ITEM F

CITY OF LA VISTA
MAYOR AND CITY COUNCIL REPORT
OCTOBER 6, 2020 AGENDA

Subject:	Type:	Submitted By:
PAVEMENT ASSESSMENT REPORT	RESOLUTION ORDINANCE ◆ RECEIVE/FILE	JEFF CALENTINE DEPUTY DIRECTOR OF PUBLIC WORKS

SYNOPSIS

Lamp Rynearson & Associates has completed the City's pavement assessment and will be presenting the report to the City Council.

FISCAL IMPACT

N/A.

RECOMMENDATION

Approval.

BACKGROUND

In the spring of 2020, a data collection van drove all of the City's streets to collect data on the overall condition of the City's public street infrastructure which is reported as a pavement condition index or (PCI). This data was analyzed by Lamp Rynearson and delivered to the City in the attached pavement condition index report. Representatives from Lamp Rynearson will make a short presentation regarding their findings and will be available to answer any relevant questions related to the process of developing the report.

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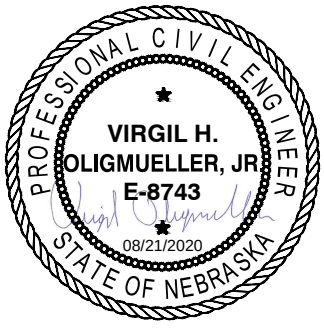
Pavement Condition Index Report

Prepared for:
City of La Vista, Nebraska

Project No. 0320015.01
June 2020



Leaving a Legacy of Enduring Improvements to Our Communities
Lamp Rynearson Purpose Statement

City of La Vista, Nebraska
Pavement Condition Index Report

Lamp Rynearson PN 0320015.01

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Figures, Tables, and Images

Acronyms

1. PCI — Pavement Condition Index
2. ASTM — American Society for Testing and Materials
3. HMA — Hot Mix Asphalt
4. PCC — Portland Cement Concrete
5. ASR — Alkali Silica Reaction
6. UBAS — Ultra-Thin Bonded Asphalt Surface
7. PAVER — Pavement Management Software
8. RT3000 — Road Tester 3000
9. GPS — Global Positioning System
10. APWA — American Public Works Association

City of La Vista, Nebraska
Pavement Condition Index Report

Executive Summary

The City of La Vista is interested in the condition of the street infrastructure in their city. The City is planning to increase their maintenance effort, but they first require information about the street conditions to assess potential repair methods and costs.

The City of La Vista hired Lamp Rynearson, partnering with Stantec, to provide a pavement condition index (PCI) of all the streets in La Vista, Nebraska. Stantec utilizes a pavement inspection van called the Road Tester 3000 (RT3000), a leading-edge data collection vehicle which incorporates the latest in mobile laser, GPS and crack recognition technology. The RT3000 is a fully mobile solution, developed to collect pavement condition data accurately and efficiently. The RT3000 drastically reduces the time required to collect pavement inspection data compared to an individual walking the streets and recording data.

Lamp Rynearson input Stantec's PCI data into a pavement management software (PAVER). PAVER is a pavement management system developed by the United States Department of Defense for managing maintenance and rehabilitation of its vast inventory of pavements. It uses inspection data rating from zero (failed) to 100 (excellent) for consistently describing a pavement's PCI and predicting maintenance and rehabilitation needs for future years. Lamp Rynearson operates PAVER 7.06 software from the American Public Works Association (APWA).

Using the data gathered, and input into PAVER, La Vista has 243 lane miles (1,713,429 Square Yards) of pavement to maintain. This includes SIDs Portal Ridge, Cimarron Woods and the Wiltham Place area. Approximately 205 lane miles (84%) of the system appears to be full depth concrete paving and presents a maintenance challenge described in the next paragraph. The lane miles are derived by length input into PAVER from Stantec multiplied by the approximate width in that segment divided by 5,280 feet and divided by 12-foot lanes. The width of the segment was generally determined from a lane mile report provided by the City. There were several segments that did not match or were missing from the lane mile report and in those cases either the 30' width originally received from Stantec was entered or a width most matching streets in a similar location was entered.

Full depth asphaltic concrete paving can have various surface treatments applied, and major maintenance can include mill and overlays, often in the two-inch range. This is not a recommended technique with concrete residential street pavements that are only 7 inches thick. Removing that much concrete weakens the base, potentially increasing the cracks coming to the surface, can conflict with any reinforcing present, and deteriorates the construction joints. Considering all options, we are recommending that the City consider testing out Ultra-thin Bonded Asphalt Surfacing (UBAS), after repairing base failures and possibly addressing joint issues, for the pavement maintenance.

Image 1: Stantec's Road Tester 3000

Study Objectives

The city of La Vista retained Lamp Rynearson to perform an assessment of their streets. Objectives of the study are as follows:

- Build a pavement database in PAVER including system development and integrate PCI GIS base mapping
- Populate street segments with current PCI data (2020)
- Populate additional right-of-way assets
- Coordinate with the subconsultant Stantec to provide:
    - Field survey
    - RT3000 pavement condition collection
    - RT3000 image collection
    - Data processing
    - Formatting to PAVER

Street Condition Inspection

Methodology

The city street pavements were inspected with the RT3000 which uses the process standardized by ASTM D 6433-07 to categorize and quantify all surface defects in the pavement and estimate the condition of the pavement on a 0 – 100 point scale. The general sections on this scale are shown:

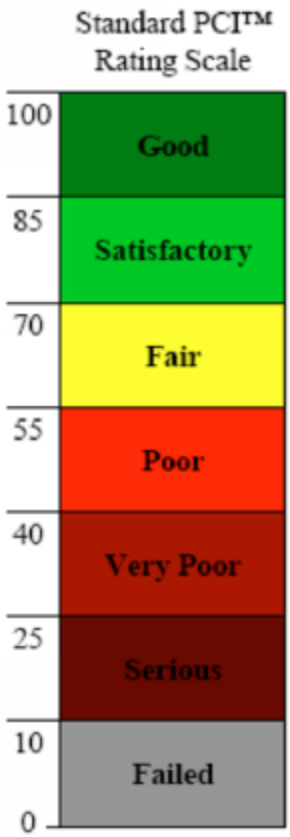


Figure 1—Pavement Condition Index Values

The RT3000 finds any of the 20 categories of surface defects seen in asphaltic concrete pavement, and 19 categories of surface defects seen in concrete pavement and analyzes to a severity following ASTM D 6433-07. PAVER weights the surface defects in each category and severity to generate a PCI in each segment of pavement.

Street Assessment

The city of La Vista has 205 lane miles of concrete streets and 38 lane miles of asphalt streets to maintain. The network was split up into 708 segments of concrete and 163 segments of asphalt. A segment generally is from one intersection to another, or to the end of a street, or to the city limits. The weighted average PCI for the asphalt streets is 59, falling in the Fair range. The weighted average PCI for the concrete streets is 81, falling in the satisfactory range.

Note that the Road Tester van picked up rutting along section 4720 of S 84th Street and dropped the PCI value into the Satisfactory rating. This street had just received maintenance the previous year and on-site inspection showed that what appeared to be rutting was, related to the recent overlay and was not load related rutting. The PCI was recalculated without the rutting distress and the score jumped back up to a rating of 92, in the Good category. It is possible that the PCI value in section 4720 will see a steeper fall than what is modeled in typical deterioration curves with similar inspections over time. This example highlights the importance of visually verifying some amount of the PCI inspections, especially where they may seem incongruous with recent maintenance activities or seem dramatically different than similar sections.

Table 1: Current La Vista Street Conditions

MEASUREMENT	FAILED	SERIOUS	VERY POOR	POOR	FAIR	SATISFACTORY	GOOD
Lane Miles	0.1	4	9	20	24	93	93
Square Feet	5,976	242,385	584,656	1,275,907	1,525,956	5,912,914	5,873,547
Square Yards	664	26,932	64,962	141,767	169,551	656,990	652,616
%	0.04%	1.57%	3.79%	8.27%	9.90%	38.34%	38.09%

Table 1 lists La Vista's current street conditions as of April 21, 2020. Its noteworthy that 14% of La Vista's streets are less than fair condition. A street with a PCI less than fair is generally viewed as requiring more than typical street maintenance. Base repairs or full reconstruction may be necessary, with significant additional costs. Typically, a street in a minimum of fair condition can be upheld with routine maintenance.

Table 2: Lane Miles of La Vista Streets

Year	FAILED	SERIOUS	VERY POOR	POOR	FAIR	SATISFACTORY	GOOD
2020	0.1 (0%)	4 (2%)	9 (4%)	20 (8%)	24 (10%)	93 (38%)	93 (38%)
2021	0.2 (0%)	5 (2%)	10 (4%)	19 (8%)	25 (10%)	91 (37%)	93 (38%)
2022	1 (0%)	6 (2%)	11 (5%)	18 (7%)	27 (11%)	98 (40%)	82 (34%)
2023	1 (0%)	7 (3%)	11 (5%)	18 (7%)	31 (13%)	92 (38%)	82 (34%)
2024	2 (1%)	7 (3%)	12 (5%)	18 (7%)	32 (13%)	102 (42%)	70 (29%)

As seen in table 2, one of the features of the PAVER program is to predict pavement deterioration, assuming no maintenance is performed, and what the condition of the streets will look like within the next 5 years. The bulk of La Vista's streets are in good or satisfactory condition. While 5 years without maintenance will not see a large uptick below satisfactory, this chart still illustrates the decrease in pavement condition over time. It is important to keep up with maintenance to keep costs as manageable as possible for future projects.

Table 3: Area Weighted PCI Average

Year	2020	2021	2022	2023	2024
Average Weighted PCI	77.33	76.50	75.66	74.82	73.99

Table 3 provides a PCI weighted by street area for all the streets in La Vista and predicts the future average PCI.

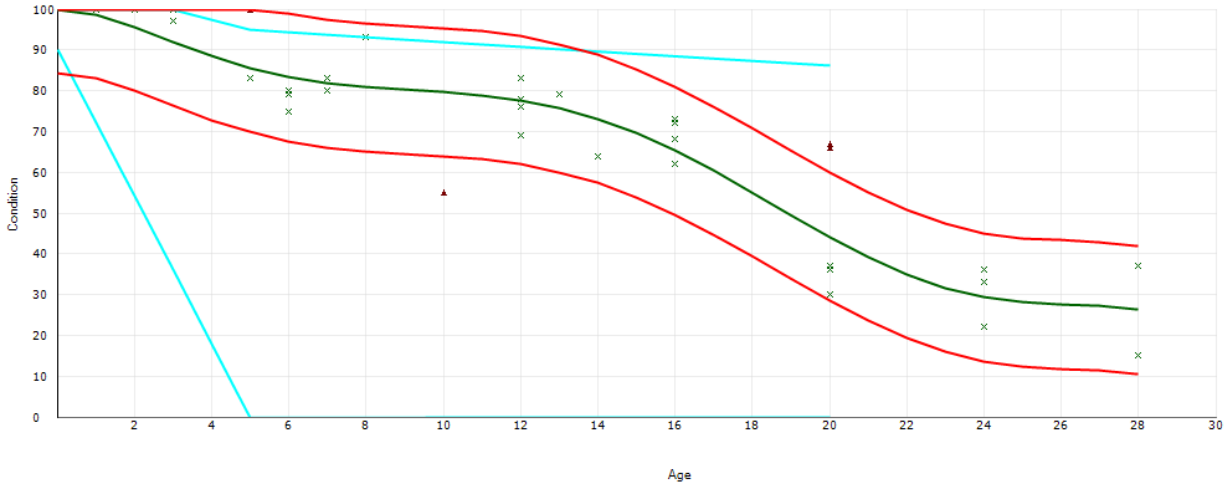


Figure 2: Typical Street PCI Deterioration Curve

This is a curve that the PAVER program uses to predict pavement deterioration. The rate at which a street deteriorates is determined by loading, pavement quality and climate. The deterioration rate above is not specific to any street in La Vista but is gathered by nationwide data to give the best representation. Achieving an accurate representation of the rate at which La Vista streets deteriorate will require continuing inspections on a regular basis.

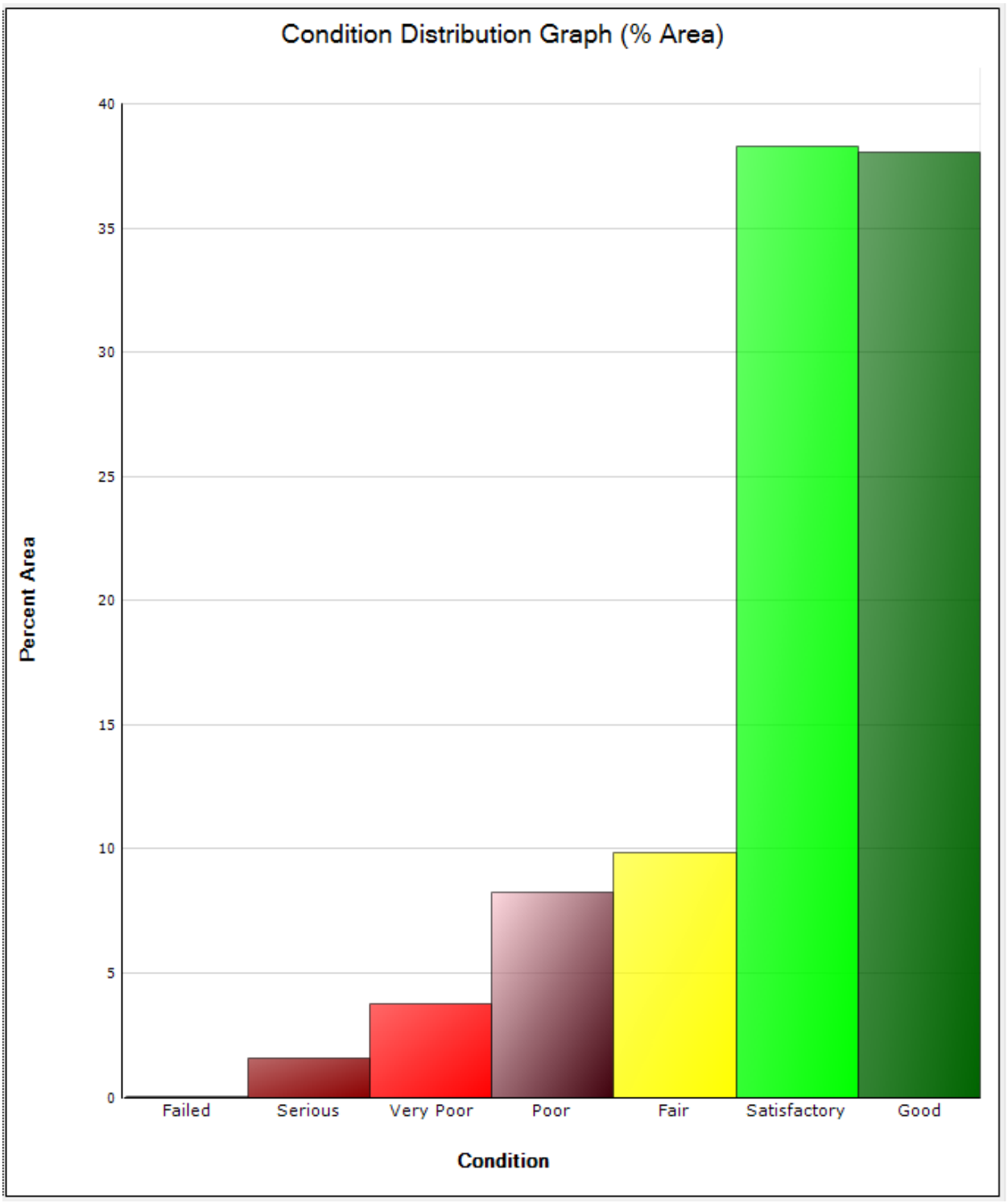


Figure 3: La Vista Street Condition by Area

Figure 3 is a graphical representation for the data in table 1.

Recommended Repairs

La Vista desires to develop a maintenance plan to keep their streets serviceable. Overall, the concrete streets are in better condition than the asphalt streets, but without maintaining those streets the damage and costs will accelerate. When water finds its way into concrete cracks and goes through a freeze-thaw cycle it will deteriorate the aggregate in the concrete. The water will wear on the durability of the concrete and begin to crack in the aggregate at the base of the concrete and works its way to the surface. This is known as D-cracking. The best way to prevent D-cracking, and other failure modes, is to seal up the surface and prevent the water from getting into the concrete.

Our recommendation on concrete streets in need of maintenance is for the City to continue to regularly maintain the pavement by crack sealing and panel replacements, as applicable. Preventing water intrusion in the pavement and subgrade by crack sealing is the best method for conserving the life of pavement at a low cost.

When the entire street is in need of maintenance our recommendation is a relatively new process called Ultra-Thin Bonded Asphalt Surface (UBAS). The City of Papillion, NE has a similar distribution of pavement type and will experience a trial of UBAS on a select group of their streets this year. Prior to the UBAS we recommend application of a joint sealer to all the concrete joints in the streets and allow a period of time to let that cure. Next, a milling machine macrotextures the street about one half inch to create a rough surface. Then a spray paver is used to place a heavy layer of polymer modified asphalt emulsion and UBAS in a single pass. The gap graded modified hot mix asphalt (HMA) layer placed on the polymer emulsion is a method primarily used on asphalt pavements to correct surface distresses or restore surface characteristics like friction and smoothness. This is also a less damaging solution compared to mill and overlay to perform on concrete streets in need of maintenance because it only requires a half inch of milling. This maintains the base thickness of the street and avoids damaging the street, as opposed to removing two inches for a conventional mill and overlay. Public acceptance of this method is high as often it drives smoother than a mill and overlay, is long lasting, and less expensive than a mill and overlay. However, UBAS is not considered a structural repair and is categorized as a surface treatment. Streets with base failures require patching or panel replacement prior to installing UBAS.

Image 2: UBAS Operation

The best options for maintenance to the asphalt streets in La Vista are Crack Sealing, a Mill and Overlay, UBAS and Chip Seal, depending on structural characteristics and condition of each street. The advantages and disadvantages are as follows:

Crack Seal/Panel Replacement/Base Patching:

- Advantages
  - Conserves the life of the street at the cheapest cost
  - Necessary prior to all other maintenance activities
  - Easily done with a Maintenance Crew
- Disadvantages
  - Looks less appealing than a brand-new street
- Approximate Costs
  - Crack Seal: $0.10/SY
    - Aggressive crack seal $2,500/lane mile (4+ passes per lm)
  - 7” Concrete Panel Replacement: $60/SY
    - Aggressive panel replacement $42,000/lane mile (10% replacement)
  - 4” Asphalt Patch: $55/SY
    - Aggressive asphalt patching $39,000/lane mile

Mill and Overlay:

- Advantages
  - Most appealing visually to residents
- Disadvantages:
  - Most expensive option because of the quantity of material used.
  - Most damage to existing street base materials because of construction equipment weight, and depth of pavement removed for overlay.
  - Requires either a UBAS or chip seal in 10-15 years.
  - Requires crack seal approximately 3 years after placement

- Approximate Costs: $84,000/lane mile

Ultrathin Bonded Asphalt Surface (UBAS)

- Advantages
  - Looks substantially like a conventional mill and overlay, visually appealing.
  - Less expensive than mill and overlay.
  - Minimal milling depth, and fewer material trucks, puts less strain on existing street base materials.
  - Probably longest lasting without repeated crack seal maintenance.
- Disadvantages
  - More expensive than chip seal.
  - Still requires crack seal approximately 2-4 years after placement, however, it is expected that crack seal of UBAS is less than what is required for a mill and overlay.
- Approximate Costs: $56,000/lane mile

Chip Seal

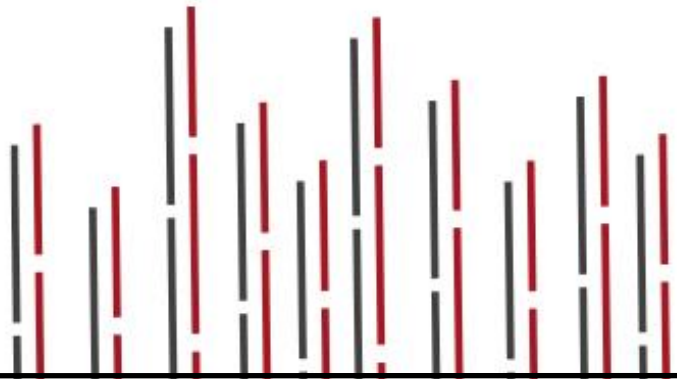
- Advantages
  - Lowest cost.
  - Best performance for the funds expended.
  - Least amount of strain on existing street base materials, no milling.
- Disadvantages
  - Leftover aggregate requires sweeping and is messy.
  - Street looks like a gravel surface and is rough.
  - Potential for asphalt emulsion to bleed through aggregate.
- Approximate Costs: $21,000/lane mile

Budgeting

A good plan to follow is to budget systematically to perform regular crack sealing, and a surface treatment (with prior panel repairs) on a street segment every eight years. Some maintenance operations last longer but the worse shape the street is in the more frequent it will require maintenance. To perform maintenance every eight years would mean averaging about 12% of the city's lane miles each year. La Vista has 243 lane miles so 29 lane miles a year would be a good place to start.

The pavement areas used in this report are not meant to be used for project estimating. We have assumed 12-foot lane widths and did not pick up all turn lanes in our estimates. For an annual maintenance program, the pavement widths should be evaluated in the field to ensure an accurate quantity is calculated.

Appendix A



PCI Map

Image 3: La Vista PCI Map