Street Evaluation and Improvement Program Report
Village of Riverlea, Ohio

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Introduction

The village of Riverlea is responsible for the maintenance of approximately two and a half miles of streets (See Appendix A for the Map). Over the years, a majority of the streets in the Village have been overlaid without milling the existing surface, resulting in the rise of pavement elevation. Overlays were extended over the existing concrete gutters to the face of the curb, reducing the effective height of the curb and partially blocking roof-drain outlets draining through the curb.

The purpose of this study is to evaluate the condition of each street within the Village and provide a planning document to be used as a basis for the systematic improvement of the Village's street system. The primary goals to be achieved through these improvements are to restore full curb height and the usefulness of the roof drain outlets, minimize on-street ponding of water that has resulted from the overlays, and provide a new asphalt surface that can be properly maintained in the future.

Task Items

1. Meet with Village officials to discuss the scope of the study and collect available maps and information. Assemble mapping for the field investigation and study using the Franklin County Auditor's Mapping as the base layer.
2. Contact the Ohio Utility Protection Services (OUPS) for information on private utilities such as gas, telephone, and electric.
3. Perform a walking inspection of each street in the Village for condition of curbs, pavements, valve box and storm castings, and general drainage.
4. Coordinate drilling of 8, 6-inch-diameter cores through the existing pavement. Collect and visually analyze pavement sample coupons and soil samples to a depth of approximately 3 feet. *Note: While compiling existing information for this study, a previous street investigation from the late 1970s, including detailed pavement and soil logs, was discovered. After review of this material, it was decided to use this information instead of performing new cores.*
5. Develop preliminary recommendations for needed repair and/or replacement of curbs, castings, and roadway base; and for milling and overlay of pavements. It is the Village's desire to preserve as much of the existing curb as possible.
6. Meet with the Village to discuss recommendations, estimated costs, priorities, and phasing of improvements.

7. Finalize the report incorporating input from the Village. The final bound report will include a brief narrative, map exhibit, estimated costs, and phasing. Future pavement maintenance will also be addressed.
8. Attend one council meeting to discuss the final report and answer any questions.

   Additional Task Item A. While developing this report it was realized that little documentation was available on the condition of Village-owned sanitary and storm sewers as well as the waterline systems, all of which have major components under the pavement. As a result of discussions with the Street Commissioner, Mayor and Council, it was decided to address interim pavement repair measures in this report to allow the Village sufficient time to identify and repair or replace deficient infrastructure located beneath pavements.

   Additional Task Item B. Upon review of the preliminary report by the Village, it was determined that a second street rehabilitation option should be evaluated. The second option involves complete removal and replacement of the base, pavement, driveway aprons and curbs. A corresponding estimate was also completed for this option and is included in the report.

Inspection Procedures and Findings

Visual Inspection Procedures

A walking evaluation of each street within the Village was performed on May 13 and 20, 2009. General observations were recorded and photographs were taken of prominent features using a digital camera. Special attention was given to the curb and areas immediately behind them, as well as areas of major pavement distress. Measurements were taken of street width, curb lengths, and distressed pavement areas. Notes were also taken as to other features that may impact future street improvements, such as utilities, landscaping and general traffic patterns.

Pavement Findings

As mentioned previously, the finished grade of the pavement is approximately 2 to 3 inches above the existing gutter pan. The asphalt surface has been crack-filled and coated with a slurry seal (Figure 1). The crack and slurry seal appears to have preserved a good riding surface, free of potholes, for some time, but is now starting to show signs of degradation and crack enlargement. The longevity of any roadway is tied closely to the condition of the base course(s) and drainage. Several other sources of information became available during the study that revealed characteristics of the pavements that could not be observed from the walking survey.

Street construction plans were provided by the Village and revealed that Riverglen Drive and Southington Avenue were originally constructed on a 6-inch concrete base with a 1-1/2-inch surface course. Subsequent asphalt overlays have been added to this cross section.

Figure 1 – Southington Avenue, Looking East.

The Riverlea Street Commissioner provided recent photographs and measurement of the pavement cross section at Westchester Court and Southington Avenue. From his description, the current asphalt surface on Southington is 4 inches thick on top of the original 1-1/2- to 2-inch surface layer (Figure 3). The concrete base as called for on the original street construction plans actually appeared to be a "bank run gravel" base as opposed to concrete. This condition of the base could be a result of degradation of the concrete base.

Figure 2 – Westchester Court

Figure 3 – Southington Avenue

The observation of the pavement cross section on Westchester Court (Figure 2, previous page) revealed less of a build-up with 1 to 2 inches of asphalt surface on a previous surface that is 1 to 2 inches thick. No concrete base was observed at this location.

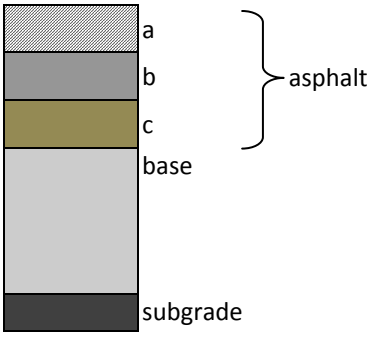
During development of this report, a previous roadway improvement study prepared by John David Jones was made available. This study, dated July 11, 1979, provided the basis for construction plans dated June 10, 1980.

The Jones report included pavement cores at 16 locations throughout the Village. The results are listed in Figure 4.

Figure 4 – Village of Riverlea Asphalt Coring Data (Reprinted from 1979 John David Jones Report)

		Inches				
Coring No.	**Location**	**a**	**b**	**c**	**total asphalt**	**base**
1	5787 Crescent Ct.	2	1¾	-	3¾	7
2	5811 Pioneers St.	1¾	1¾	-	3½	7
3	5807 Carrington Ct.	1¾	1¾	-	3½	7
4	5813 Westchester Ct.	2¼	2	-	4¼	7
5	5830 Falmouth Ct.	5	-	-	5	7
6	5747 Dover Ct.	1½	1½	-	3	6¼
7	267 Beverly Pl.	1¼	2		3¼	7
8	315 Melbourne Pl.	1¾	1¾		3½	8
9	5743 Olentangy Blvd.	1¾	1¾		3½	8¼
10	5861 Olentangy Blvd.	1¾	2		3¾	8½
11	264 Riverglen Dr.	1¾	1¾	-	3½	8
12	267 Frontenac Pl.	1½	1¾		3¼	7½
13	127 Riverglen Dr.	1¾	1	½	3¼	7¾
14	95 Southington Ave.	1¼	1½		2¾	7½
15	177 Southington Ave.	1½	1¼	1	3¾	7
16	5775 Southington Ave.	1¼	1½		2¾	8

The average *asphalt depth* was 3½ inches; the average *base depth* was 7 ½ inches.



Curb and Gutter Findings

All of the streets have had previous pavement overlays to the face of the curb, covering the gutter with approximately 2 to 3 inches of asphalt. A couple of areas of exposed gutter revealed that the gutter has decayed to the point that the aggregate within the concrete is now loose (Figure 5).

The addition of asphalt onto the gutters has partially blocked the roof-drain outlets that pass through the curb, limiting their usefulness (Figure 6). A few sections of curb and gutter have been replaced. Several of these have been placed at a higher elevation to match the existing asphalt. Some driveway approaches have also recently been replaced (Figure 7) primarily with concrete and are graded to match the existing asphalt elevation, as well.

Figure 5

Figure 6

Figure 7

Street Rehabilitation Recommendations

A modern residential pavement in central Ohio typically consists of either 6 inches of asphalt over 6 inches of compacted aggregate base or 3 inches of asphalt over 5 to 6 inches of concrete base. From our observations of the thickness of the existing asphalt and the deteriorated condition of the existing concrete base, we believe that removing any substantial thickness of asphalt prior to overlay will weaken the overall strength of the roadway and shorten the life of the new pavement. Two rehabilitation options are presented in this report with the associated advantages and disadvantages:

Street Rehabilitation *Option 1* – Raise Existing Pavements and Curbs

Almost all the gutter within the Village has been paved over. As previously described, the gutter we could observe shows signs of deterioration. Our experience has shown that a gutter pan is typically covered with asphalt because of the following reasons: it is in need of repair, additional asphalt was needed to shore up the existing pavement thickness, or an attempt was made to correct drainage through a "sagging" section of curb. Though it is possible to mill off the existing asphalt down to the concrete gutter, the gutter pan and curb face that remains will be unsightly and, more than likely, drain poorly. Even in cases in which the gutter pan is not in

an advanced state of deterioration, the milling machine often leaves scuff marks that lead to an increased susceptibility to future freeze/thaw deterioration in the surface of the concrete.

Based on these observations, the desire of the Village to reestablish the roof drains and aesthetics of a full height curb, and the need for increased pavement thickness, we recommend replacing all concrete curb and gutter. Engineering will need to be performed to determine the best approach for this task, but we observed that the elevation of the curbs may be raised 4 to 6 inches in most areas with Option 1 to allow for an additional full three inches of pavement overlay while maintaining full curb reveal. This overlay should consist of an asphalt leveling course of approximately 1 inch over the existing pavement, pavement fabric, and a minimum 2-1/2-inch asphalt surface course. The pavement fabric positioned between the two asphalt layers will prevent reflective cracking from underlying pavements and improve strength by distributing stresses imposed by vehicular traffic. Raising the curb and pavements will require the following improvements:

- Complete removal of the existing curb and construction of new concrete curb at the higher elevation.
- Grading and seeding from the curb back to the residential property line. On a 50-foot-wide street with 26 feet of pavement, this property line is approximately 12 feet beyond the curb.
- In a few cases, a drainage catch basin would be required for proper drainage of yard areas after the curbs are raised.
- Removal and relocation of some landscaping and structures occupying the street right-of-way. Residents should be contacted well in advance of this work in order to give them the option of replanting in an area outside of the street right-of-way.
- Replacement of street sign bases to the new grade where fill would be added behind the curb.
- Roof-drain outlets would need to be provided in the new curb as well as new piping to connect to the existing residential drainage system.
- Replacement of each driveway approach from the street to a point near the residential property line to allow for the new grade of the curb and street. Our estimate includes a typical concrete residential driveway approach based on the city of Columbus standard detail and may be found in Appendix B. New driveway approaches, curb and gutter, and asphalt pavements will provide an aesthetically pleasing and consistent appearance throughout the Village.

Street Rehabilitation *Option 2* – Remove/Replace Curb, Base, and Pavements

The second option for pavement rehabilitation is to completely rebuild the street by removing all of the existing curb, base and pavement down to the existing sub-base or bare earth and replacing with all new material. The proposed pavement cross-section would include 6 inches of Ohio Department of Transportation (ODOT) Item No. 304 **aggregate base**, 3 inches of ODOT Item No. 301 **bituminous base**, 1.5 inches of ODOT Item No. 448 **intermediate asphalt layer**, and 1.5 inches of ODOT Item No. 448 **surface course**. The existing curbs would be removed and

replaced with new concrete curb at the same elevation with the exception of those areas that may need drainage enhancements. In those cases, the street and curb may be adjusted to improve the flow from private properties and/or existing low areas in the street which hold water after rain events. Complete reconstruction of the street would also involve the following:

- Residents may be required to park on an adjoining street or drive over gravel and dirt to access their property. Street rebuilds typically happen during the summer months so dust is sometimes an issue. Other minor inconveniences to residents may include disruption of curb-side trash/recycling pickup and package delivery. Most of these issues can be solved through good communication with the residents and the affected agencies.

- Removal and replacement of existing catch basins as needed to insure proper drainage after street improvements.

- Some landscaping inside of the right-of-way will be impacted, but greatly minimized as compared to Option 1.

- At a minimum, replacement of each driveway approach from the curb line back to the first control joint in the approach apron. If the Village desires, the driveways aprons could be replaced back to the street right-of-way line to provide a more consistent look. Our estimate is based on the latter including a typical concrete residential driveway approach per the city of Columbus' standard detail and may be found in Appendix B. New driveway approaches, curb and gutter, and asphalt pavements will provide an aesthetically pleasing and consistent appearance throughout the Village.

- Removal and replacement of roof drain outlets in the area immediately behind the curb. Since the curb for the most part will be at the same elevation as the existing curb, much less piping will be required to provide positive drainage from the point of connection just behind the curb through the curb outlet.

Discussion of Options

The work described in Street Rehabilitation Option 2 is preferred from an engineering and durability standpoint, since drainage is more easily handled from both private properties and the right-of-way as street grades are adjusted to accommodate any existing issues. This option would also minimize grading on private property and, as a result, minimizes the impacts to private landscaping existing within or near the street right-of-way.

With either rehabilitation method, drainage is one of the most significant influences on pavement life. Poor drainage weakens the base structure of the pavement and deteriorates the surface. Our walking survey revealed that several streets have relatively flat slopes and no drainage structures within several hundred feet. Our estimates for street rehabilitation include adding piping and drainage structures to improve this condition. Each street will have the existing catch basins removed and replaced with new precast concrete units. For the purpose of deriving the Option 1 budget, we assumed that each north-south street would have catch

basins installed somewhere near mid-block. Option 2 would need fewer catch basins as the new curb grades could be adjusted to provide positive drainage.

A few properties have split-level garages below street grade or sloping grades towards the house which may require special attention during design of the street improvements. Therefore, the estimates for each option include catch basins in areas of split level homes. These catch basins will reduce the amount of storm water passing the ends of these driveways, thus reducing the likelihood of water damage.

All storm and sanitary sewer manhole lids will need to be adjusted to match the new street elevations. We recommend replacing the castings on the sanitary sewer manholes with solid, gasketed lids to prevent inflow of rainwater to the sanitary sewers.

Water valve boxes may need to be replaced if adjustment is not available within the current stem. We have budgeted for full replacement of these boxes.

Several areas of pavement distress were identified in the walking survey by the presence of settlement and alligator cracking. An allowance for subgrade repair has been made for these areas in both rehabilitation options. Further investigation is warranted at the time of final design to determine the full extent of needed subgrade replacement.

The two primary disadvantages of Option 2 (versus Option 1) are the added cost and the increase in construction time. The cost of each rehabilitation option may be found on Page 11. With Option 2, each street may take several weeks longer to complete and residents would be asked to drive on gravel and make-shift access points to their property. As mentioned earlier, dust and mud are also an issue when removing pavements down to the existing sub-base (bare earth). Good communication, planning, and a cooperative contractor would help to minimize these inconveniences.

Phasing Street Improvements and Other Infrastructure Repair

Phasing

Phasing of street improvements is an important part of planning for large capital expenditures and involves more than just planning and bidding the street rehabilitation work itself. It entails the investigation of existing underground utilities, extending storm sewer for future drainage improvements, and implementing necessary repairs. Phasing and proper construction sequence will also limit the movement of heavy construction vehicles over recently completed streets, help to maintain drainage outlets through the various phases, and ensure that all work requiring excavation within the street is complete prior to final paving.

As mentioned in the Utilities section of this report (Page 13) and in the Village's Sanitary Sewer Evaluation Study Schedule, subsurface utilities should be regularly investigated to identify maintenance needs, hopefully well in advance of emergencies. For the purpose of planning a street rehabilitation, both the sanitary and storm sewers should be video-inspected at least one

year in advance to allow time to affect repairs on Village-owned utilities. Other utility companies with underground facilities should be informed with the details of upcoming work well in advance of pavement work, and a request should be made that they investigate and repair, as needed, their facilities. Figures 8a and 8B on Page 11 summarize the proposed sequence of construction and related activities.

As is evident from the estimates within this report, both the interim repairs and street rehabilitation projects are large investments and are in addition to the EPA-mandated sewer evaluations and studies. All of these projects will need to be properly sequenced or phased and will need to follow a multi-year investment plan. Figure 9 (Page 12) is an example of a capital improvement plan to assist in defining priorities based both on need and budget constraints. The plan helps to establish a framework to secure funding for the Village's need. In fact, five-year capital invest plans are a required part of an OPWC funding application. OPWC funding options are discussed further in the Funding section of this report.

Street Rehabilitation *Option 1* – Raise Existing Pavements and Curbs

Village of Riverlea, Project Phasing	Melbourne	Beverly	Frontenac	Falmouth	Westchester	Pioneers	Carrington	Riverglen	Dover	Olentangy	Crescent	Southington	
Overall Street Construction Sequence	Phase 1							Phase 2		Phase 3			
Engineering & Surveying	2014							2015		2016			
Video Inspection of Storm and Sanitary Sewers	2014							2015		2016			
Consult with Columbia Gas and other Utilities	2014							2015		2016			
Perform any identified underground repairs	2015							2016		2017			
Construction of Street and Drainage Improvements	2016							2017		2018			
Project Cost (2009)	$176,100	$80,400	$149,800	$144,100	$150,600	$123,400	$143,800	$656,300	$228,600	$484,700	$128,600	$524,600	Total
Approximate Project Cost per street Group	$968,200							$884,900		$1,137,900			$2,991,000

Figure 8a – Phasing for Option 1

Street Rehabilitation *Option 2* – Remove/Replace Curb, Base, and Pavements

Street Rehabilitation Remove/Replace	Melbourne	Beverly	Frontenac	Falmouth	Westchester	Pioneers	Carrington	Riverglen	Dover	Olentangy	Crescent	Southington	
Overall Street Construction Sequence	Phase 1							Phase 2		Phase 3			
Engineering & Surveying	2014							2015		2016			
Video Inspection of Storm Sewers	2014							2015		2016			
Consult with Columbia Gas and other Utilities	2014							2015		2016			
Perform any identified underground repairs	2015							2016		2017			
Construction of Street and Drainage Improvements	2016							2017		2018			
Project Cost (Based on 2009 Values)	$243,700	$124,800	$207,900	$179,900	$197,800	$164,200	$157,700	$984,800	$289,700	$590,800	$181,400	$760,100	Total
Approximate Project Cost per street Group	$1,276,000							$1,274,500		$1,532,300			$4,082,800

Figure 8b – Phasing for Option 2

For the purpose of these tables, it is assumed that the Village will perform interim pavement repairs and SSES work from 2010 to 2014 and that all sanitary sewers were inspected as part of the SSES project. These figures do not include any water line, storm sewer pipe, or sanitary sewer pipe replacement. The estimate does include all new CBs and MH lids.

Multi-Year Capital Improvement Plan (Hypothetical)

Project Description	Total Cost	Two-Year Effort		Five-Year Plan							
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
		Funded		Planned							
SSES	$150,000		$50,000	$50,000	$50,000						
Pavement Maintenance	$200,000	$10,000	$190,000								
Storm Sewer Investigation	$50,000				$50,000						
Storm and Sanitary Sewer Improvements (Includes Lift Station Elimination)	$600,000					$600,000					
Water Line Investigation	$100,000				$100,000						
Water Line Improvements	$2,000,000						$2,000,000				
Street Rehabilitation	$2,993,000								$970,000	$885,000	$1,138,000

Figure 9 – This Improvement plan example uses the Street Rehabilitation Option 1 estimates.

Utilities

Electric

Distribution of electric power within the Village is provided by American Electric Power (AEP). Power is run throughout the Village by overhead facilities mounted on poles. Repaving or even reinstalling curbs should not be impacted by AEP's facilities.

Natural Gas

Columbia Gas maintains the underground natural gas distribution within the Village. From the maps provided, several streets have gas lines and subsequent services within the right-of-way. We recommend consulting with Columbia Gas at least one year prior to any scheduled street resurfacing program to check on their planned maintenance and inquire as to the condition of their lines, especially those under the pavement and curbs.

Water

The Village owns an existing water system comprised primarily of 4- and 6-inch, cast-iron water main pipe and associated water service connections. From the records provided by the Village, the water lines appear to have been installed sometime around 1925 and have not been replaced. For water systems of this age, it is not uncommon to experience leaks during and immediately after construction activities. Unfortunately, for the latter this usually involves digging up new pavement and curbs to repair the leak. Consideration should be given to updating the water lines and service connections at least to a point behind the curb. We recommend that this work be completed a year or two in advance of the street work.

Sanitary and Storm Sewer

The Village owns and maintains the separate sanitary and storm sewer systems. Many of these lines run within the right-of-way and under the pavement. The technology used to clean and video-inspect these systems is available and very affordable. We recommend performing this inspection well in advance of paving, so the Village can identify and complete repairs ahead of any related street work. Work on the sanitary sewer system will be carried out in accordance with the upcoming Village Sanitary Sewer Evaluation Survey (SSES) Report mandated by the Ohio Environmental Protection Agency (EPA) Findings and Orders.

Telecommunications

AT&T was the only telecommunications provider to respond to our recent OUPS request; however, from our field inspection, it appears that communication lines are run overhead with the electric. As a result, we do not foresee any impact of these facilities on future street repair activities.

Worthington Trunk Sanitary Sewer

The City of Worthington has undertaken design of a new trunk sewer that starts near High Street and Kenyon Brook Drive and runs southwest along Rush Run through Broadmeadows Park to the interceptor sewer at the Olentangy River. The new sewer, to be completed in 2011, will be installed deep enough to eliminate the siphon that currently exists beneath Rush Run and should give Riverlea the ability to eliminate the lift station located at the south end of Olentangy Boulevard through construction of a short gravity sewer to a manhole on the new Worthington sewer. Construction of the trunk sewer by Worthington and connection to the sewer by Riverlea to eliminate the lift station would not affect any of the Village's street pavements other than some possible construction traffic to and from the area at the end of Olentangy Boulevard. All of the street work proposed in this report starts after completion of the proposed sewer work.

Interim Repairs/Pavement Maintenance

This section of the report is two-fold. We will discuss a specific preventative maintenance strategy that may be used on the new pavements after reconstruction. We also will use these same techniques as an interim repair strategy that will preserve the existing pavements and allow time for the Village to investigate and repair underground utilities beneath the pavement.

Because the evaluation and repair of underground facilities will take a few years to complete, we recommend that interim measures be taken to preserve the pavement structure currently in place. This may be achieved by utilizing pavement preventative maintenance techniques discussed below.

The first step to proper preventative maintenance is correctly identifying the strategy to use on a block-by-block basis. The pavements to be treated must be structurally sound; otherwise, the benefits of preventative maintenance treatments will not be fully realized. The Village has successfully employed crack and slurry seal pavement maintenance measures in the past which has preserved the integrity of the street base in most areas.

Crack Seal

Crack Sealing is the process of filling surface pavement cracks with rubberized asphalt or other specialized materials. The objective is to prevent water from migrating downward into the pavement base and incompressible materials from becoming lodged within the crack. Crack-filling is typically performed during the summer months when the pavement and underlying base is dry.

Pavement bases are typically comprised of native soil and aggregate. Keeping them dry is very important. Excessive moisture will weaken the base material which in turn causes the surface pavements to flex or yield well beyond their design limits. Excessive flexing leads to cracks and potholes and eventually to complete pavement failure. During the winter months, water

penetration coupled with the freeze/thaw cycle will aggressively break down the pavement at the surface and contribute to the formation of potholes.

Typically, crack filling is performed as cracks develop to 1/8 to 1/4 inches in width. This cracking often occurs within four to five years after a resurfacing project. As with other pavement maintenance techniques, the purpose of crack sealing is to extend the useful "smooth riding" lifecycle of the pavement through early treatment, not waiting for potholes and other defects to appear.

Slurry Seal

Slurry seal is a thin asphalt overlay composed of asphalt emulsion and small aggregate designed to seal small cracks (typically less than 1/8 inch in width), provide protection to surface aggregates, and provide a uniform finished texture that improves friction and overall vehicle traction. Because slurry is only effective at sealing small cracks, it is often used in conjunction with traditional crack filling. Slurry seal is not a structural overlay and does not add strength to the pavement section. For this reason it is important to communicate with the residents what this material is and its purpose so it is not mistaken for a complete overlay.

Figure 10 - Slurry Seal Application

Spray Polymer Asphalt Repair System (SPARS)

This system is often used by municipalities to fill potholes, large cracks, and certain areas of pavement distress (Figures 11 to 13). The process includes applying a polymerized asphalt binder with 100-percent fractured aggregate via compressed air. By using compressed air as the delivery mechanism, thin dense lifts of patch material can be placed. The finished product may also be used in conjunction with a crack and slurry seal program to help seal very large cracks associated with the distressed area and potholes prior to applying the slurry seal.

Figure 11

Figure 12

Figure 13

Stress Absorbing Membrane Interlayer (SAMI)

Stress-absorbing layers act as a barrier for reflective cracking as well as filling large cracks in the host pavement. Interlayers act similar to paving fabrics in that they absorb the stress points of underlying cracks preserving the pavement surface. The interlayer is constructed of a polymer modified bituminous binder and 100-percent crushed stone similar to that used in SPARS. SAMI, however, is applied with an asphalt distributor truck and a self-propelled aggregate spreader. For urban applications, slurry seal is used as the surface course on top of the SAMI to provide an aesthetically pleasing driving surface.

Economic Benefits of Maintenance

Even though the serviceability of an asphalt pavement is still adequate after several years of use, pavement deterioration has already begun. Initiation of a proper preventative maintenance program before significant pavement deterioration has appeared is essential to extending pavement life. As shown in Figure 14, properly timed crack and slurry seals can be far more cost effective than corrective maintenance such as pavement overlays. On many types of streets, a timely application of crack and slurry seal will extend the *serviceable* pavement life and lower the lifecycle cost.

Description	**Avg Life Cycle**	**Cost/CL Mile**	**Life Cycle Cost** (No discount included)
Surface Pavement and Association Work (Mill/Fill, not Rehab)	12	$275,000	$23,000
With Crack and Slurry (Add 5 yrs*)	5 + 12 = 17	$45,000 + $275,000	$19,000

Figure 14 – Life Cycle Analysis

*Five years is a conservative estimate. Table values are based on manufactures/installers general experience. It is believed that the current crack and slurry seal treatment in Riverlea is approximately 15 yrs old.

Preventative Maintenance Approach

Preventative Maintenance Item	**Year to Consider**	**Unit Cost (2009)**	**Cost/ CL Mile**
Crack Fill	1 to 2 years after overlay	$1.75/lb	$9,850
Slurry Seal	5 to 10 years after overlay	$2.50/SY	$35,200
SAMI	More than 5 years after overlay	$3.50/SY	$49,280
SPARS	As needed	Varies greatly depending on the potholes within a street.	Varies greatly depending on the potholes within a street.

Figure 15 – 2009 Unit Prices

Note: It is also effective to crack and slurry seal the same year.

Interim Repairs Budget Summary

Because funding or other infrastructure needs usually dictate the extent of capital improvements in any given year, it is often necessary to perform interim repairs, or in this case, additional pavement preventative maintenance. The objective of these types of repairs is to preserve the structure of the base and base pavements until a proper upgrade can be performed. All streets within the Village, except Riverglen Drive and Southington Avenue, would receive a SPARS treatment prior to Crack and Slurry Seal. The SPARS will be used to fill in the potholes and delaminated areas as well as any large cracks that could not be effectively filled with Crack Fill material. Due to the heavier traffic volume and the number and severity of surface cracking, Riverglen and Southington will receive a SAMI prior to Slurry Sealing the surface. As with street reconstruction, maintenance may be phased-in, but for the purpose of this report it is assumed that one maintenance contract would be awarded and performed in one year. The project estimate for interim repair work is shown below in Figure 16. During the fall of 2009 and while the report was being completed, the Village contracted with American Pavements for a Village-wide SPARS treatment.

Maintenance Type	**2009 Project Estimate**
Crack Seal	$25,000
Spray Polymer Asphalt Repair System	$15,000
Stress Absorbing Membrane Interlayer	$60,000
Slurry Seal	$90,000
Asphalt Patching (Base Repair)	$10,000
Total Interim Repair Estimate	**$200,000**

Figure 16

Funding

Annual Revenues

One of the most common forms of infrastructure funding is through the annual budgeting process, whereas improvements are identified, planned, designed and constructed through the use of annual reoccurring revenues. The primary limitation to this method is that large, long term capital improvements such as street reconstructions have very large costs which cannot typically be absorbed into an annual budget. As a result, only smaller, less extensive improvements such as maintenance activities are funded out of annual revenues.

Bond Issue

Some infrastructure projects directly impact the community at-large for years to come. Street and utility improvements such as those discussed within this report are an example. Because annual revenues cannot typically cover large infrastructure projects, the Village may propose a bond issue to pay for the improvements. A majority of voters must approve the bond issue and, if approved, the tax collected repays the debt of the improvements.

Special Assessment

The Village has the authority under Chapter 727 of the Ohio Revised Code, with proper legislation and public notification, to assess individual properties abutting the proposed improvements. The assessment is collected as part of the property tax system and distributed to the Village for retirement of the project debt. The Village will still need to cover a portion of the construction and design costs as outlined in the Ohio Revised Code.

If the Village is interested in pursuing either assessments or a bond issue, the Village Solicitor should be consulted early in the process to determine the most current procedure and anticipated annual revenues.

Ohio Public Works Commission (OPWC)

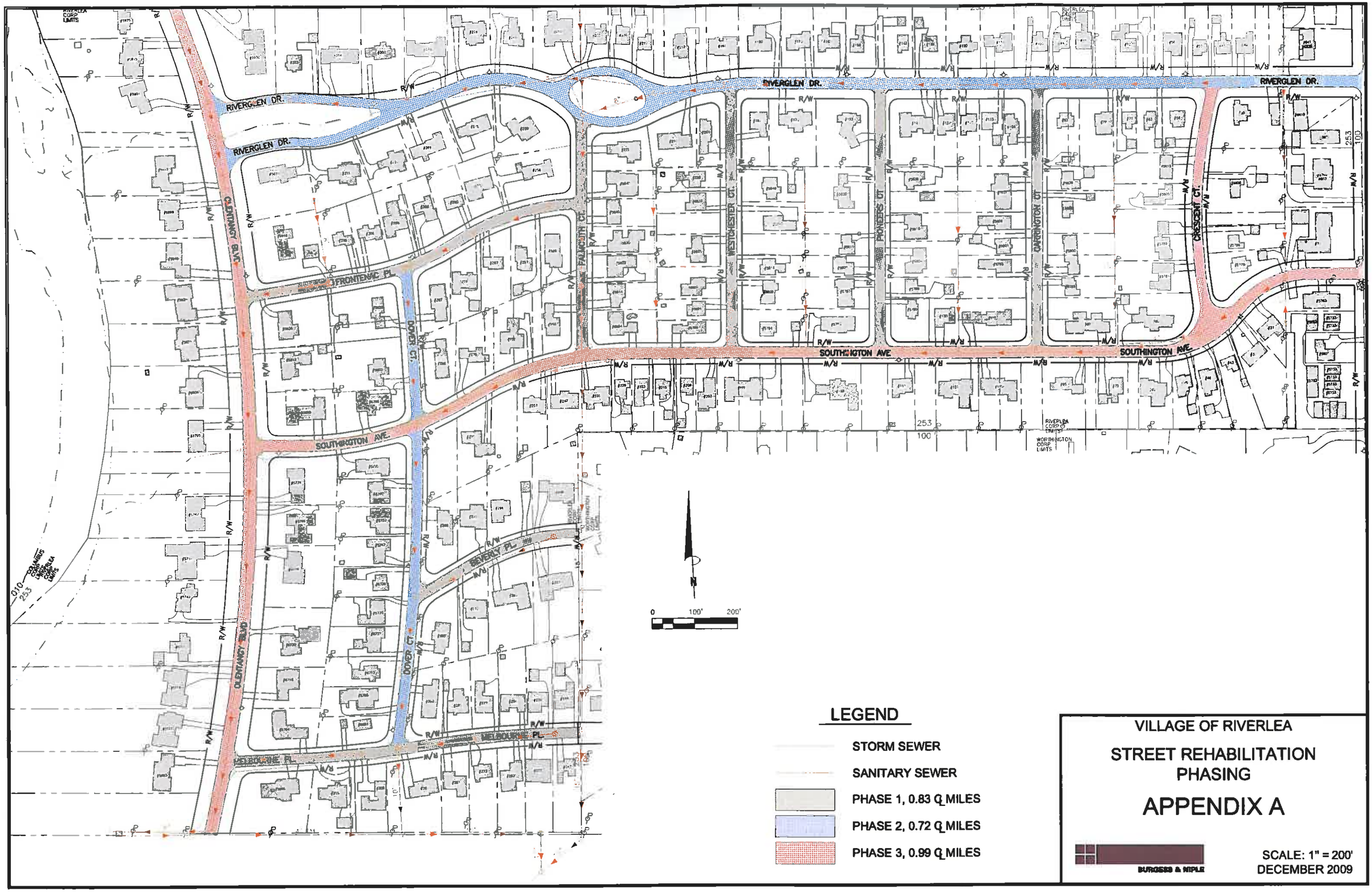
The Village of Riverlea is located in OPWC District 3. The Mid-Ohio Regional Planning Commission (MORPC) operates the day-to-day activities associated with the OPWC programs including the State Capital Improvement Program (SCIP) and the Local Transportation Improvement Program (LTIP).

SCIP funds come from the sale of bonds by the State of Ohio and can be used for roads and bridges, sewers and water supply systems. A minimum of 10 percent local match is required for grants. SCIP also has a revolving loan program that may be used in conjunction with the grant program.

LTIP funds are derived from the gas tax and may be used only for road and bridge work. No matching funds are required for application to the program.

Other sources of funding within the OPWC framework include the *Emergency Fund* for projects associated with the immediate preservation of health, safety, and welfare, and *Small Government Funds* for communities with populations of less than 5,000. The *Emergency Fund* would not be applicable for the street improvements being considered as outlined in this report.

All OPWC programs would require upfront funding to create an application and associated support documents including a 5-year capital improvements plan, and it is reasonable to assume that phasing would be required to spread out the allocation request over several years. It is also advisable to have engineering underway for the improvements so that the Village is ready to proceed in a reasonable time if awarded the grant and or loan.



LEGEND

- STORM SEWER
- SANITARY SEWER
- PHASE 1, 0.83 ℄ MILES
- PHASE 2, 0.72 ℄ MILES
- PHASE 3, 0.99 ℄ MILES

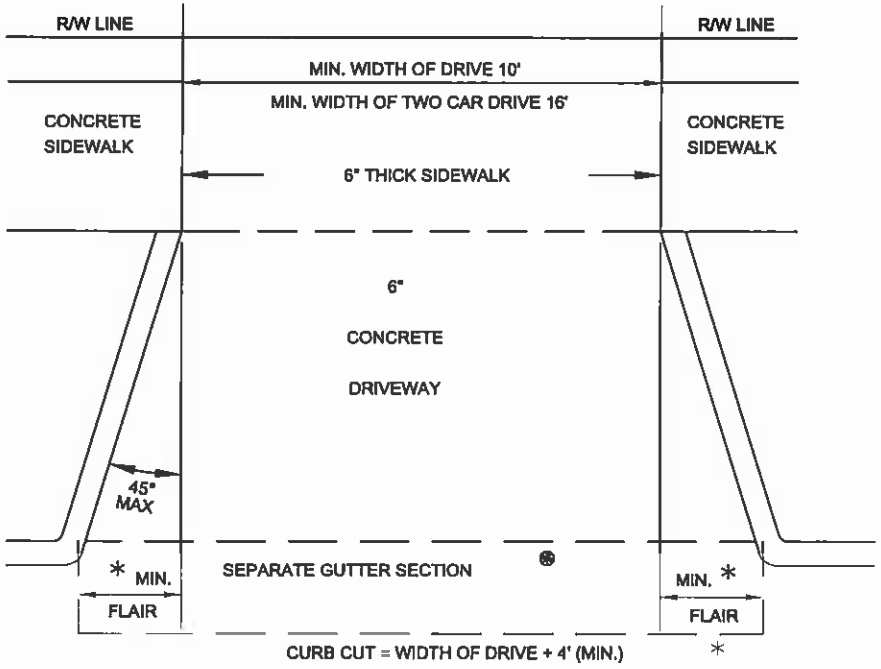
VILLAGE OF RIVERLEA

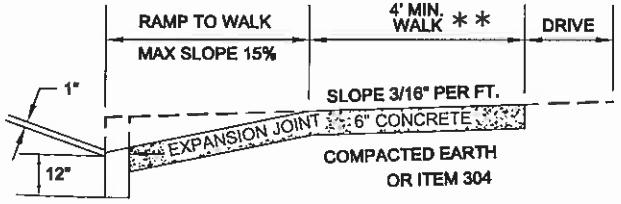
STREET REHABILITATION PHASING

APPENDIX A

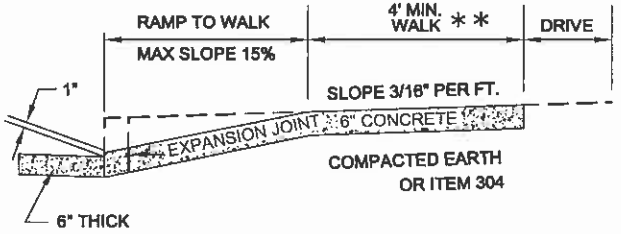
BURGESS & NIPLE

SCALE: 1" = 200'
DECEMBER 2009





STANDARD CURB SECTION



STANDARD COMBINED CURB AND GUTTER SECTION

* 5' ON ROADWAYS WITH 35 MPH SPEED LIMIT, 2' FOR SPEED LIMITS LESS THAN 35 MPH.

* * SIDEWALK WIDTH SHALL BE A MINIMUM OF 5 FEET ALONG AN ARTERIAL ROADWAY.

⊛ CURB OR COMBINED, CURB AND GUTTER SHALL BE TAKEN OUT AND REPLACED WITH CONCRETE, SEPARATED FROM THE RAMP BY 1/2" PREMOLDED EXPANSION JOINT. WHEN LESS THAN 5' OF A CURB SECTION REMAINS AFTER THE CURB CUT IS LOCATED, IT SHALL ALSO BE REMOVED AND REPLACED. CURB SHALL BE CONSTRUCTED IN MINIMUM 5' SECTIONS AND MAXIMUM 10' SECTIONS.

FILLS, IF REQUIRED, SHALL BE OF EARTH, COMPACTED IN 2" LAYERS, OR OF ITEM 304, AGGREGATE BASE, COMPACTED IN LAYERS NOT EXCEEDING 4".

DRIVEWAYS AND SIDEWALKS SHALL BE CONSTRUCTED AS SHOWN IN DETAILS OF PLAIN PORTLAND CEMENT CONCRETE, ITEM 452, 5% TO 8% AIR ENTRAINED, CONTAINING 6.4 BAGS OF CEMENT (CLASS C, SECT.499) PER C.Y., AND 3" MAX. SLUMP.

EXPANSION JOINTS SHALL BE PLACED TO FORM UTILITY STRIPS WHERE REQUIRED, AND WHEREVER NEW CONCRETE MEETS EXISTING CONSTRUCTION.

FORMS SHALL CONSIST OF WOOD 2" NOMINAL THICKNESS OR METAL OF EQUAL STRENGTH.

A STANDARD CURING COMPOUND SHALL BE PROPERLY APPLIED IMMEDIATELY AFTER FINISH.

ALTERNATE ASPHALT CONCRETE APPROACH: INSTEAD OF PLAIN PORTLAND CEMENT CONCRETE THE PORTIONS OF THE DRIVEWAY OUTSIDE OF THE LIMITS OF THE SIDEWALK MAY BE CONSTRUCTED TO THESE MINIMUM REQUIREMENTS (TO BE USED ON UNCURBED RESIDENTIAL STREETS ONLY)

4" AGGREGATE BASE, ITEM 304
2" HOT MIXED, HOT LAID ASPHALT CONCRETE, ITEM 402 OR ITEM 416
2" HOT MIXED, HOT LAID ASPHALT CONCRETE, ITEM 404 OR ITEM 416

NOTE: ALTERNATE ASPHALT CONCRETE APPROACH SHALL NOT BE USED ON A CURBED STREET UNLESS OTERWISE APPROVED BY THE C.O.C..

ITEM NUMBERS REFER TO STANDARD SPECIFICATIONS. TRANSPORTATION DIVISION, COLUMBUS, OHIO, CURRENT EDITION AND ALL WORK SHALL BE DONE IN ACCORDANCE WITH THESE SPECIFICATIONS.
REGULATIONS CONCERNING DRIVEWAY ARE COVERED IN THE CITY OF COLUMBUS CODE, 1959, UNDER CHAPTER 905, AND AS AMENDED IN 1969.

NOTIFY THIS OFFICE WHEN FORMS WILL BE READY FOR INSPECTION, AT LEAST 24 HOURS BEFORE CONCRETE IS TO BE PLACED. TELEPHONE 645-7497. IN NO CASE SHALL CONCRETE BE PLACED WITHOUT APPROVAL OF FORM WORK BY THE INSPECTOR.

NO CONCRETE SHALL BE PLACED UNTIL TEMPERATURE IS 35° F. MIN. AND RISING. CONCRETE SHALL BE PROTECTED IN ACCORDANCE WITH SECTION 451.061 OF ITEM 451.

STANDARD RESIDENTIAL DRIVEWAY WITH TREE LAWN ON PUBLIC R/W

CITY OF COLUMBUS, OHIO
DEPARTMENT OF PUBLIC SERVICE
TRANSPORTATION DIVISION

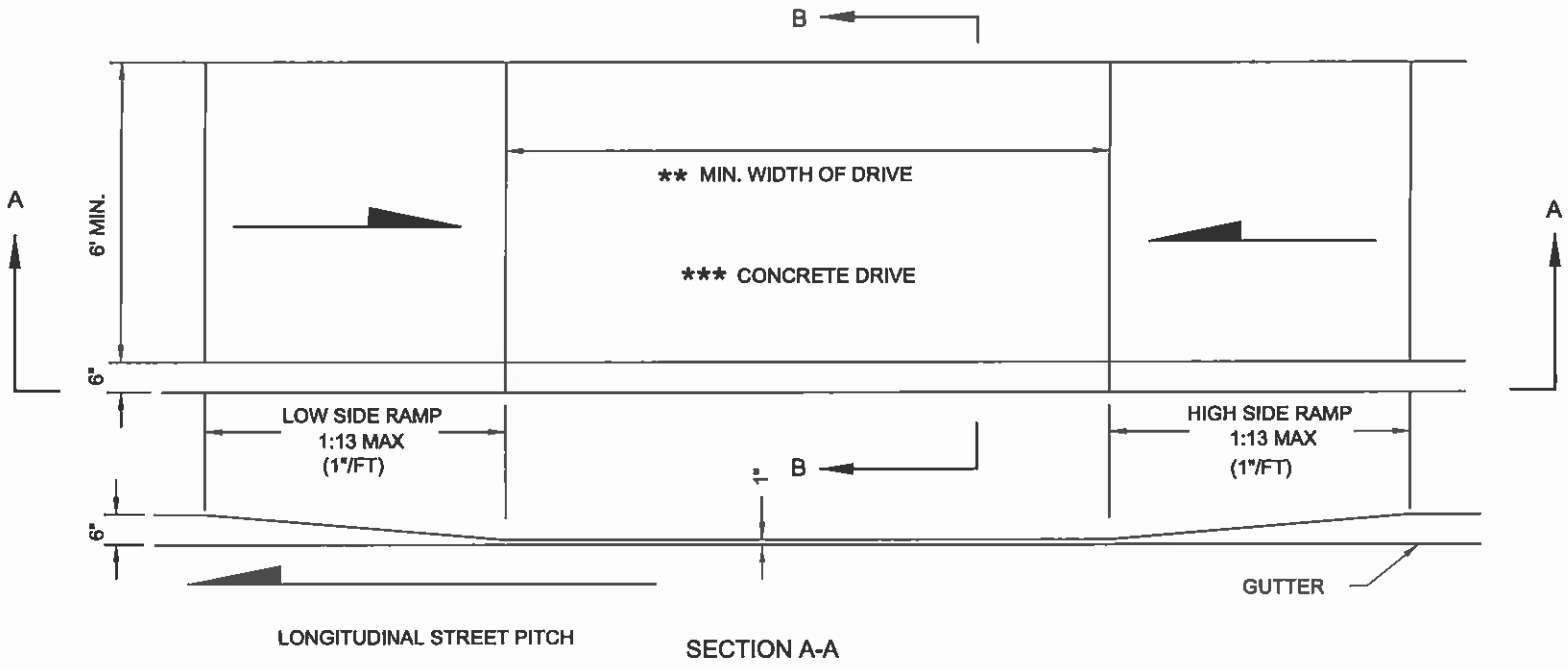
CITY ENGINEER

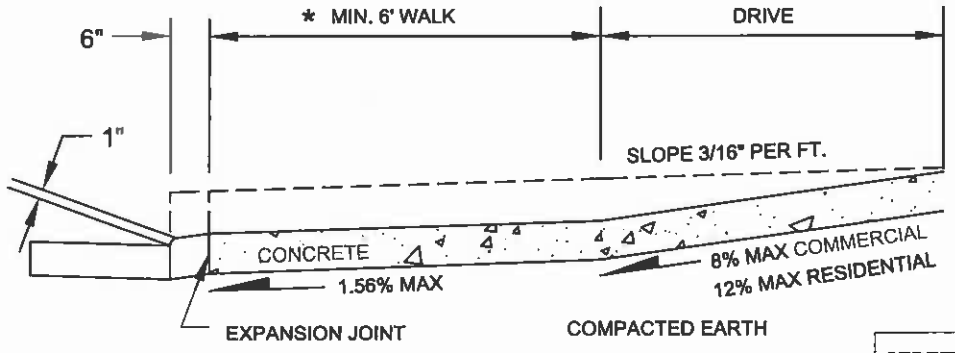
STD DWG 2201

REV: 01/01/07

SHT 1 OF 4

APPENDIX B





SECTTION B-B

* 7' MIN. ALONG AN ARTERIAL

** WIDTH = 10' - RESIDENTIAL
WIDTH = 20' COMMERCIAL OR
26' WITH 60 OR MORE
PARKING SPACES

*** THICKNESS = 6" - RESIDENTIAL
THICKNESS = 8" - COMMERCIAL

STREET PITCH	RAMP LENGTH (1:13)	
	LOW SIDE *	HIGH SIDE *
1%	5' - 6"	7'-2"
2%	5' - 0"	8'-4"
3%	4' - 6"	10'-0"
4%	4' - 2"	12'-6"
5%	3' - 10"	16'-8"

* MEASURED ALONG THE BACK OF CURB

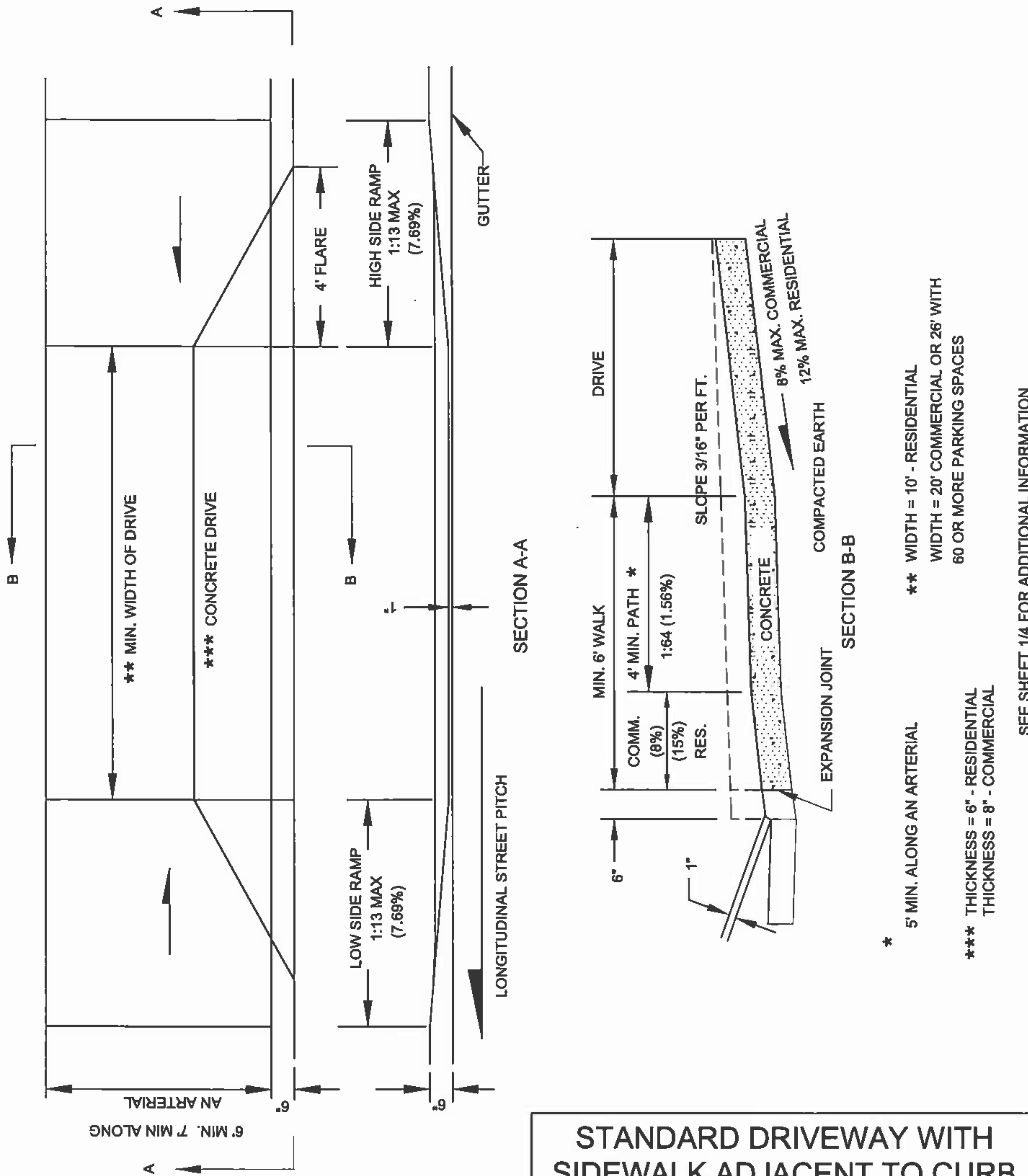
SEE SHEET 1/4 FOR ADDITIONAL INFORMATION

STANDARD DRIVEWAY WITH SIDEWALK ADJACENT TO CURB ON PUBLIC R/W (RESIDENTIAL & COMMERCIAL)

CITY OF COLUMBUS, OHIO
DEPARTMENT OF PUBLIC SERVICE
TRANSPORTATION DIVISION

STD DWG 2201
REV: 01/01/07
SHT 2 OF 4

APPENDIX B



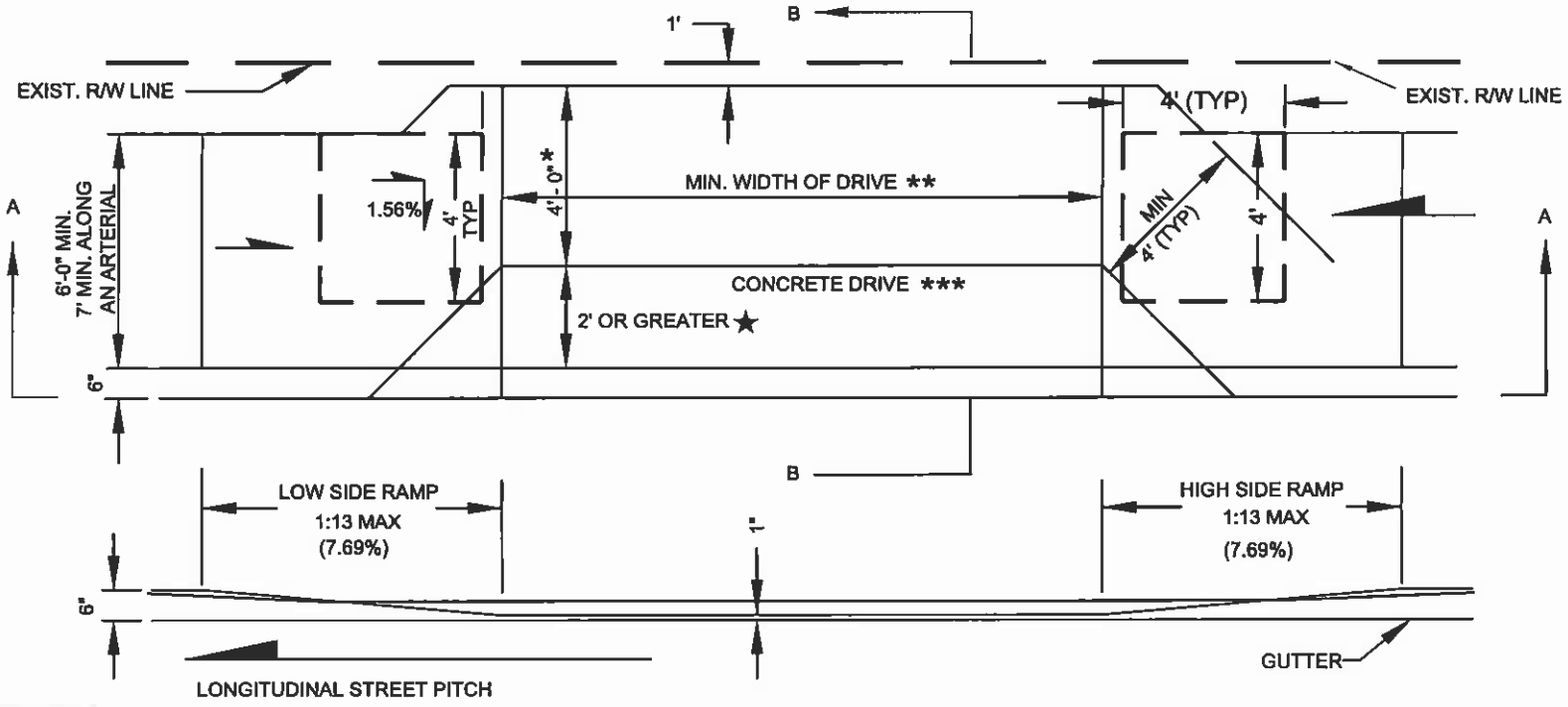
STANDARD DRIVEWAY WITH SIDEWALK ADJACENT TO CURB ON PUBLIC R/W, PARALLEL RAMP TYPE (RES. & COMM.)

CITY OF COLUMBUS, OHIO
DEPARTMENT OF PUBLIC SERVICE
TRANSPORTATION DIVISION

STD DWG
2201

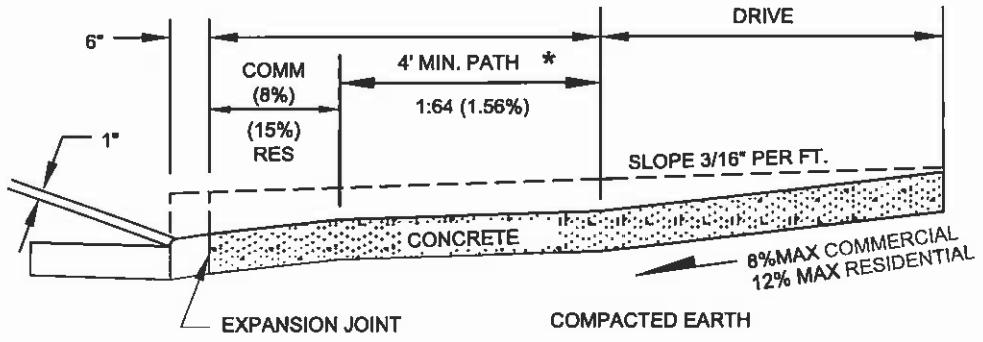
REV: 01/01/07

SHT 3 OF 4



SECTION A-A

★ NOTE: USE WHEN FRONT RAMP IS LONGER THAN 2'. MAINTAIN R/W CLEARANCE FOR WALK.



SECTION B-B

* 5' MINIMUN ALONG AN ARTERIAL

** WIDTH = 10' - RESIDENTIAL
WIDTH = 20' COMMERCIAL OR 26' WITH 60 OR MORE PARKING SPACES

*** THICKNESS = 6" - RESIDENTIAL
THICKNESS = 8" - COMMERCIAL

SEE SHEET 1/4 FOR ADDITIONALINFORMATION

SIDEWALK RUN-AROUND ON DRIVEWAY WITH SIDEWALK ADJACENT TO CURB ON PUBLIC R/W PARALLEL RAMP TYPE (RES. & COMM)

CITY OF COLUMBUS, OHIO
DEPARTMENT OF PUBLIC SERVICE
TRANSPORTATION DIVISION

STD DWG 2201

REV: 01/01/07

SHT 4 OF 4

APPENDIX B