E3: Preserving Markham's Pavement Investment

Adapting a new Sustainable Strategy

Operations Division

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Purpose

This presentation will:

1. **Highlight the investment Markham has made in their roads to make them among the best in Ontario**

2. **Outline a new proactive strategy designed to keep the roads at their best and to preserve the investment**

3. **Detail the sustainability elements of this strategy focusing on Community, Economic, and Environmental drivers**

The State of Ontario's Road Needs Prior to 1995

- **In Ontario, municipalities received up to 50% funding from the Province to address their road rehabilitation needs**
- **Municipalities were required to complete visual "Road Need" studies with MTO inspectors to qualify for funding**
- **Funding was determined based on "Worst-First" criteria. i.e. Funds were given to repair only the worst roads**

The State of Ontario's Road Needs After to 1995

- When MTO funding was eliminated in 1995, most municipalities struggled to increase their budgets to close the funding gap
- Compounding the issue in the GTA area, the housing boom which started in the early 70's, was now 25 years old. Backlogs of road repairs would soon begin to mount if additional funding wasn't found
- By 2000, Markham had estimated their road repair backlog at more than 60 km

What was Markham's Investment?

- **In 2001, Markham adopted a 5 year plan to rehabilitate 117 km of road to not only clear their backlog but to address additional road needs during that 5 year period.**
- **In those 5 years, Markham raised their investment in their roads from $2M per year to $4M per year and has continued to increase that investment ever since**
- **As the backlog was addressed, Markham began to pilot new techniques, products, and approaches for the purpose of proactively maintaining the roads in good repair and extending their life**

Striving for Excellence – Benchmarking Road Performance

% Roads Rated Good or Better	2004	2005	2006	2007	2008
Markham	86	83	85	87*	89*
Provincial Average	74	74	71	70	N/A

Source – Markham's annual MPMP submissions
** - values have been corrected to include new roads and rehabilitated roads*

At 89% Markham roads are among the best in Ontario

Striving for Excellence

"Roads, are essential to a robust economy and good quality of life – and require careful engineering"

Dr. Susan Tighe, *Professor, Civil Engineering*
Canada Research Chair in
Pavement & Infrastructure Management
University of Waterloo
2006 Member of Canada's Top 40/40

New Direction:

Preserving Markham's Pavement Investment

New Direction: *Preserving Markham's Pavement Investment*

E3 – Continuous Improvement

- **Objective:** **Sustainability Focus**
  - Community
  - Economic, and
  - Environmental
- **Service Planning Project:** ***Pavement Preservation Program***
  - Evaluate the results of existing program and pilot projects undertaken,
  - Develop a proactive approach to managing the state of good repair of our road network.

New Direction: *Preserving Markham's Pavement Investment*

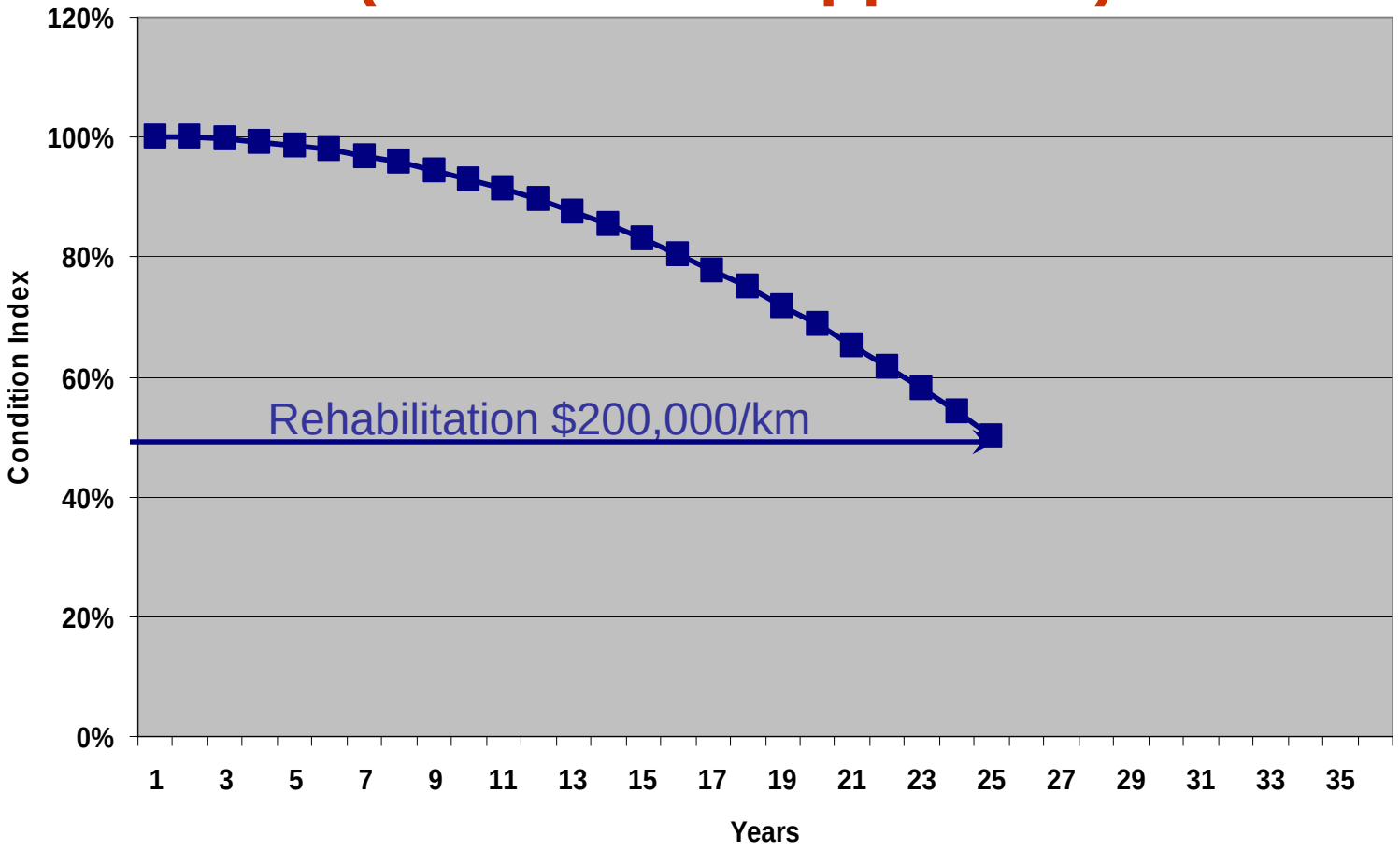
- **Strategy:**
  - **Build on the investment that Markham has made to clear the backlog of road repairs and move away from the 'Worst-First' approach and move to a 'Preservation' approach**
- ***Goals:***
  - Maintain high ratio of roads rated good or better (Community)
  - Reduce the overall life cycle cost (Economic)
  - Reduce the environmental impacts of rehabilitation (Environmental)

Preserving Markham's Pavement Investment

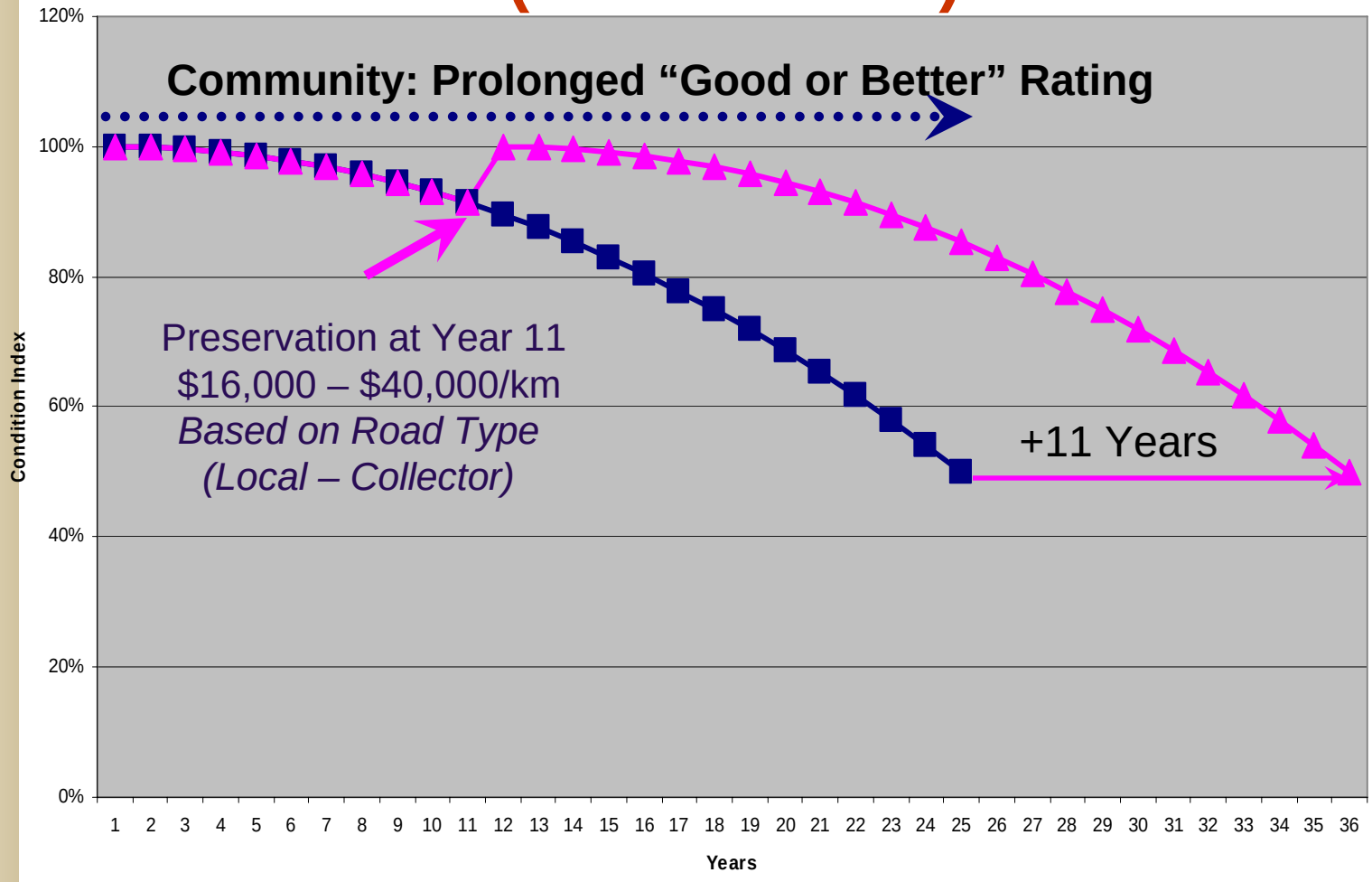
Elements of the New Program :

1. **Preserve the roads** by proactively treating the surface early in its life to prolong its state of good repair
2. **Strengthen roads during rehabilitation** for longer life. Revised standards for new road construction to reflect a longer life cycle.
3. **Employ green technologies** to reduce emissions, save energy, and recycle aggregates and asphalt
4. **Monitor, track performance**, and condition to ensure that network remains in good repair

Typical Road Performance Curve (Worst-First Approach)



Typical Road Performance Curve (Preservation)



Element 1. Preserve the Road

Pavement Preservation

Using the right technique, performed at the right time, on the right road to **extend the life** of the roads and **reduce the overall annual cost** of ownership**.**

Pavement Preservation

2005 Micro-surfacing Project
Apple Creek Boulevard

Pavement Preservation

- **Primary preservation treatment applied in Markham is micro-surfacing. A process to add a thin layer of asphalt and stone to seal the road surface**
- **Pilot focused on collector roadways,**
- **Different techniques are available for the different road types**
- **Target roadways in early stages of cracking and deterioration (Collector roads from 8 to 11 year age range and Local roads from 10 to 15 years)**

Example of Micro Surfacing

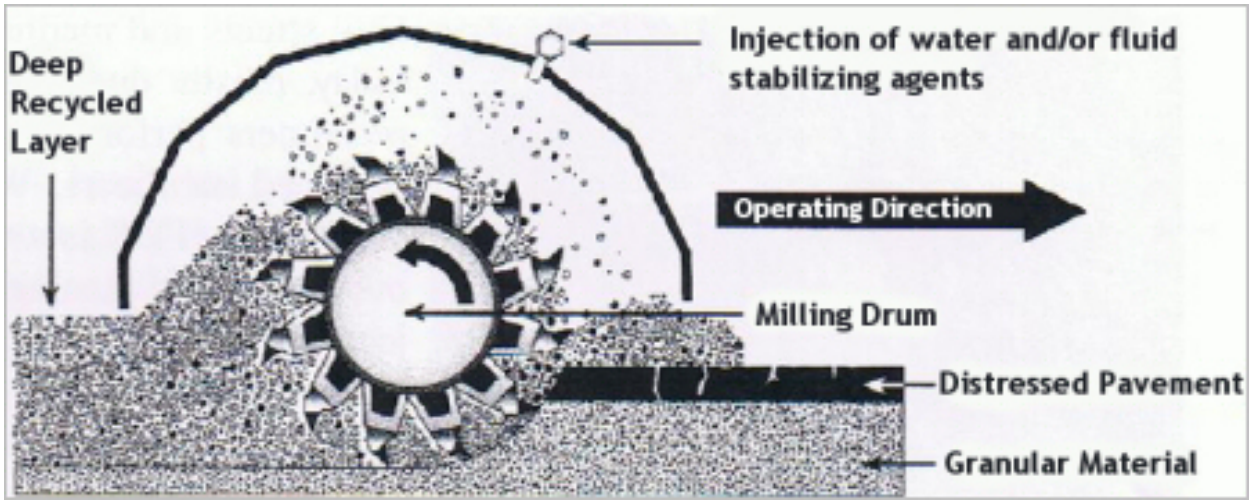
- **Uses low energy requirements techniques**
- **Road reopens within 1 hr of application**

Element 2. Strengthen Road at Rehabilitation

Expanded Asphalt Stabilization (EAS)

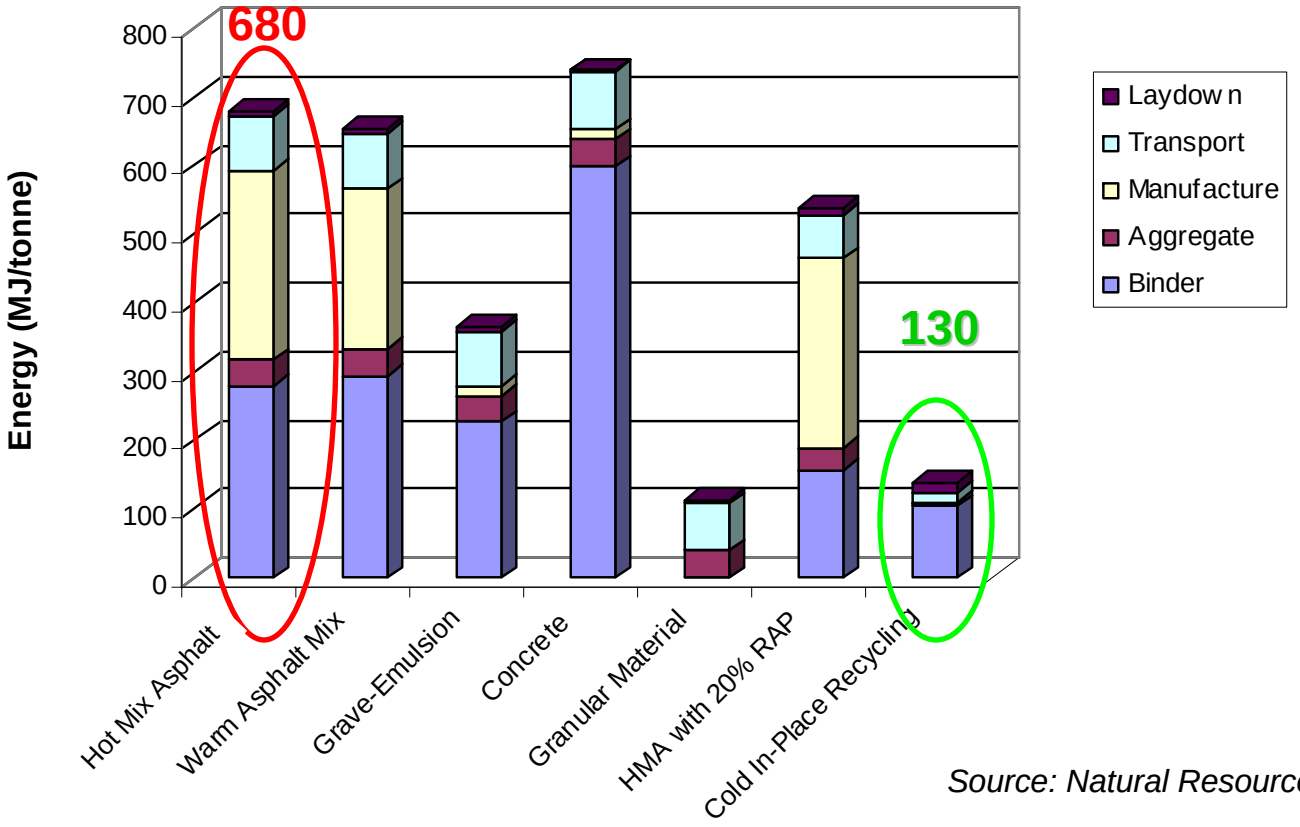
- **Initially developed and exclusively used in highway and rural road applications, Markham has urbanized the process to successfully rejuvenate our roads**
- **EAS provides**
  - **Approx 20% greater strength**
  - **Approx 20% longer life**
  - **Reduced energy and emissions through use of cold emulsions**
  - **90% Recycle ex. Aggregate and Asphalt**

Expanded Asphalt Stabilization



- **All existing asphalt and aggregates are recycled in new road base (20% Stronger)**
- **Cold emulsion techniques reduces energy needs and emissions from the process**

Energy Consumed by Different Processes for Road Surfaces



Source: Natural Resources Canada

Element 3. Employ Green Technologies

- **Cold emulsions and low energy techniques to reduce energy and emissions**
- **In-place recycling of aggregates and asphalt**

And…..

Recycled Asphalt Shingle (RAS)

Leading Edge Research in Canada

Markham has partnered with Miller Group and the University of Waterloo on an Ontario Centres of Excellence grant to develop a hot mix asphalt using recycled “tear-off” asphalt shingles.

This produces a more superior asphalt, preserves and reuses resources, and also diverts the shingles from landfill.

Ontario Centres of Excellence
Where Next Happens

THE MILLER GROUP

University of Waterloo

Recycled Asphalt Shingle (RAS)

- **EAS still requires a top lift of hot mix asphalt,**
- **We have been using the RAS with**
    - Typical application is 18% recycled asphalt with 1.5% recycled asphalt shingles
- **In 2007 and 2008, 135 tonnes of used shingles were applied to Town roads and diverted from landfill**

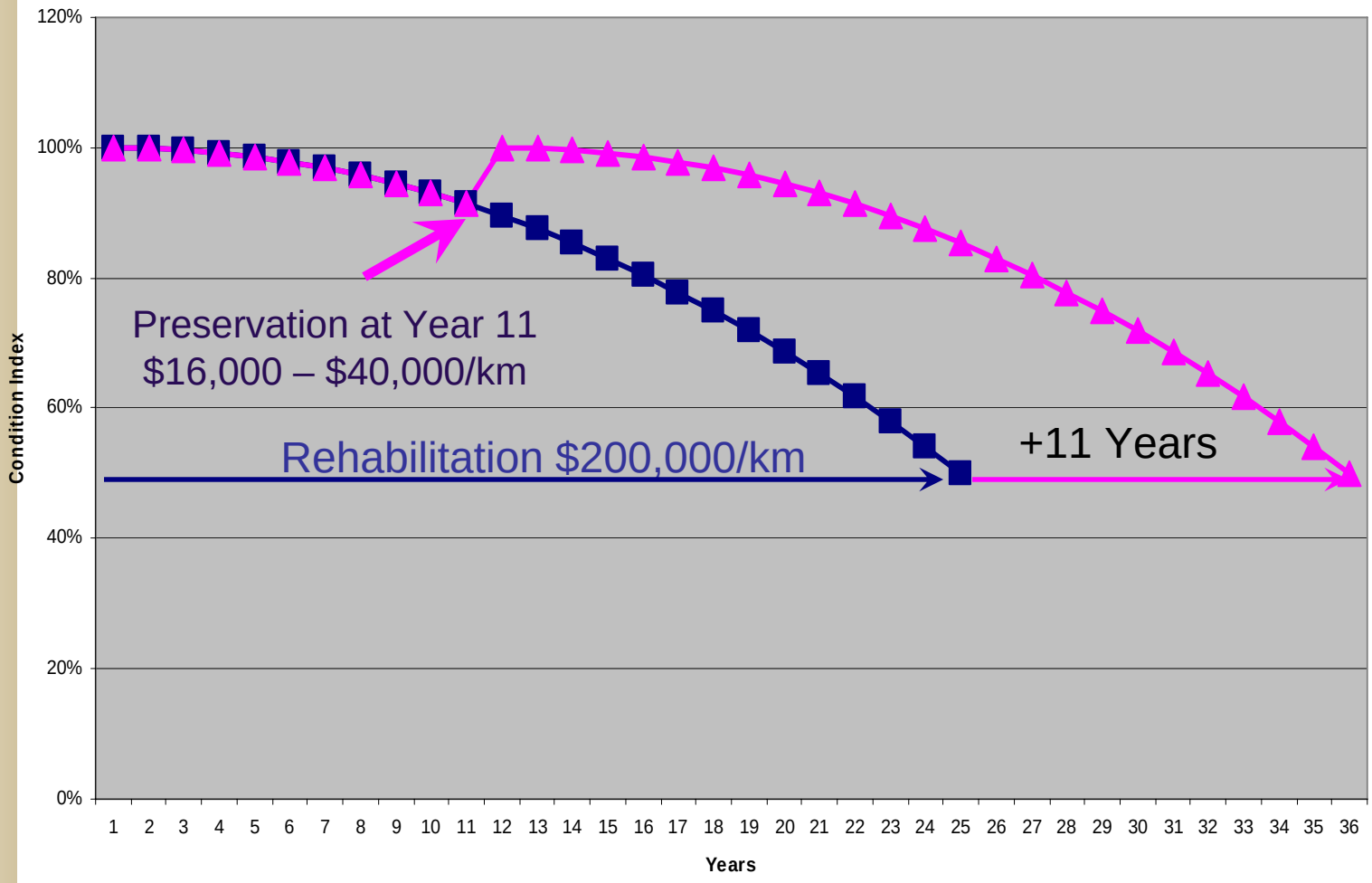
Element 4. Monitor and Track Performance

- Markham will continue to partner with the University of Waterloo to monitor our roads, review new techniques and products, and document our approach to Pavement Preservation.
- Staff will be undertake annual condition assessments of our roads.

Sustainable Benefits of the Program

- Community
  - **Demonstrated increased performance – longer period of "Good or Better" rating (preservation and strengthened roads)**
- Environmental
  - **Cold emulsion technologies reduced emissions and saves energy**
  - **Recycling of asphalt and aggregates**
  - **Diverting asphalt shingles from landfill**

Economic Benefit

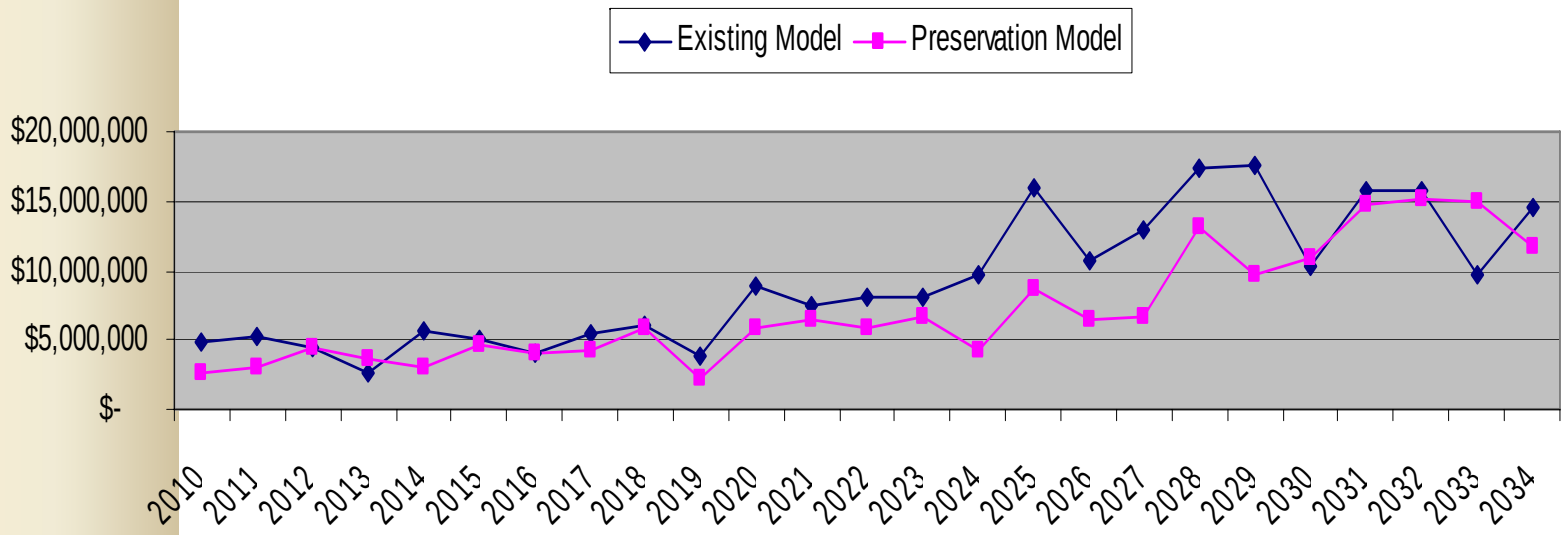


Economic Benefit

	Total Cost (per km)	Life Cycle (yrs)	Annual Cost (/yr/km)	Potential Savings over Worst First (/km/yr)	Projected Annual Savings*
Worst First Strategy	$ 200,000	25	$ 8,000	$ -	
Preservation Strategy (Collector)	$ 240,000	36	$ 6,667	$ 1,333	$ 1,273,333
Preservation Strategy (Local)	$ 216,000	36	$ 6,000	$ 2,000	$ 1,910,000

* - based on road inventory of 955km of roads

Life Cycle Reserve Expenditures by Year



- **Based on current inventory age and condition data, we have re-modelled our life cycle funding needs for Pavement Rehabilitation**
- **The model shows an expenditure reduction over the 25 year period**

Life Cycle Reserve Contributions

- As we **transition** to the new program, some roads in the inventory are beyond the right time for preservation and these new strategies will not be employed until their next cycle.
- We have estimated annual savings of $1.3M to $1.9M over the entire network once a preservation program is fully implemented in approximately 10 years.
- Therefore we recommend a one time reduction in life cycle contributions of $1 million.
- Continue to monitor performance and report back to Council in 2 years**.**

Recommendations

- That the Pavement Preservation Strategy be implemented starting in 2010
- That a one-time reduction of $1 million from the operating contribution to Lifecycle Reserves be approved
- That staff manage the transition and evaluate the success of this program and report back to Council at the end of 2011
- That staff continue to partner with the University of Waterloo to document and publish results
- That staff undertake annual condition evaluations of the road network