

September 10, 2024

Colonel Tuftonboro Estates Association
Tuftonboro, NH 03850

Re: Roadway Engineering - Senter Cove Road, Vere Royce Road, and Mason Road

Dear Association Members:

We have completed the preliminary investigation, plans and estimates for the roadway reconstruction project. This work was completed as outlined in the December 5, 2023 letter agreement. Following is a brief discussion of our efforts and findings:

Field Investigations

The field investigations focused on pavement condition, drainpipes, and roadside drainage. Each pipe was inspected from both ends (if possible) to determine the pipe condition.

Drainage Pipes

We found that all of the roadway culverts (pipes beneath the roadway) were corrugated metal pipes (CMP) and were in much better condition than expected. We did find that some of the pipe ends were buried with soils, vegetation or debris (leaves, etc.) which restricts flow, significantly in some locations. CMPs typically corrode on the bottom of the pipe where in contact with flowing water but these pipes were in good condition with only some surface corrosion.

The driveway culverts were mostly CMP but some were high density polyethylene pipe (HDPE). All the driveway culverts were in good physical condition and appeared to be flowing freely. There is one short section of culvert associated with a transformer that appears to be a restriction to ditch flow due to the invert of the pipe. There was standing water in this ditch and the wet area may be considered a wetland. A Certified Wetland Scientist will need to verify the presence of wetlands. This pipe should be removed and the ditch regraded to improve ditch flow (will require relocating secondary service direct buried cables). Also, a downstream driveway culvert must be replaced to lower the elevation of the ditch . With utility relocations and pipe replacements the minimum ditch grade can be set at 0.75%.

The existing pipe at Station 9+00 was set as low as possible, however, a ponding area remains below the invert of the pipe on the south side of the roadway (about 0.7'). If the pipe were to be replaced in its current location (noted as Option 1), the invert could not be set at a lower elevation since the outlet of the pipe is at the invert of the existing ditch (without regrading the ditch and replacing the downstream driveway culvert). Alternatively, a pipe could be installed from this location to the outlet of the existing 24" pipe (noted as Option 2) which is much lower

than the ponding area (about 3') fully eliminating any ponding and reducing flow in the swale that leads to the 24" pipe.

Roadside Ditches

We found that many of the roadside ditches were well maintained, adequate to manage stormwater flows, and deep enough to drain the roadway subbase (about 2'). Other ditches were not deep enough, not adequate to convey expected stormwater flows or drain the roadway base areas. The ditches where deficiencies were found and improvements are required are noted on the plans. Most of the reported drainage problems associated with these roadways are a result of inadequate ditches, not inadequate pipes.

Roadway Pavement Condition

We evaluated the roadway conditions by walking the road and identifying potential problem areas on the plans (surface rock areas, rutting, excessive cracking, surface drainage problems, etc.). We found a variety of pavement conditions when inspecting the roadways. The worst section of roadway appears to be at the low point in the road (Senter Cove Road/Mason Road) where significant pavement deterioration was found. There were also rocks visible in some locations such as Vere Royce Road. We cannot know the specific soil properties of the gravel beneath the road but rocks near the surface and the significant deterioration in some locations indicate that the subsurface materials are not ideal. We also understand that paving companies that visited the site refused to do reclamation (grinding the pavement and gravel together) due to the number of rocks observed (would damage the equipment). In general, the pavement condition is poor except where recent overlays have been placed.

Roadway Grading

During our previous discussions, we understood that some roadway grading was being considered at the low point in the roadway to better drain the roadway and direct more flow to the stormwater pond. The road in this location has a well-maintained ditch on the uphill side and the natural grade of the ground leads to the pond on the downhill side. This area drains to a 24" CMP that allows flow under the road and towards the pond. It does not appear that changing the profile of the road to direct more stormwater to the pond will provide any additional benefit to the roadway drainage system. Raising the entire section of roadway in the low area by 9" or so should be considered to provide more separation between the groundwater and roadway base course.

Recommendations

Any roadway construction project begins with proper drainage. Pipes that were found to be plugged and crossed the roadway are proposed to be replaced as noted on the plans. The inlets and outlets need to be opened up at all locations and protected with a stone apron (prevent future erosion and clogging). There is one location on that has two options for pipe improvements (Station 9+00). Although more expensive, Option 2 is recommended because it will fully drain the low-lying area near the road and reduce flow in the existing swale.

The roadside ditches need improvement in many locations that are noted on the plans. The ditches should be at least 2' deep to properly drain the roadway base courses. This work should be completed regardless of what pavement improvement method is selected.

Pavement reconstruction methods are limited to pavement overlay or full reconstruction. Pavement overlays will need to be competed every few years and will break up within a few years due to the suspected poor base materials and poor pavement condition. Reclamation may be a good option if so, many rocks were not in the gravel base but since they are, this option must be eliminated. Full depth reconstruction (excavation, gravel, crushed gravel) and a new pavement structure is recommended and shown on the plans.

Attached are preliminary plans and construction estimates for your review and consideration. We have not suggested project phasing at this point but did provide a per foot cost of the roadway full depth reconstruction and overlay so members can consider a possible phasing plan. Keep in mind that the per foot costs are for the entire project and the smaller the construction phase the higher the per foot cost.

If you have any questions or need any additional information, please feel free to contact me at 603-413-6650 or on my cell phone at 603-731-1562 or by email at MVignale@kvpllc.com.

Sincerely,

KV Partners LLC



Michael S. Vignale, P.E.
Principal Engineer

MEMORANDUM - Preliminary Construction Cost Estimate**To: Colonel Tuftonboro Estates Association****From: Mike Vignale, KVPartners, LLC****Project: Roadway Improvements - Senter Cove Road, Mason Road, and Vere Royce Road (3,700')****Subject: Approximate Construction Estimate (TOTAL PROJECT - FULL RECONSTRUCTION)****Date: September 10, 2024**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COSTS
1	Mobilization	1	LS	\$20,000.00	\$20,000
2	Site Preparation	1	LS	\$15,000.00	\$15,000
3	Excavation	7600	CY	\$15.00	\$114,000
4	Rock Excavation	20	CY	\$75.00	\$1,500
5	Gravel	3600	CY	\$30.00	\$108,000
6	Crushed Gravel	2,000	CY	\$34.00	\$68,000
7	Hot Bituminous Pavement Driveways	40	TON	\$180.00	\$7,200
8	Hot Bituminous Pavement Base Course	1,200	TON	\$90.00	\$108,000
9	Hot Bituminous Pavement Wearing Course	700	TON	\$90.00	\$63,000
10	Class B Stone Fill (Class C)	40	CY	\$60.00	\$2,400
11	12" HDPE Pipe	230	LF	\$60.00	\$13,800
12	Drain Manhole	1	EA	\$4,000.00	\$4,000
13	Loam and Seed	2000	SY	\$7.50	\$15,000
14	Erosion Control	1	LS	\$7,500.00	\$7,500
15	Traffic Control	1	LS	\$10,000.00	\$10,000
16	Asphalt and Fuel Adjustments	1	LS	\$1,000.00	\$1,000

Total Construction Cost **\$558,400****Contingency (10%)** **\$55,840****Construction Oversight (4%)** **\$22,336****Total Project Amount** **\$614,240****Cost per Linear Foot** **\$166**

MEMORANDUM - Preliminary Construction Cost Estimate**To: Colonel Tuftonboro Estates Association****From: Mike Vignale, KVPartners, LLC****Project: Roadway Improvements - Senter Cove Road, Mason Road, and Vere Royce Road (3,700')****Subject: Approximate Construction Estimate (TOTAL PROJECT - PAVEMENT OVERLAY)****Date: September 10, 2024**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COSTS
1	Mobilization	1	LS	\$8,000.00	\$8,000
2	Site Preparation	1	LS	\$10,000.00	\$10,000
3	Excavation	600	CY	\$25.00	\$15,000
4	Rock Excavation	5	CY	\$75.00	\$375
5	Hot Bituminous Pavement Driveways	40	TON	\$180.00	\$7,200
6	Hot Bituminous Pavement Leveling	700	TON	\$90.00	\$63,000
7	Hot Bituminous Pavement Wearing Course	700	TON	\$90.00	\$63,000
8	Gravel Shoulders	7,400	LF	\$1.50	\$11,100
9	Class B Stone Fill (Class C)	40	CY	\$60.00	\$2,400
11	12" HDPE Pipe	230	LF	\$60.00	\$13,800
12	Drain Manhole	1	EA	\$4,000.00	\$4,000
13	Loam and Seed	2000	SY	\$7.50	\$15,000
14	Erosion Control	1	LS	\$2,500.00	\$2,500
15	Traffic Control	1	LS	\$5,000.00	\$5,000
16	Asphalt and Fuel Adjustments	1	LS	\$1,000.00	\$1,000

Total Construction Cost **\$221,375****Contingency (10%)** **\$22,138****Construction Oversight (3%)** **\$6,641****Total Project Amount** **\$250,154****Cost per Linear Foot** **\$68**

MEMORANDUM - Preliminary Construction Cost Estimate**To:** Colonel Tuftonboro Estates Association**From:** Mike Vignale, KVPartners, LLC**Project:** Roadway Improvements - Senter Cove Road, Mason Road, and Vere Royce Road (3,700')**Subject:** Approximate Construction Estimate (TOTAL PROJECT - PAVEMENT OVERLAY - NO DITCH WORK)**Date:** September 10, 2024

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COSTS
1	Mobilization	1	LS	\$8,000.00	\$8,000
2	Hot Bituminous Pavement Driveways	40	TON	\$180.00	\$7,200
3	Hot Bituminous Pavement Leveling	700	TON	\$90.00	\$63,000
4	Hot Bituminous Pavement Wearing Course	700	TON	\$90.00	\$63,000
5	Gravel Shoulders	7,400	LF	\$1.50	\$11,100
6	Traffic Control	1	LS	\$5,000.00	\$5,000
7	Asphalt and Fuel Adjustments	1	LS	\$1,000.00	\$1,000

Total Construction Cost **\$158,300****Contingency (10%)** **\$15,830****Construction Oversight (2%)** **\$3,166****Total Project Amount** **\$177,296****Cost per Linear Foot** **\$48**