vehicles tires to lose grip and spin, contributing to the wash boarding depicted in the figures (Denardo & Ewald, 2017). The differences in the aggregate size and shape can be seen in Figure (8). Two potholes of similar size were selected, one on VT 65 east of Bear Hill Road near mile maker 2.1(with RAS, photo on the right) and the other on Bear Hill Road near the intersection with VT 65 (no RAS, photo on the left). A visual analysis of the aggregates within the potholes clearly shows that the aggregate used on the Brookfield project is more rounded and cubic as opposed to the more elongated and irregular aggregate used on surrounding roadways.

Winter maintenance, which includes the plowing of the road, along with freezing of the roadway surface might have also contributed to the improvement of the VT 65 roadway after the winter season. It should be noted that winter conditions and necessary maintenance activities are just one of many uncontrollable factors that influence the performance of any gravel road surface in Vermont. The plowing of the road tends to move loose stones to the shoulders and the application of winter sand for traction introduces a new material to the surface blend. Seasonal changes also alter the behavior of the roadway, for example when the surface course is in a frozen “bound” state, it resists movement much more than in a thawed “unbound” state.

Assessing the performance throughout the length of the VT 65 project after the 2016/2017 winter season, deterioration of the roadway surface was limited to some localized potholing and rutting. Areas near the Allis State Park (Figure (9)), west of the I-89 overpass (Figure (10)), and east of Bear Hill Road (Figure (8)), exhibit the greatest concentration of the potholing after the winter season. It should also be noted that the aggregate within the potholes on VT 65 was more visible or exposed, most likely due to the lack of fines and mixing of the aggregate during construction. Rutting was prevalent, but not extensive, east of the intersection with Bear Hill Road near mile marker 2 (Figure (3)), north of the intersection with Bear Hill Road near mile marker 1.7 (Figure (4)), on the steep decline near the intersection with VT 12 at mile marker 0.8, (Figures (5 & 11)), and near the intersection with VT 12 at mile marker 0.3 (Figure (6)). The thawing of the roadway surface contributed to the rutting depth due to excessive moisture conditions in the roadway materials, which are expected on a gravel road during spring. Road conditions can be seen in Figure (11).

In general, the rutting on VT 65 was relatively minor and the potholes were relatively small, in size and depth, and limited to a few sections throughout the roadway. This was verified by our field visit and the video taken driving the length of VT 65 (Pappas, 2017). Visual observations of nearby roads like Bear Hill Road, shown in Figure (7), and Stone Road, shown in Figure (12) and from the videos taken driving through sections of road (Razinger, 2017), emphasize that the conditions of the nearby town roads, that do not incorporate RAS in the surface course, were generally worse than VT 65. These observations make it difficult to argue that the inclusion of RAS into the surface course was the sole cause of the deterioration observed during the fall 2016 site visits after the construction of the VT 65 roadway. If necessary random surface course samples could be taken on VT 65 to determine if the gradation of the roadway has significantly changed from the gradation conducted by the Materials Section in December of 2016 (Denardo & Ewald, 2017).

References

Denardo, E., & Ewald, C. (2017). *Brookfield STP 2960(1) - Surface Course Aggregate Test Results.* Berlin: VTrans Materials Section.

Pappas, N. (2017). *VT 65 Drive Through.* Retrieved from VTransTV - Youtube Channel: https://youtu.be/GJ02BT_KtxY

Razinger, J. (2016). *Assessment and Application of Reclaimed Asphalt Shingles (RAS) in Pavement Mixtures and Unbound Aggregate.* Montpelier: VTrans Research Section.

Razinger, J. (2016). *RAS in Surface Course Brookfield Field Report 9_9_16.* Montpelier: VTrans Research Section.

Razinger, J. (2017). *Stone Road Drive Through.* Retrieved from VTransTV - Youtube Channel: https://youtu.be/SgRV0-KQL2U

Photos:

Figure 1: Brookfield Village East of Floating Bridge (Non-RAS Section) at VT 65 Mile Marker 3.2. Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom)

Figure 2: Intersection with West Street at VT 65 Mile Marker 2.5. Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom)

Figure 3: East of Intersection with Bear Hill Road at VT 65 Mile Marker 2. Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom)

Figure 4: North of Intersection with Bear Hill Road at VT 65 Mile Marker 1.7. Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom)

Figure 5: VT 65 Looking Down Decline Towards VT 12 Mile Marker 0.8. Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom). Minor ruts formed on the left side of the road and can be seen in more detail in Figure (11)

Figure 6: VT 65 Looking Towards VT 12 Mile Marker 0.3. Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom)

Figure 7: Bear Hill Road Looking Towards Intersection with VT 65 (Non- RAS Section). Photo Comparison between 10/26/16 Site Visit (Top) and 4/14/17 Site Visit (Bottom)

Figure 8: Bear Hill Rd Pothole Near Intersection with VT 65. Road has no RAS, aggregate is more irregular (Left). Pothole on VT 65 East of Bear Hill Rd near Mile Marker 2.1. Road has RAS, aggregate is more cubic (Right). Photos taken during 4/14/17 Site Visit.

Figure 9: Potholes Near the Entrance to the Allis State Park, VT 65 Mile Marker 1.4. Photo taken during 4/14/17 Site Visit.

Figure 10: VT 65 just West of I-89 Overpass, Mile Marker 2.7. Photo taken during 4/14/17 Site Visit.

Figure 11: VT 65 Looking Down Decline Towards VT 12 Mile Marker 0.8. Some Rutting is occurring on the left side of the road. Photo taken during 4/14/17 Site Visit.

Figure 12: Stone Road Near Intersection with VT 64 on a Hill (Town Road with no RAS). Road cracking, rutting, depressions and potholes were widespread. Photos taken during 4/14/17 Site Visit. See also Stone Road video.