

May 16, 2018

Township of Lower Makefield
1100 Edgewood Road
Yardley, PA 19067-1696

**Attn: Terry Fedorchak
Township Manager**

**Re: Schuyler Tennis Courts Crack Repair
Township of Lower Makefield
RVE File# PBLMT034**

Dear Mr. Fedorchak:

Remington & Vernick Engineers (RVE), on behalf of the Lower Makefield Township, performed a visual inspection of the Schuyler Tennis Courts. The inspection of the courts took place on April 9, 2018 at approximately 7:00 PM. A set of photos are attached to this letter.

Below is a summary of the observations noted during the inspection visit:

- There are a significant amount of cracks throughout the tennis courts. Debris and vegetation has accumulated in some of the largest cracks.
- There are some cracks that begin at discontinuities such as net posts and fence posts.
- There are some cracks that do not begin at discontinuities and span the width of the court.
- Cracks are probably the result of water infiltrating the system, freezing and thawing. We also found that the cracks are more than likely the result of a poor subbase and drainage system.
- The court was overlaid approximately 2 years ago according to the Township staff. Some erosion on the edges of the tennis court pavement was observed. The erosion allowed a section view of the pavement to be seen. It appears that several layers of overlay paving were installed without the milling of the original surface. Furthermore, the old epoxy layer can be seen within the cross section indicating this was not removed prior to the new overlay being placed.

While we did not take core samples of the pavement and were unable to see the paving section beyond what appears on the surface and from the cross section witnessed at the edges, it is our belief that the cracks in the previous pavement were not adequately repaired and the surface was not adequately prepared for the new overlay. In order to confirm this belief, core sampling of the paving system will be needed.

A proper crack repair would have involved sawcutting the cracks open to provide a clean edge for the new material to sufficiently bond to the old pavement, applying a bonding agent to join the new material with the old pavement, and providing new joint filler material to adequately seal the joint from water infiltration.

A properly prepared surface for the new pavement overlay would involve milling off the existing surface, applying a geotextile matting to adequately bridge the cracks in the old pavement, applying a tack coat to adequately bond the new asphalt material to the old, installing the new asphalt surface, and then applying the epoxy coating and line striping on top.

There is evidence to suggest this was not completed (see Photo 9 attached), thus we believe this to be a contributing factor to the deterioration of the new pavement system. Furthermore, we believe the deterioration occurred at a rate faster than can reasonably be expected for a new pavement system.

Furthermore, there is evidence to suggest (see Photo 9 attached) that the old epoxy coating was not removed prior to the placement of the new paving. Therefore, we believe that any water infiltration into the new pavement layer will not be able to drain down to the old pavement system and will become trapped within the new layer. This suggests that the new pavement layer will deteriorate at a faster rate than even the old system.

RVE has developed cost estimates for five (5) remediation options. Below is a summary of each remediation option. Attached to this letter are more detailed cost estimates.

Option 1 – Do Nothing.

Project Cost Estimate: \$0.00

Summary: No action to be taken.

Advantages: No immediate construction cost.

Disadvantages: Cracks will become tripping hazards. Repairs in the future may be more costly if the court is not maintained regularly.

Option 2– Total Demolition and Reconstruction

Project Cost Estimate: \$357,650

Summary: Remove the existing court and build a completely new asphalt paving court.

Advantages: The surface planarity and slope are corrected. An adequate drainage system can be installed. All cracked asphalt is removed.

Disadvantage: This option has the highest immediate construction cost estimate. Costs could be even higher than the initial estimate based on the stability of the earth underneath the courts.

Option 3– Saw Cut, Asphalt Patch and Crack Filler

Project Cost Estimate: \$126,500

Summary: Areas with large cracks are cut out and replaced with new asphalt. Small cracks are filled with a crack filler or caulking material. An acrylic system is painted on the entire court surface.

Advantages: This option is relatively inexpensive. This is the traditional method of repairing tennis courts. The subbase is repaired for the larger cracks.

Disadvantage: Crack fillers are meant to be used as a temporary fix. Therefore, cracks may appear soon after repairs are made. There will be higher maintenance costs. The saw cuts made for the large crack repairs may be visible on the surface.

Option 4– Armor Crack Repair System

Project Cost Estimate: \$198,950

Summary: An expandable fabric is applied over the crack. The fabric will absorb any movement without it ripping or delaminating. The court is repainted.

Advantages: No machinery is required. This type of crack repair system typically lasts longer than that described in Option 3. Existing cracks are concealed. The cost is relatively low.

Disadvantage: Cracks may continue to grow beyond repairs made based on the marginal condition of the subbase.

Option 5– Mill and Overlay

Project Cost Estimate: \$257,600

Summary: Fence and net posts will be removed as necessary. The court will be milled. Cracks will be filled as necessary and an adequate mat for surface preparation will be placed. The court will be overlaid and painted.

Advantages: The existing cracks will be repaired.

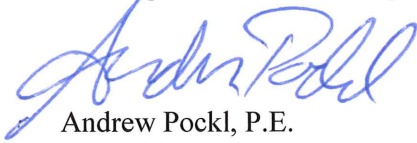
Disadvantage: The subbase will not be repaired.

Please note the costs presented above are based on state required Prevailing Wage Rates and an assumption was made that repairs would be made through the Public Bid Process. The estimates include contingency items and a percentage for engineering and construction management.

In summation, the deterioration of the existing pavement system witnessed is more advanced than what should reasonably be expected. We do not believe Option 1 (do nothing) is a viable option as the cracks are severe enough to present a safety hazard to those that use the courts. Other options offer a range of solutions which vary greatly in both cost and expected lifetime. Our office looks forward to discussing these options with the Township staff and Supervisors.

Should you have any questions, please feel free to contact our office at (610) 940-1050.

Very truly yours,
Remington & Vernick Engineers



Andrew Pockl, P.E.
Township Engineer

cc:

John Lewis, President, Board of Supervisors
Dan Grenier, Supervisor
Monica Tierney, Director of Parks and Recreation
Thomas F. Beach, PE, CME, Executive Vice President
Christopher J. Fazio, PE, CME, Executive Vice President
Kelly Goff, PE



Photo 1 - Debris Accumulation in Crack



Photo 2 - Debris Accumulation in Crack



Photo 3 - Vegetation Accumulation in Cracks



Photo 4 - Crack Beginning at Net Post



Photo 5 - Crack Beginning at Net Post

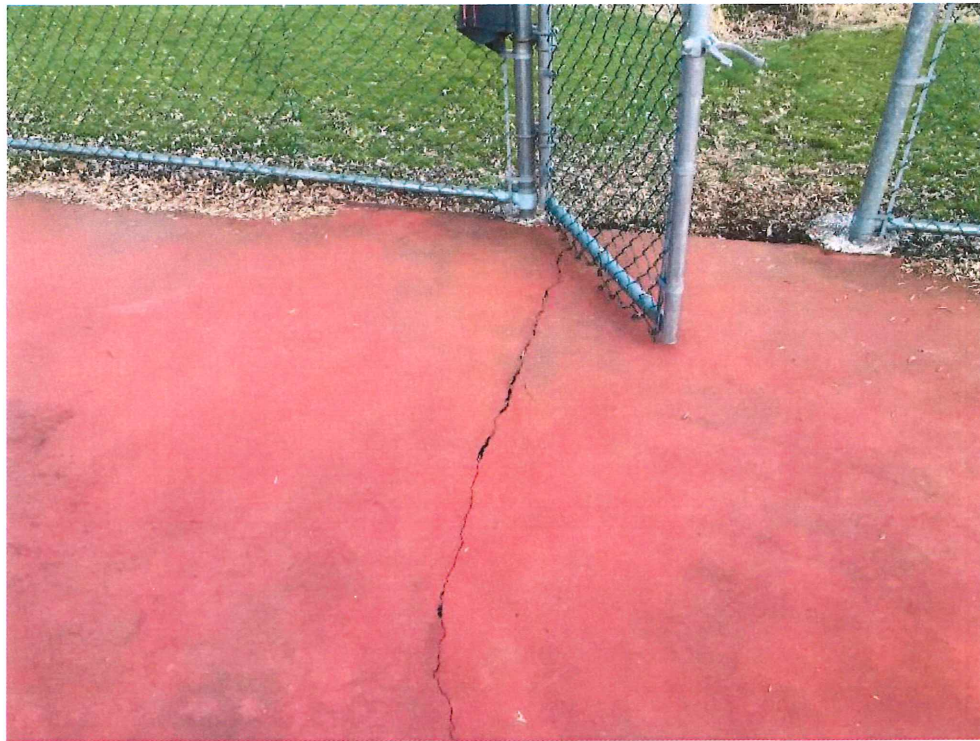


Photo 6 - Crack Beginning at Fence Post

Lower Makefield Township

There are some cracks that do not begin at discontinuities (**Photo 7**). These cracks are probably the result of water infiltrating the system at a joint along the edge of the paving placement. As the water infiltrated the system, freezing and thawing occurred which opened a crack.

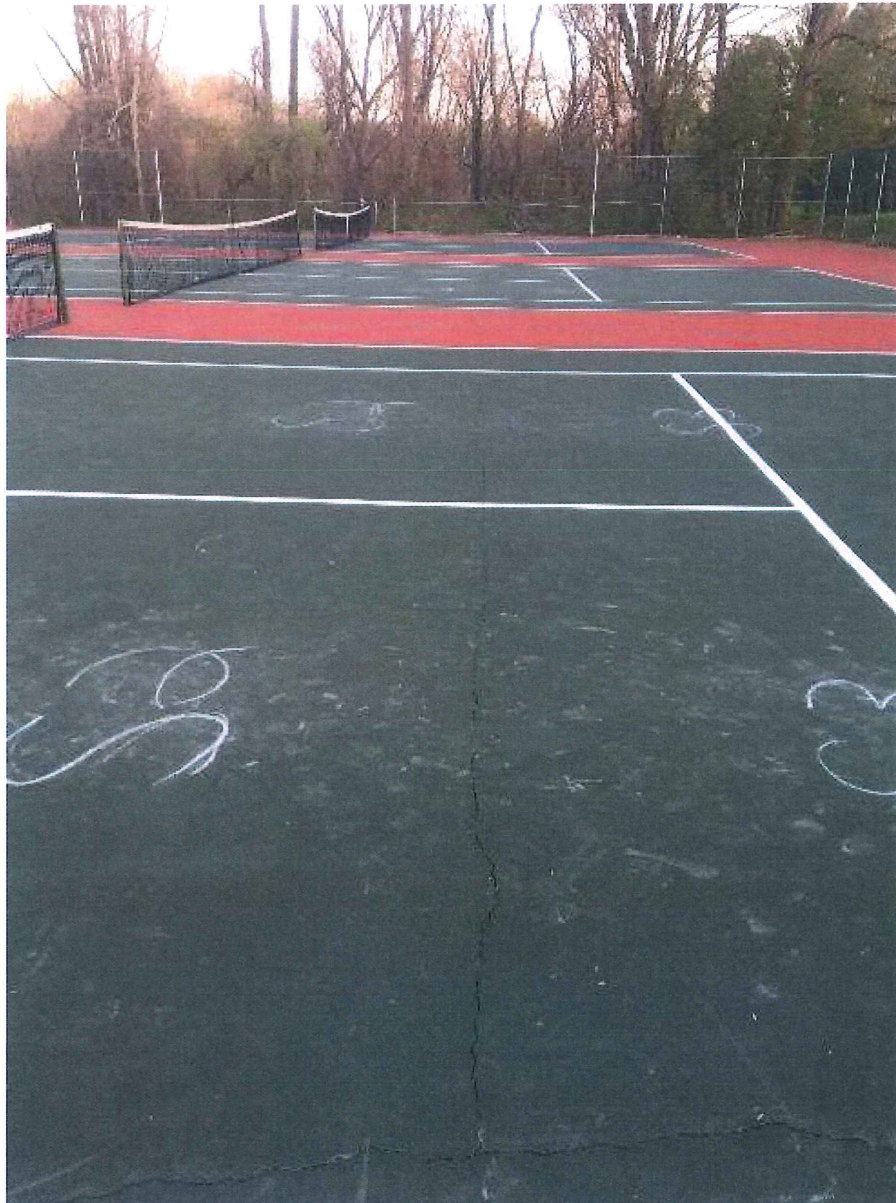


Photo 7 – Crack Spanning Most of the Court Width



Photo 8 – Erosion



Photo 9 – Paving Cross Section

PRELIMINARY PROJECT COST ESTIMATE

Project Name: Schuyler Tennis Court - Total Reconstruction
Project Number: PBLMT034
Client: Lower Makefield Township
Date: 5/9/2018

No.	Description	Estimated Quantity	Units	Estimated Unit Price	Item Subtotal
1	Mobilization	1	LS	\$ 7,000.00	\$ 7,000.00
2	Demolition and Removal	1	LS	\$ 37,000.00	\$ 37,000.00
3	Removal and Re-installation of existing Fence/Fence Posts as needed to Access Court	710	LF	\$ 40.00	\$ 28,400.00
4	Removal and Re-installation of Tennis Net Posts	1	LS	\$ 20,000.00	\$ 20,000.00
5	Excavation	1045	CY	\$ 6.00	\$ 6,270.00
6	Base Course, Leveling Course, and Surface Course	3125	SY	\$ 40.00	\$ 125,000.00
7	Liquid Applied Acrylic Surface System, Line Striping and Prime Coat	3125	SY	\$ 15.00	\$ 46,875.00
Construction Cost Estimate Subtotal:					\$ 270,545.00
15% Contingency:					\$ 40,455.00
Construction Cost Estimate Total:					\$ 311,000.00
15% Engineering & Inspection:					\$ 46,650.00
Project Cost Estimate Total:					\$ 357,650.00

Note: (1) This preliminary estimate does not include the costs of permitting, financing or utility provider charges.
 (2) This preliminary estimate is valid for a period of 6 months.

PRELIMINARY PROJECT COST ESTIMATE

Project Name: Schuyler Tennis Court - Sawcut, Asphalt Patch, Crack Filler
Project Number: PBLMT034
Client: Lower Makefield Township
Date: 5/9/2018

No.	Description	Estimated Quantity	Units	Estimated Unit Price	Item Subtotal
1	Mobilization	1	LS	\$ 2,500.00	\$ 2,500.00
2	Repair Cracks > 0.5" with sawcutting, base course installation and pavement restoration	140	LF	\$ 25.00	\$ 3,500.00
3	Repair Cracks < 0.5" with crack filler	2110	LF	\$ 15.00	\$ 31,650.00
4	Liquid Applied Acrylic Surface System, Line Striping and Prime Coat	3125	SY	\$ 15.00	\$ 46,875.00
5	Regrading around Border	1	LS	\$ 10,000.00	\$ 10,000.00
Construction Cost Estimate Subtotal:					\$ 94,525.00
15% Contingency:					\$ 15,475.00
Construction Cost Estimate Total:					\$ 110,000.00
15% Engineering & Inspection:					\$ 16,500.00
Project Cost Estimate Total:					\$ 126,500.00

Note: (1) This preliminary estimate does not include the costs of permitting, financing or utility provider charges.
 (2) This preliminary estimate is valid for a period of 6 months.

PRELIMINARY PROJECT COST ESTIMATE

Project Name: Schuyler Tennis Court - Armor Crack Repair System
Project Number: PBLMT034
Client: Lower Makefield Township
Date: 5/9/2018

No.	Description	Estimated Quantity	Units	Estimated Unit Price	Item Subtotal
1	Mobilization	1	LS	\$ 3,500.00	\$ 3,500.00
2	Repair Cracks with Armor Repair System	2250	LF	\$ 40.00	\$ 90,000.00
3	Liquid Applied Acrylic Surface System, Line Striping and Prime Coat	3125	SY	\$ 15.00	\$ 46,875.00
4	Regrading around Border	1	LS	\$ 10,000.00	\$ 10,000.00
Construction Cost Estimate Subtotal:					\$ 150,375.00
15% Contingency:					\$ 22,625.00
Construction Cost Estimate Total:					\$ 173,000.00
15% Engineering & Inspection:					\$ 25,950.00
Project Cost Estimate Total:					\$ 198,950.00

Note: (1) This preliminary estimate does not include the costs of permitting, financing or utility provider charges.
 (2) This preliminary estimate is valid for a period of 6 months.

PRELIMINARY PROJECT COST ESTIMATE

Project Name: Schuyler Tennis Court - Mill and Overlay
Project Number: PBLMT034
Client: Lower Makefield Township
Date: 5/9/2018

No.	Description	Estimated Quantity	Units	Estimated Unit Price	Item Subtotal
1	Mobilization	1	LS	\$ 5,000.00	\$ 5,000.00
2	Removal and Re-installation of existing Fence/Fence Posts as needed to Access Court	710	LF	\$ 40.00	\$ 28,400.00
3	Removal and Re-installation of Tennis Net Posts	1	LS	\$ 20,000.00	\$ 20,000.00
4	Asphalt Milling, 1.5"	3125	SY	\$ 4.00	\$ 12,500.00
5	PetroMat Installation and Crack Filling	1	LS	\$ 35,000.00	\$ 35,000.00
6	Pavement Overlay	3125	SY	\$ 15.00	\$ 46,875.00
7	Liquid Applied Acrylic Surface System, Line Striping and Prime Coat	3125	SY	\$ 15.00	\$ 46,875.00
Construction Cost Estimate Subtotal:					\$ 194,650.00
15% Contingency:					\$ 29,350.00
Construction Cost Estimate Total:					\$ 224,000.00
15% Engineering & Inspection:					\$ 33,600.00
Project Cost Estimate Total:					\$ 257,600.00

Note: (1) This preliminary estimate does not include the costs of permitting, financing or utility provider charges.
 (2) This preliminary estimate is valid for a period of 6 months.