KIRTLAND ROAD PROGRAM

2020

A NEW DIRECTION to MOVE KIRTLAND FORWARD

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The primary purpose for assembling a Kirtland Citizens Road Task Force is to develop strategies and make recommendations for the development and implementation of a new road plan for the City of Kirtland. The Task Force members are Kirtland residents with extensive Engineering, Geotechnical and Road Construction backgrounds. Serving in no official capacity, it is anticipated that the committee act as an advisory counsel to the Administration, Public Service Director and City Engineer. The group will help determine how to prioritize the substantial road improvements that are needed. Based on sound engineering principles, recommendation and/or participation in field exploration and resulting data collection, the group will help develop a program that deciphers the existing pavement, soil subgrade, surface drainage, and groundwater conditions. Ultimately, the committee will assist the Administration to execute best practices to repair or rebuild Kirtland's roadways.

TASK FORCE MEMBERS

Four members of our Kirtland community have been requested to join the volunteer Task Force. They are:

Dan Laux. Dan is recently retired from Polaris Engineering & Land Surveying Inc. He was a founder and partner for 17 years. He is a professional land surveyor in the States of Ohio and Florida. He has been involved with hundreds of major construction projects over his 48-year career.

Premo Panzarello. Premo is a retired heavy equipment operator who has worked on innumerable construction projects, and whose career spans more than 50 years. He has been involved in all facets of road construction (asphalt, concrete and bridge work) and is very familiar with the latest techniques of asphalt repair and paving.

Dave DiCillo. Dave is a Project Superintendent/Manager with Anthony Allega Cement Contractor, Inc., one of this region's largest Heavy Civil construction contractors. Dave has more than 22 years of related experience. His clients included ODOT, the Port of Cleveland, Cleveland Metroparks, RTA, the Pennsylvania Turnpike Commission, and the Corps of Engineers.

Joe Petraus. Joe is a mostly but not fully retired professional engineer with over 50 years of practical experience in geotechnical engineering design and construction, with a special interest in pavement failure studies, pavement design, and pavement construction. He was a partner with EDP Consultants in Kirtland for 24 years.

The Task Force plans to work closely with Kirtland's Service Director, Joe Fornaro, and City Engineer Doug Courtney.

HOW WE GOT TO WHERE WE ARE NOW

Kirtland began as a Township in the mid-1800s and was incorporated into a Village in 1968. Its population first exceeded 5000 in 1970, and it became a City in early 1971. Due to residential subdivision development over the last forty years, Kirtland's population, today, approaches 7,000. As a result of this population growth, as well the growth of surrounding communities, traffic increases have put a strain on Kirtland's road system. Many of those roads were not designed for current traffic conditions, and most construction procedures and materials used would today not be considered "best practice". Specifications for new subdivision streets were updated from time to time, and we will be reviewing these specifications to ensure the most current and applicable standards are used moving forward. Today, we look back and question some of the design details and material specifications, and the lack of thorough inspection to make sure specifications were being properly met at the time of construction.

No long term, multi-year pavement management and improvement plan was developed. Instead, the Service Department did the best they could to keep up with maintenance on an as-needed basis, using available funds to address the worst of the problem areas. This is the foundation on which we must now build.

EVALUATING CURRENT PAVEMENT CONDITIONS

One principle of construction is that a structure is only as good as its foundation, and the same holds true for pavements. The quality of the subgrade that supports the pavement can be inferred from site observations by a skilled, experienced observer. But visual observations have their limitations, and assumptions need to be confirmed and if necessary, revised, based on the results of field sampling. A sampling program should include coring of the existing asphalt or concrete section, sampling of the base course, sampling of the soil subgrade, and evaluating groundwater conditions. Anything less is guesswork.

THEN WHAT?

Once we identify existing pavement, subgrade, and water conditions, we can then select the most practical, cost-effective approach to repair or replace each road. Some of the required work can be done by our Service Department personnel, such as constructing underdrains to keep water from saturating the soil subgrade and base course, and improving surface drainage by cleaning existing drainage swales or re-establishing others whose function has been eliminated by improper yard grading.

Pavement repair or reconstruction should be outsourced, and a variety of approaches are available, keeping in mind that some are relatively less costly, and others substantially higher in cost. They primarily include:

- Conventional patching, using a wide range of proper construction techniques
- Saw-cutting and full-depth repair of deteriorated concrete pavement areas
- Milling, patching, and resurfacing, such as we see being done on our major highways
- Complete reconstruction, incorporating material recycling if appropriate
- Improving surface grades with a thin scratch course layer, followed by a chip-seal treatment

Some of these approaches are very costly, but potentially have a long service life. Others are less costly, with a shorter expected service life. Kirtland has about 60 miles of roadway. We need to keep in mind that it took several decades to reach the current situation we face, and it will take many years to achieve our goals. Regardless of funds or funding mechanisms determined by the Administration and City Council, we will need to focus on underdrainage and improved surface drainage to attack the primary causes of deterioration and frost heaving (that means water). In certain instances, less costly surface treatments might be recommended to buy certain roads time.

The Administration has selected approximately 5 miles of roads, distributed in each of the City's four wards, as a sample of some of the most challenging pavement conditions we now face. The list could easily have been expanded to well beyond the initial 5 miles. The Task Force's intent is to focus on those initial 5 miles, help plan and implement a proper field exploration program, analyze the results, and recommend the repair or rehabilitation steps that need to be followed. The group will then work with the City Engineer in an advisory capacity to help implement the plan, which will include appropriate specifications and construction inspection by competent personnel to help make sure that the specifications are followed.

SUMMARY OF MARCH 18, 2020 SITE OBSERVATIONS OF "PRIORITY" ROADS

SPRINGER DRIVE AND SPRINGER COURT

- Substantial alligator cracking and potholes
- Deterioration significantly worse where the road begins its downward slope (water beneath pavement is culprit)
- Pavement conditions uniformly poor throughout remaining areas
- Areas of wheelpath rutting, indicating soft subgrade and/or base
- Topography directs surface water toward pavement, primarily from south but also from other directions
- Phreatic surface generally follows topography; groundwater is routed to beneath pavement
- Lack of swales on south side and in other areas
- Extensive network of 3 ft deep underdrains required incl. some transverse to pavement
- Re-shape or construct new swales where practical to do so
- Without improved under-drainage, any pavement renovation is doomed to failure

PARKWOOD / CRESTWOOD NEIGHBORHOOD

- Overall, these were probably the worst asphalt pavement conditions observed that day
- Alligator cracking with raveled edges was prevalent throughout most areas
- Many areas of potholes
- Many depressed (rutted or settled) areas with wheel path rutting
- The land is relatively flat, and surface drainage is mostly poor, with minimal swales. Interestingly, however, was the first few hundred feet west of SR 306, which had quite deep drainage swales along the pavement edges, and yet severe pavement deterioration and alligator cracking. This suggests an

under-designed pavement section (possibly including inadequate base, poor quality base, and/or a poor-quality soil subgrade).

- Regardless, water below the pavement section is a significant contributor to the distress.
- The extent and degree of alligator cracking in this neighborhood is such that it may be impractical to try to incorporate any of these materials into a renovated pavement.

CRESTWOOD SOUTH (CONCRETE PAVEMENT AREA)

- Concrete pavement, with virtually no surface drainage, likely no underdrains, and extensive areas of joint repair using hot mix asphalt which is now extensively cracked and ugly.
- We need to determine how the asphalt joint repairs were done (full depth? partial depth?, etc.)
- Given the nature of the joint deterioration, underdrainage is needed.
- We preliminarily believe that deteriorated joints should be saw-cut and removed, replaced with concrete. Repair depth to be determined. With or without doweled joints to be determined. How best to improve underdrainage to be determined.

REGENCY WOODS DRIVE

- Compared to most other Kirtland roads, this road is in c*omparatively* good condition, except for the hill and embankment at the far western end, but needs more-or-less "standard" repairs including selected mill and fill, selected areas of full depth repair with base improvement, and more extensive work in areas of transverse joint deterioration. Ride quality is reduced by noticeable bumps at transverse joints that are experiencing frost heave. Transverse joint repair methodology needs to be studied.
- Transverse bumps are not occurring for no reason, and if we don't address that reason, we will have a repeat of what Willoughby Hills has experienced when Rt 6 was resurfaced not too long ago.
- Anecdote has suggested, the City installed some underdrains about 10 years ago. The extent is unclear, as are the depth and materials used. We need to research records and interview some of the Maintenance staff, to learn more about what they did and what records were kept. We must keep in mind that underdrains can clog if the gradation of the drainage aggregate is not compatible grain-size wise with the surrounding soil, or if not compatible, whether a geotextile separating fabric was used (which presents its own challenges).
- Additional underdrainage is clearly needed in select areas. We will need to expose some of the prior-installed underdrains to determine whether they are still functioning.

REGENCY WOODS DRIVE, EMBANKMENT AND HILL AT FAR WEST END

- Settlement, alligator cracking, wheel path rutting, and potholes are evident.
- Groundwater is clearly a significant and possible primary contributing factor.
- How can this be occurring with the roadway constructed on a high embankment? Considering the extent of *Fragmites* growing several feet below pavement level on the north side, groundwater must be finding its way into the subgrade.
- Unless we control seepage in this area, any pavement repairs will fail.
- Drilling a series of borings and completing each as small diameter piezometers will be a necessary step in understanding what is happening.

BILLINGS ROAD

- The pavement exhibits substantial areas of various deterioration, but with selected repairs completed last fall, is tolerable but in need of spot repairs, probably using "standard" techniques such as localized mill and fill, selected full depth repair, and underdrainage in select areas.
- Unfortunately, some of last fall's repairs were apparently only surficial in nature and did not address the underlying cause(s) of the prior deterioration, such as the need for subgrade improvement or improved localized underdrainage.

WHERE DO WE GO FROM HERE? THE FOLLOWING ARE POINTS FOR DISCUSSION TO CONSIDER

- We need to recognize and accept the fact that renovating these roads, and many others like them, will be very costly if the work is to be done correctly, and will take many years to complete.
- Given the extent of current deterioration, in order to keep the roads safe and passable, there may be no practical alternative to completing repairs/improvements that fall short of full rehabilitation but will improve rideability and extend pavement life.
- First, focus on Drainage, Drainage, and Drainage. We need to keep in mind that a substantial increase in pavement longevity can be realized by managing subsurface water and intercepting it before it can seep below the pavement section. There is no better long-term investment we can make. There is no reason that good quality underdrains cannot be constructed by our own City maintenance personnel.
- With the roadway protected at the edges by nominal 3 ft deep underdrains, next focus on preventing or reducing surface infiltration. Consider the following for deteriorated but still passable roadways, where alligator cracking is apparent, but the pavement still has some integrity: First mill and remove the absolute worst of the deteriorated surface. Some localized full depth pavement removal may be needed. Next, patch the milled/cut out areas to achieve some uniformity, then apply a thin scratch course of hot mix asphalt to improve uniformity of surface grades and promote runoff. Follow with a chip-seal application, possibly finished with a fog seal to provide a more "conventional" appearance.
- Does this make up for a potentially inadequate pavement section to begin with? Obviously, no. But by keeping water out from below the pavement, and reducing surface infiltration, the pavement support capability of the soil subgrade will improve, and the improvement in CBR can be significant.
- Some may think that a chip-seal approach is a step backward, but that would be incorrect. It will extend the life of the pavement and reduce the extent of pothole repairs. Experience indicates that the applied bitumen retains some degree of elasticity and thus is, to some extent, self-healing.
- Some existing pavement (Crestwood neighborhood) may be too deteriorated to do anything except to remove it and start over, but with improved underdrainage. FDR or possibly pulverizing in place followed by placement of new intermediate and surface courses can be considered, but problems have been experienced in the past when trying to pulverize asphalt that has no structural integrity. The larger pieces don't readily break down. We can seek some contractor advice in this regard.
- With respect to future planning, both short term and long term, attempting to develop specific - pavement renovation plans without pavement coring and subgrade sampling would be foolish indeed. To avoid mistakes of the past, estimating costs based on what we currently know about pavement and subgrade conditions is little more than guessing. Core sampling is imperative.
- The City's interests would be best served by the Task Force working as a team to select and mark preferred test locations; contract with our local geotechnical consultant to core the pavement and sample the top 4 ft of the base course and subgrade; have their lab complete some basic laboratory tests on the recovered samples; and prepare boring logs that represent the findings. The Task Force, working through or with the City Engineer, could interpret the results and prepare recommendations for repair.