TRANSPORTATION PLANNING
AND
ENGINEERING STUDY

Huron Industrial Development

Marshall
Macklin
Monaghan
August 5, 1982
File #16-81140

Engineering Department
City of Kitchener
33 Ontario Street North
Kitchener, Ontario
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Attention: Mr. D. Suzuki, P. Eng.
Director of Engineering

Dear Sirs

Subject: Final Report - Huron Industrial Development Transportation Planning and Engineering Study

We are pleased to submit our Final Report on the Transportation Planning and Engineering Study for the Huron Industrial Development.

The report outlines the proposed development, the anticipated traffic generation, and the major road and rail requirements to service the area. A major component of the study was the evaluation of alternative alignments and presentation of recommended routes for both Huron Road and Strasburg Road.

We trust that the report addresses the requirements for the transportation components of the secondary plan.

It has been a pleasure to work with you and the Project Team throughout the study.

Yours very truly

MARSHALL MACKLIN MONAGHAN LIMITED

R.K. Wanless, P. Eng.
Project Manager
Transportation Planning Department

RKW/ct
HURON INDUSTRIAL DEVELOPMENT

CITY OF KITCHENER

August 1982
16-81140-101

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ACKNOWLEDGEMENTS

We wish to acknowledge the assistance provided throughout the course of the study by all members of the Project Team and other staff of the agencies represented. The Project Team members were:

Mr. D. Suzuki (Chairman)  City of Kitchener
Mr. T.R. Stanley  City of Kitchener
Mr. V. Bridle  City of Kitchener
Mr. D.R. Snow  City of Kitchener
Mr. R.C. Sills  Lochead, Sills
Mr. M. Dorfman  Regional Municipality of Waterloo
Ms. L. Bish  Regional Municipality of Waterloo representing the Huron land owners
Mr. P. Dietrich  McNaughton, Hermsen Planning
Mr. B.P. Hermsen  M.T.C., Stratford
Mr. R.K. Wanless (Project Manager)  Marshall Macklin Monaghan Limited
Mr. J.C. Greenough  Marshall Macklin Monaghan Limited

We also wish to acknowledge the information provided by Dr. Matthew H. Hill, Mr. Jack Redmond and Mr. William Fox concerning the archeological aspects of the area.
SUMMARY AND RECOMMENDATIONS

1. The proposed Huron Industrial Development will include 470 net hectares of general and prestige industrial development and 16 net hectares of "service centre" industrial development.

2. The area north of Huron Road is proposed for industrial development. To the south of Huron Road, industrial development is proposed west of Strasburg Road.

2. Residential development will occur south of Huron Road and east of Strasburg Road.

3. The employment in the area will total approximately 17,660 jobs. The area will generate up to 6,235 outbound and 1,650 inbound peak hour vehicle trips.

4. The area is served by a good network of existing arterial roads which when improved together with the construction of arterial roads within the area, provide adequate traffic service for the projected development.

5. The following major roads are required:
   - Bleam's Road - 4 basic lanes
   - Westmount - 4 basic lanes
   - Huron Road - 4 basic lanes
   - Strasburg Road - 4 basic lanes
   - Homer Watson Boulevard - 6 basic lanes

6. Although direct access may be desirable for specific development parcels, including the proposed service centre developments, both Huron Road and Strasburg Road should be designed with rear-lot development to avoid numerous access driveways. Both roads require a basic road allowance width of 30 metres although wider R.O.W. may be required in some cut or fill areas, subject to lot grading for development.
7. Provision should be made for future construction of a rail spur line into the area when the demand exists. The report recommends feasible alignment alternatives which can be finalized as detailed secondary and subdivision plans are developed. The existing spur line east of Homer Watson Boulevard could be extended into the study area via an underpass of Homer Watson and along a 12 metre wide easement which should be reserved at the time of registration of plans of subdivision. Lot grading should be designed to conform to the preliminary profile for the rail spur line.

8. Several alternative alignments were generated for both Strasburg Road and Huron Road, and were evaluated according to the following major criteria:

1) construction cost
2) right-of-way requirement
3) impact on the environment
4) impact on existing residential properties
5) impact on potential development
6) traffic and transit service
7) geometric design

9. For Strasburg Road, the preferred alignment is N3-S2.

10. For Huron Road, the preferred alignment is W5-E4-H2.
1. **INTRODUCTION**

The proposed Huron Industrial Development is part of a large parcel of land located in the South/West area of the City of Kitchener. The study area is bounded on the north by Bleam's Road and on the south by the Doon watershed boundary (which is approximate only and to be adjusted to fit with land ownerships) on the east by the existing Trillium Industrial Park and a line west of Biehn Drive and on the west by Westmount Road.

The study area includes approximately 880 hectares of which approximately 610 hectares (485 developable hectares) will be included in the Huron Industrial Development. The site location and study area are illustrated in Figures 1 and 2.

The purpose of this study is to identify and establish the transportation infrastructure requirements of the Huron Industrial Development. In particular, this study focuses on the development of a secondary arterial road network as well as the provision of rail and public transit services to the area.
2. PROPOSED DEVELOPMENT

The proposed Huron Industrial Development comprises approximately 610 hectares within the total study area of approximately 880 hectares. The 610 hectares of industrial development will encompass the entire study area with the exception of the area south of Huron Road and east of the new alignment of Strasburg Road. This area is designated for residential development as an extension of the existing Pioneer Park West development and the proposed Doon South Community.

Approximately 485 net hectares are available for industrial development of which approximately 470 will be general and prestige industrial and the remaining 15 will comprise service centre industrial development. The service centre designation is intended to include office and related commercial uses in support of the industrial development. For purposes of the study it was agreed that an approximate distribution of the service centre development would be as follows:

- 5.7 hectares at Huron/Strasburg
- 4 hectares at Bleam's/Strasburg
- 4 hectares at Bleam's/Westmount
- 2.4 hectares at Huron/Westmount

Existing and/or proposed development in the areas surrounding the Huron Industrial area is as follows:

- Residential development on the north side of Bleam's Road. Existing development has proceeded to a point west of Strasburg Road and will eventually be completed to Westmount Road.

- The area to the west of Westmount road is currently outside the area designated for development in the City of Kitchener Official Plan.
To the south of the study area boundary, the area to the west of the proposed alignment of Strasburg Road is currently outside the area designated for development in the City of Kitchener Official Plan. East of the proposed Strasburg alignment there will be residential development in the Pioneer Park West development and the Doon South Community.

To the east of Strasburg Road, south of Huron Road, will be residential development in the Doon South and Pioneer Park west communities. North of Huron Road the study area is bounded by the existing Trillium Industrial Park on Homer Watson Boulevard. The area east of Strasburg Road south of Bleam's Road, has recently received draft plan approval for industrial development (Trillium West Extension).
3. **TRANSPORTATION NETWORK**

3.1 **Existing Road Network**

The Regional context of this site location is indicated in Figure 1. The site is bounded by a number of existing and proposed arterial roads under the jurisdiction of either the Regional Municipality of Waterloo or the City of Kitchener which provide good accessibility throughout the area including connections to Highway No. 401 to the south and the Conestoga Parkway (Highway Nos. 7 and 8) to the north.

**Homer Watson Boulevard** is a two-lane Regional arterial road which currently has an interchange at the Conestoga Parkway and at Highway No. 401. This road provides access across Highway No. 401 into the City of Cambridge. A functional planning study is currently underway by the Region to review the feasibility of widening Homer Watson Boulevard to four lanes. This study will include a review of the potential alternatives for an improved intersection or possible grade separated interchange at Huron Road.

**Westmount Road** to the west of the site is a rural Regional arterial road which provides access to the north into the developing western sections of the Cities of Kitchener and Waterloo. To the south, Westmount Road continues south across Highway No. 401 but does not currently have an interchange.

**Strasburg Road** is a four-lane minor City arterial road running northerly from Bleam's Road to Ottawa Street through a residential area. The area is currently partially developed but does have single family residential frontage. The road terminates at Ottawa Street near the Homer Watson Boulevard interchange on the Conestoga Parkway. The alignment of Strasburg Road south of Bleam's Road will be the subject of this study. The intent is to provide a continuous minor arterial road to service the industrial area and to connect with Reidel Drive, an existing north-south road allowance south of Stauffer Drive (Figure No. 2).
Huron Road is presently a two-lane surface treated road with primarily undeveloped frontage with the exception of a few clusters of residential development. The grade of the road is rolling and residential development in some areas is immediately adjacent to the right-of-way.

Plains Road is an oil treated two-lane rural concession road with some residential development.

3.2 Proposed Road Improvements

The Regional Transportation Plan Review (TPR) has identified a number of improvements to roads in this vicinity. These include the proposed widening of Homer Watson Boulevard to four lanes in the priority two period (1984-1989) and from four lanes to six lanes in the priority three period (1989-2001). Fischer Road is proposed to be extended southerly from Ottawa Street to Westmount Road in the priority three period (1989-2001). Bleam's Road has been proposed to be extended easterly from Manitou Drive, through the Hidden Valley area across Highway No. 8 to connect with River Road. An interchange is planned at Highway No. 8.

3.3 Internal Road System

Access points to the industrial development from the boundary arterial roads and the internal road pattern have not yet been identified. Access points from the boundary arterial roads will be situated in order to guarantee adequate traffic capacity consistent with design constraints including intersections at existing roads, adequate intersection spacing and intersection locations consistent with constraints of road grades, visibility, etc. The only outlets to Homer Watson Boulevard will be Bleam's Road the existing Beasley Drive connection and Huron Road. The only outlet to Bleam's Road east of Strasburg Road will be the draft approved road connection in the Community Expansion draft plan. There is flexibility in the remainder of the area with the exception that intersections on Bleam's Road west of Strasburg should align with existing or approved road locations on the north side of Bleam's Road.
3.4 Public Transit

Kitchener Transit currently operates three routes in the general area:

- 10 Doon Valley - which connects Fairview Mall to Conestoga College via Wilson - Manitou - Homer Watson - Wilson

- 13 Pioneer Park - Chicopee - which connects Fairview Mall to Pioneer Park via Courtland - Bleam's - Homer Watson and services the existing Trillium Industrial area

- 11 Victoria - Country Hills - which connects downtown Kitchener to the Country Hills area via Strasburg Road

3.5 Rail Access

An existing CNR spur line exists east of the study area between Homer Watson Boulevard and Manitou Drive. The existing Homer Watson Boulevard north of the Huron Road intersection is at an elevation which would permit a westerly extension of the spur line via a grade separation under Homer Watson Boulevard to provide access to the Huron industrial area.
4. DEVELOPMENT TRAFFIC

4.1 Traffic Generation

The amount of traffic generated from a development is a function of the type and density of various land uses and the demographic characteristics of the surrounding areas.

Traffic is also dependent on the hours of operation of the components and can be expressed in terms of daily or peak hour trips. For purposes of this analysis traffic generated during the roadway p.m. peak hour was determined as this is generally the most critical period for the assessment of boundary roads and internal site roadway facilities. The procedure used for determining the amount of traffic generated during the p.m. peak hour for the development is summarized below.

General and Prestige Industrial

Traffic generation rates for industrial development are normally expressed in terms of vehicle trips per employee. Available information from the Region of Waterloo indicates average employment densities of approximately 22.2 employees per hectare (9 per acre) in industrial areas. However, in discussions with the Region and City representatives, it was agreed that this may represent incomplete development in many areas. Available data from the Region of Peel and other areas suggest a mature employment density of approximately 29.7 employees per hectare (12 per acre) for general industrial and 37.1 employees per hectare (15 per acre) for prestige industrial which may include a larger proportion of office uses. In order to maintain flexibility for the future distribution of general and prestige industrial development it was agreed that a density of 33.4 employees per hectare (13.5 per acre) would be used in this analysis.
Typical traffic generation rates were based on the ITE Trip Generation Report\(^1\) and other selected studies including a study of an industrial area in Brampton undertaken by the Region of Peel.

The traffic generation for the industrial uses is summarized as follows:

- land area available for industrial development 469 hectares
- total employment (33.4 employees per hectare) 15 660 employees
- 0.35 vehicle trips per employee outbound 5 480 vehicle trips outbound
- 0.1 vehicle trips per employee inbound 1 565 vehicle trips inbound

**Industrial Service Centre**

The industrial service centre will comprise a total of approximately 16 hectares and will include office development and other commercial and industrial development related to providing a service for the surrounding industrial area. The proposed office component will have a coverage ratio of approximately 0.4 with a gross floor area (GFA) not exceeding 23 225 m\(^2\). The projected traffic generation from the office component is summarized as follows:

- office development 23 225 m\(^2\) GFA
- total employment (assuming 4.3 employees per 100 m\(^2\) GFA) 1 000 employees
- number of employees leaving in p.m. peak roadway hour (assume 60 percent of total employment) 600 employees
- number of employees leaving by private automobile (assume a modal split for transit of 12 percent) 530 employees

\(^1\) Trip Generation - An Informational Report - Institute of Transportation Engineers.
- number of vehicle trips leaving in the p.m. peak roadway hour (assume vehicle occupancy of 1.3 persons per vehicle) - 405 vehicles

- number of vehicles entering during the p.m. peak hour (assume 10 percent of total) - 45 vehicles

The precise type of development included in the remaining sector of the service centres has not been clearly defined. For purposes of the analysis, it has been assumed that a development of 25 percent coverage would be permitted resulting in approximately 23,225 m² of floor area. On the basis of 4.3 employees per 100 m² this would result in approximately 1,000 employees. Using a similar generation rate for outbound trips to that of industrial, and assuming 10 percent of total trips inbound, the traffic generated by the balance of the service centre is summarized as follows:

- total floor area (at 25 percent coverage) - 23,225 m² G.F.A.

- total employment (at 4.3 employees per 100 m²) - 1,000

- number of vehicle trips leaving in the p.m. peak roadway hour (assuming 0.35 vehicle trips per employee) - 350

- number of vehicle trips entering during the p.m. peak hour (assume 10 percent of total trips) - 40

Summary

The following table summarizes the total employment and traffic generation during the p.m. peak roadway hour.
<table>
<thead>
<tr>
<th>Land Use</th>
<th>Number of Employees</th>
<th>Number of vehicle trips during roadway p.m. peak hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>General and Prestige</td>
<td>15 660</td>
<td>1 565 5 480</td>
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<tr>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Service Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Office</td>
<td>1 000</td>
<td>45 405</td>
</tr>
<tr>
<td>- Other</td>
<td>1 000</td>
<td>40 350</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17 660</td>
<td>1 650 6 235</td>
</tr>
</tbody>
</table>

4.2 Traffic Distribution and Assignment

The distribution of trips approaching and leaving the study area from various directions was determined based upon information supplied by the Region of Waterloo. The trip tables for zone 141, the existing Trillium Park industrial area, were used to determine the origins of the trips approaching the area as indicated in Figures 4.1 and 4.2. The distributions are different for the years 1986 and 2001 as a result of different population and development distribution within the Region in the two years.

Based on projected road needs the extension of the proposed new Strasburg Alignment was assumed not to evolve until after 1986. Similarly, the Hidden Valley road extension providing connection to Highway 8 was assumed not to occur until beyond 1986. Hence, the 1986 traffic distribution reflects trips generated to/from areas south of the study area assigned to Westmount Road, Homer Watson Boulevard and Manitou Drive only.

Traffic generated to/from the north and northeast is also expected to redistribute by the year 2001 to reflect the Hidden Valley extension. Until the connection is made to Highway No. 8 this traffic will be assigned to the same roads as indicated above plus Strasburg Road, north of Huron Road.
It is assumed that traffic generated to/from all other areas outside the study area will generally maintain a similar distribution on the roads existing in both horizon years.
5. TRAFFIC IMPACT

5.1 Basis of Analysis

The procedure used for analysis was to develop the site generated traffic which was added to the estimated background traffic on the adjacent major roads to determine the total traffic volumes. The 1986 and 2001 background traffic volumes were developed based on 1981 turning movement counts provided by the Region of Waterloo and the City of Kitchener. The following growth rates in background traffic were assumed to slightly exceed the predicted population growth rates for the Region of Waterloo. (1)

<table>
<thead>
<tr>
<th>Period</th>
<th>Growth Rate</th>
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<tr>
<td>1981 to 1986</td>
<td>2.4%</td>
</tr>
<tr>
<td>1986 to 2001</td>
<td>2.0%</td>
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Some adjustment of the forecast turning movement distributions was necessary to account for the addition of proposed new roads to balance the counts.

The site generated traffic has been estimated on the basis of the above noted traffic generation and distribution calculations and has been assigned to a number of access points from each of the major roads surrounding the development. For purposes of this analysis it was assumed that the development will be approximately 25 percent complete by 1986 and 95 percent complete by 2001.

At this stage in the study the analysis was limited to a review of the capacity of the intersections providing access to the development and the impact of traffic on road sections of the major arterials adjoining the developments. The 1986 site generated, background, and total traffic volumes for the roadway p.m. peak hour are indicated in

(1) Horizon years 1986 and 2001 correspond to population forecasts of approximately 342 000 and 460 000, respectively, for the Region of Waterloo.
Figures 5.1, 5.2 and 5.3 respectively. The estimated 2001 site generated, background, and total traffic volumes for the roadway p.m. peak hour are indicated in Figures 5.4, 5.5 and 5.6 respectively.

5.2 General Road Requirements

The projected peak hour traffic volumes indicate that the major roads in the study area will provide an adequate level of service in the year 2001 with 4 lane pavement widths, except Homer Watson Boulevard which will require 6 lanes. Four lanes will be required on Huron Road, Bleam's Road, Strasburg Road and Westmount Road. South of Huron Road, Westmount may not require more than 2 through lanes.

All major intersections were analyzed for 2001 traffic volumes: Satisfactory traffic operations (level of service C or D) can be maintained with left turn lanes at all intersections, and with right turn lanes in several locations to accommodate heavy right turn movements (see Figure 5.7). At many locations, the right turn lanes will not be required immediately, but can be postponed until later stages of development, provided that adequate road allowance widths are provided.

In general the heavy traffic flows on the secondary arterial roads (Huron, Bleam's and Strasburg) can be accommodated most safely and efficiently if access from abutting properties is restricted. On Westmount Road, on Huron Road east of Strasburg Creek, and on Bleam's Road east of Strasburg Road where volumes are expected to exceed 700 vehicles per lane per hour, no direct access should be permitted to adjacent properties. On other sections of Bleams's Road, Strasburg Road and Huron Road limited access may be acceptable for "service centre" development parcels. As well as for certain other specific parcels with access constraints. However, in general, both Huron Road and Strasburg Road should desirably be rear-lotted throughout.

On the road sections with rear-lot development where no access will be permitted, a 4-lane pavement on a 26 m road allowance is adequate in most situations, subject to cut/fill requirements. However, considering the rolling topography in much of the study area, a basic R.O.W. width of 30 m would be appropriate.
The road allowances on the major roads should be at least 30 m wide in the vicinity of all intersections to provide for turning lanes, bus bays, etc.
5.3 Transit Service

The trip generation forecasts reflect a modal split to transit in the range of 10%, which represents approximately 900 roadway p.m. peak hour, peak direction transit riders and 3,500 daily two-way transit riders (assuming peak hour, peak direction represents 25% of two-way daily volume).

Service and routing to the area must be the subject of a more detailed review. However, on a preliminary basis it appears that the existing Country Hills (#11) route could be extended southerly on Strasburg Road to serve the easterly section of the Huron development.

The westerly section of the development could be served by a route which also serves the westerly section of the Country Hills residential area. The internal collector roads in the industrial development, west of Strasburg Road must be designed to facilitate transit service. It will not be practical to provide a transit route on Westmount Road because no development is planned to the west. Therefore, a transit routing within the industrial area will be required. Kitchener Transit is currently considering a continuous bus route to serve the north-south Westmount-Fischer corridor. It may be feasible to extend such a service through the Country Hills residential area to the Huron Industrial area or provide a route in these areas which connects to the north-south route. Transit service to the area will be initiated and expanded as development proceeds.
6. **TRANSPORTATION CONTROLS**

The planning and evaluation of route alternatives for Strasburg Road and Huron Road was based upon an investigation of the major study area features. The major controls and significant features governing the design and alignment alternatives are presented in this section of the report.

6.1 **Policy**

- The alignment for Strasburg Road will proceed southerly from the existing intersection at Bleam's Road to connect to Stauffer Drive at Reidel Drive.

- The selected alignment for Strasburg Road south of Huron Road will serve as the separation between the industrial development and the proposed westerly expansion of the Pioneer Park residential area.

- The alignment for Huron Road will connect to Homer Watson Boulevard at approximately the existing intersection location, and will connect to existing Huron Road west of Westmount Road.

6.2 **Design Criteria**

The following design criteria are suggested as follows, in accordance with RTAC standard UAU-70:

- **design speed**: 70 km/h
- **minimum right-of-way**: 26 m
- **number of lanes**: 4 (3.5 m wide)
- **cross-section**: urban, undivided
- **horizontal curvature (min.)**: 190 m radius
- **vertical curvature (min) crest: sag:**
  - k = 35
  - k = 25
- **gradient**: 6% maximum
- **stopping sight distance**: 120 m
6.3 Land Use

- There are a number of single-family residential properties on existing Huron Road including, east and west of Trillium Drive, near Plains Road and at Westmount Road.

- The existing residential properties fronting on Westmount Road north of Huron Road are planned to remain and be separated from the industrial development by a buffer strip.

- The existing residential properties on the south side of Huron Road east of the new Strasburg Road will be incorporated into the planned westerly expansion of the Pioneer Park residential development.

- It is anticipated that the residential properties in the vicinity of Plains Road will be redeveloped for industrial uses in the long term. Several residential dwellings west of Strasburg Creek are part of development holdings which are expected to be replaced by industrial development in the short term.

- Residential development (some existing) is planned for the north side of Bleam's Road between Homer Watson Boulevard and Westmount Road.

- There are approved draft plans for expansion of the Trillium Industrial Park westerly to Strasburg Road on the Community Expansion and Paul Tuerr Construction properties.

6.4 Road Access

- Only two access points are available on the east side south of Bleam's Road - at existing Beasley Drive, and at Huron Road. These access points must serve the traffic destined to the south and southeast (primarily to Cambridge and to Highway No. 401) which represents 25-30% of total development traffic.
Two to three access points can be provided to Bleam's Road on the north side - one opposite Colony Drive, and the others to be located appropriately in accordance with intersection spacing, visibility, and road grade considerations.

Three access points can be provided to Westmount Road, subject to the above-noted design considerations.

Strasburg Road and Westmount Road will provide access to/from the south.

6.5 Utilities

Hydro

A major Hydro tower line runs in a northwest to southeast alignment through the southwesterly section of the proposed development. It is understood that the tower line is on an easement so that the land under the tower line may possibly be used for parking. The design of the proposed road alignments will avoid conflict with existing hydro tower locations.

A major trunk Bell telephone pole line easement runs diagonally from northeast to southwest parallel to Huron Road. Any relocation or raising of this line to accommodate road construction is expected to be difficult because it is a major line.

A gas main was recently installed on Huron Road by the City of Kitchener. In areas where a new alignment is selected and the existing alignment of Huron Road is not retained as a road, an easement 12.2 metres wide will be required.

6.6 Soil Characteristics

The whole area is generally outwash sand with a high silt content over basement till. There are several small areas with high gravel contents. The wetland area adjacent to the ponds and the water courses is characterized by organic soils.
6.7 Topography

- The topography of the study area is generally flat in the northern section and becomes rolling terrain of 10% to 30% in the south. The high ground is on the west adjacent Westmount Road sloping towards the southeast.

6.8 Environment

- There may be some archaeological interest in the vicinity of the former New Aberdeen townsite located on Huron Road near the west branch of Strasburg Creek. Evidence of pre-historic remains has been found in the southwest area of the proposed industrial development south of Huron Road. The study area to date has not had a complete archeological survey. Hence, the City of Kitchener may require under provincial guidelines that such an assessment be undertaken before construction within the rights-of-way of the selected Strasburg Road and Huron Road alignments.

- Water Courses - a mixture of spring-fed and intermittent streams feed major pond areas located within the area southwest of the existing Huron Road and Strasburg Road intersection. The water courses are small and do not create any serious constraint to the design of road alignments within the proposed Huron and Strasburg corridors. However, future design will be based on avoiding the flood plain area of these water courses to reduce the requirements for special design and construction procedures.

- Mill Ponds - numerous pond areas exist within the study area. However, only two specific areas have been identified as major pond areas. One of these ponds is located within the east/west strip of property owned by Community Expansion Ltd. The other major pond area is within the Major Holdings property south of Huron Road. Both pond areas are primarily spring-fed. Therefore, it is recommended that proposed road alignments through these areas be avoided. If this is not possible, then an effort should be made to minimize the impact of any road alignment proposed through these areas.
The mill pond and surrounding wooded area south of Huron Road has been identified as being more compatible with residential than to industrial land use. Residential land uses could take better advantage of the aesthetic attributes offered by the woodland. In evaluating alternative road alignments for Strasburg Road this issue will be considered since it has been established that the future alignment of this road will define the westerly limit of residential development south of Huron Road.

- Wooded Areas - wooded areas are primarily concentrated in areas of wetland (more specifically, mill ponds) and generally throughout the flood plain regions. In relation to these wooded areas, one major constraint was identified as critical to the development of road alignments within the proposed corridors. A stand of maple trees located just west of the pond area south of Huron Road is protected by a stable forest margin which runs along the perimeter of this wooded area. This margin consists of physically stronger trees and shrubs which have gradually developed over the years having successfully weathered the harsh natural elements (i.e., north winds, direct sun, etc.). Trees which grow in an area protected by this forest margin lack the ability to withstand exposure to the elements. Therefore, any proposed road alignment should avoid penetration of this area in order to preserve this natural shield.

6.9 Constraints

Map A (Appendix B) illustrates a summary of the major site constraints and controls considered during the development and preliminary evaluation of alternative routes for the Strasburg Road and Huron Road arterials.

The major physical constraints in the study area are:

- single-family residential properties;
- major Hydro transmission tower line;
- major trunk Bell telephone pole line;
- 32 -

- gas main on Huron Road;
- streams, pond and other wetland areas; and
- wooded areas and forest margins.

The names of contact persons at agencies which provided information for this section of the report are listed in Appendix A.
7. **RAIL SERVICE**

The opportunity for rail service exists for the proposed Huron Industrial Development by extending the existing CNR spur line located east of the study area between Homer Watson Boulevard and Manitou Drive. The feasibility of this opportunity was investigated through numerous discussions with Canadian National Railway.

7.1 **Market Summary**

The availability of large industrial lands with rail access is extremely limited throughout South Western Ontario. Locally, the City of Cambridge has only a minimum supply of sizeable industrial lots on existing rail lines and CNR expects these to be exhausted within five (5) years.

The Guelph area has available only one or two known large vacant industrial properties with potential for rail service. Currently, within the Cities of Kitchener and Waterloo, no known vacant industrial lands having rail accessibility exist. Only limited parcel and small freight shippage is available in the City of Kitchener area through the operation of an independent forwarding company. Bulk shipping by rail car is therefore, not available to companies which would be involved in such kinds of shipping.

These facts, coupled with the knowledge that Kitchener's industrial belt is the next major one west of Toronto, suggests that the marketability of land within the Huron Industrial Development with accessibility to rail would be excellent, particularly for 8 to 10 hectare lot sizes.

7.2 **Design Criteria**

Provision of a rail alignment to the study area is subject to the following design criteria of CNR and land developers.
7.2.1 - Rail Standards

- A maximum gradient for a rail spur line should be 1.5 percent (1 percent if possible).

- The maximum radius on a rail curve should be 130 metres (13 degrees). Trains cannot couple on a curve that is more than 13 degrees.

- A minimum easement width of 12 metres was suggested, with widening at various locations depending on grades.

- Grade crossings have to be approved with the Canadian Transport Commission.

- Oblique angle road crossings are dangerous and harder to maintain and should be avoided.

7.2.2 - Land Development Requirements

- Maximize lands backing onto rail.

- Minimum 100 metre to 200 metre lot depth from rail.

- Minimum lot size for rail service should be 4 hectares.

- Minimize irregular shaped land parcels.

- Maximize distribution of rail access among current land developers.
7.3 Constraints

It was indicated that the existing CNR spur line to the east of Homer Watson Boulevard does not have a weight constraint and it is likely that the extension of this spur into the Huron area would have a high weight payload capacity (90 - 105 tonne capacity).

From a rail traffic point of view, there is sufficient capacity in the spur line to accommodate the additional area.

7.4 Cost

It was indicated that if a particular industry is going to generate enough traffic, then CN may be willing to enter into an agreement to pay for the construction of a spur line, and then rent out the use of the line to the industry. At present, the annual rental would be calculated on the basis of an initial $1,000 plus $6.50 per metre.

On the other hand, if the industry was not going to generate sufficient traffic, and still wished to have rail service, then it would be up to the industry to pay for the spur line. An example of construction costs is $230.00 to $260.00 per metre not including the cost of grading works and $330 per metre with grading works included.

7.5 Strategy

It was suggested that a possible strategy would be to retain a rail alignment in the planning stage. It was suggested that the rail line could be in the form of an easement as opposed to a right-of-way. This appears to be the most flexible approach since the land subject to the easement can be sold as part of the industrial property. However, the actual construction of a rail would depend upon demand at such time as industries began to locate in the area. In this manner, the option for rail service would be preserved while minimizing front end construction costs.
7.6 Recommended Rail Alignment

It is recommended that either rail alignment R1 or R2 as indicated on Map A be considered for purposes of future rail access to the industrial development. Each alignment strictly serves the industrial lands north of existing Huron Road and west of existing Strasburg Road, primarily because of ideal topography of the area for rail design. Generally, both rail alignments exhibit very similar impacts on the Strasburg Road alternatives. Alignment R2, however, does provide a more equitable share of the rail line between developers. The decision as to which alignment should be selected is therefore subject to the agreement between affected developers and the City during the detailed preparation of the secondary plan and subdivision plans.

Land parcels developable under each rail plan would typically range in size from 2 hectares to 16 hectares depending on the property configurations under each Strasburg Road alignment. These parcels would be shared by various land developers in this area.

Each rail alignment is shown to terminate at the central greenbelt but is capable of being extended to serve lands farther west within the study area.

Alternative east-west alignments were examined. However, the combination of rough terrain, the need for bridging to cross the middle Strasburg Creek and poor land development capabilities, made the selection of such alternatives unfeasible. The requirement of deep cuts for rail along such alignments would impose upon developers extensive grading requirements to match rail grades. The cost of building a railway bridge is considered too high. Land sectioned by the rail alignments produced inadequately sized lots for industrial use with rail.

7.7 Rail Traffic

CNR predicts that rail traffic generated along any spur line provided to the Huron Development would most likely be only one 'switch' per day. Rail switches in Ontario greater than two are rare.
Generally, both rail alignments exhibit very similar impacts on the Strasburg Road alternatives. Alignment R2, however, does provide a more equitable share of the rail lines between developers.

7.8 Impact on Road Alignments

The major concern related to the proposed road alignments is how each road alignment coupled with each recommended rail alignment affect land development potential and design compatibility between the road and the rail line. The impacts of each rail alternative are generally the same by virtue of the minor difference in their alignments.

With road alignments N1 and N2 the most "constrained area" of developable land (i.e., bordered by road and rail) is approximately 4 hectares. Regular shaped parcels of land up to approximately 12 hectares are possible. Alignment N1 is marginally better than N2 because it provides the flexibility for larger sized and more regular shaped rail-accessed lots within the properties of Breslau Farms and Community Expansion. But generally, 4 hectare to 8 hectare lots were most predominant. One 90° rail crossing is required for either road alignment alternative.

Road alignments N3 and N5 demonstrate nearly identical impacts on land development potential. Two triangle-shaped lots within the Community Expansion property are limited to approximately 2 hectares and in the one land parcel east of the rail line only limited frontage on the rail line is available to incorporate a rail siding. In addition, an approximate 8 hectare land parcel to the east of the rail alignment on Breslau Farms property is isolated from rail access. Land parcels are again generally 4 hectares to 8 hectares with maximum capabilities of providing up to approximately 12 hectares. One at-grade rail-crossing at 90° is required.

Alignment N4 produces a minimum constrained area of approximately 4 hectares located east of the alignment on the Breslau Farms property. This parcel of property is somewhat inaccessible to rail because of the limited amount of land fronting onto the rail line on
which to incorporate a siding. A small 0.4 hectare triangular portion of the Community Expansion property is entrenched by the road and rail alignments east of N4 producing poor development potential for this isolated parcel of land. A rail crossing significantly greater than 90° would be required for this alternative. Although rail traffic would be negligible on this rail line a sub-standard crossing remains undesirable.

In terms of compatibility with either rail alternative and land development potential road alignment N1 is best and N2 marginally second best. Among the remaining road alignments either N3 or N5 may be considered next best and N4 the least attractive alternative of the five.
8. ALIGNMENT ALTERNATIVES

8.1 Strasburg Road

Map A (Appendix B) illustrates seven (7) preliminary alternative routes developed for the proposed Strasburg Road arterial. Several sections of proposed road are common to more than one alternative. All seven routes are to be included for detailed evaluation.

8.2 Huron Road

Map A also illustrates the alignments of eight (8) preliminary alternative routes for the proposed Huron Road arterial. Again, several sections of proposed road are common to more than one alternative. All eight alternatives are to be included for detailed evaluation.

The vertical alignments of all alternatives for both Strasburg Road and Huron Road are included in Appendix C.
9. ALIGNMENT EVALUATION

9.1 Objectives and Criteria

Objective: To select economical and feasible alignments for Strasburg Road and Huron Road which minimize the impact on existing conditions while satisfying the community planning and transportation service requirements of the area.

Criteria: The major criteria used to assess and compare the alternative routes include:

- construction costs
- R.O.W. requirements
- impact on environment
- impact on existing residential development
- impact on potential development
- traffic and transit service
- geometric design

The following brief descriptions of each of the major evaluation criteria outline the basis of consideration.

9.1.1 - Construction Costs

Each alternative was costed, based on a preliminary design for a four-lane construction. Material standards and unit quantities were estimated for the purpose of costing, however, detailed soils investigations will be required to establish the necessary pavement design criteria.

Since the preliminary vertical alignment design was established from topographic mapping and the cost and material quantity assumptions were preliminary in nature, the construction costs developed for each alternative should only be used on a comparative basis and should not be considered as absolute construction cost estimates.
9.1.2 - Right-of-Way Requirements

The minimum right-of-way requirements for each alternative were measured in hectares to provide a basis for comparison.

9.1.3 - Impact on the Environment

The major areas of environmental concern were identified, including ponds, watercourses and woodlots. In addition, the topography along and adjacent to each alternative was assessed for its impact and compatibility with the proposed land use, roadway classification and traffic service characteristics. The potential impact on areas of archaeological interest was identified.

9.1.4 - Impact on Existing Residential Properties

Existing residential development in the study was identified and the impact of each alignment assessed, including consideration of proximity of alignments to each property, noise impact, exposure to arterial traffic and property requirements for each alignment.

9.1.5 - Impact on Potential Development

The location and staging of proposed residential and industrial developments and existing land ownership boundaries were identified. The impact of each alternative road alignment was assessed on the basis of its degree of compatibility with each of these items.

9.1.6 - Traffic and Transit Service

The recommended road alignment should encourage efficient traffic and transit services. Therefore, alternative road alignments were assessed on the basis of the following:

- centrality of alignment to development;
- impact of construction staging on transit routing and traffic circulation; and
- transit circulation.
9.1.7 - Geometric Design

Horizontal and vertical control and intersection designs were assessed for each road alignment.

9.2 Comparison of Alternatives

9.2.1 - Construction Costs

The following are the estimated unit prices used for the purpose of evaluating construction costs for each alignment alternative. These prices are based on 1981 costs and adjusted for construction with large quantities.

Assume
- 150 mm Asphalt
- 150 mm Granular 'A'
- 450 mm Granular 'B'

Sodded Boulevard = 8.0 metres wide

Sidewalk 1.5 metres wide - one side

Road Construction $400/m
Drainage (a) culvert $200 000 to $500 000 each and stream bed protection
(b) Storm Sewer $1 200/manhole average $120/m of sewer

Illumination $85/m of roadway

Intersections Including left turn lanes right-of-way widening and traffic islands approximately 20% of total road construction.
Property Requirement for Residential Land
$11.0/m² for strip of frontage
$25 000 for first fifth hectare
$25 000 per hectare after first fifth hectare
$270/m² of house floor area

For Farm Land: $25 000 per hectare

The total length of Huron Road and Strasburg Road construction will be approximately 7 km.

The purpose of the cost estimate is for comparison among the alternatives and a rough figure for the cost of the construction only.

The pavement structure design conforms to a major city road or minor highway design. Grading quantities are calculated based on profiles plotted from the 1:2000 contour map.

Tables 9.1 and 9.2 are the summary of the total costs of each alternative. The total estimated costs for the Strasburg alignments differ only marginally. The costs for alternatives W1 and W4 are significantly higher because of extra length and more property requirement west of Westmount Road.
Table 9.1

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Length km</th>
<th>Earthgrading $</th>
<th>New Construction $</th>
<th>Property $</th>
<th>Total Million $</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1/S1</td>
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<td>791 200</td>
<td>3 845 800</td>
<td>N/A</td>
<td>4.64</td>
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<tr>
<td>N2/S2</td>
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<td>4 010 800</td>
<td>N/A</td>
<td>4.79</td>
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<tr>
<td>N3/S3</td>
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<tr>
<td>N4/S4</td>
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<td>4.35</td>
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<tr>
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<tr>
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Table 9.2

Huron Road (Construction Cost Summary)

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<th>Alternative (1)</th>
<th>Length km</th>
<th>Earthgrading $</th>
<th>New Construction $</th>
<th>Property $</th>
<th>Total Million $</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1/E1</td>
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<td>164 000</td>
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<tr>
<td>W2/E1</td>
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<td>3 232 000</td>
<td>67 500</td>
<td>3.46</td>
</tr>
<tr>
<td>W3/E4 (2)</td>
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<td>3 611 400</td>
<td>745 000</td>
<td>4.50</td>
</tr>
<tr>
<td>W3/E3</td>
<td>4.4</td>
<td>129 400</td>
<td>3 599 600</td>
<td>814 900</td>
<td>4.54</td>
</tr>
<tr>
<td>W4/E4</td>
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<td>131 700</td>
<td>3 033 900</td>
<td>99 800</td>
<td>3.27</td>
</tr>
<tr>
<td>W4/E3</td>
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<td>169 700</td>
<td>3.32</td>
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<td>83 000</td>
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<td>142 300</td>
<td>3.16</td>
</tr>
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(1) Cost for H1-H2 alternatives included.
(2) All E2 alternative costs are equal to all E4 alternative costs.
(3) Incremental cost increase.
9.2.2 - Right of Way Requirements

Strasburg Road

It is assumed that the basic R.O.W. is 30 m except where wider sections are required to accommodate cut and fill. N1/S1, N2/S2 and N3/S3 have about 1,000 m of road which requires a R.O.W. wider than 30 m. The other alternatives require about 800 m of R.O.W. wider than 30 m. N3 and N4 have only a 500 m section along the existing Strasburg Road which requires widening.

Huron Road

There are 400 m to 600 m of extra wide R.O.W. (more than 30 m) for each alternative except W5/E4 and W5/E3 which are along the existing Huron Road.

The 0.4 hectare of Turner property at the northeast corner of Biehn Drive/Huron Road has to be acquired for any of the alternatives. W5 requires only strips of frontage from private residential land totalling 6,800 m². W1 and W3 also require 270,000 m² of land west of Westmount. The costs of property are shown on tables 9.1 and 9.2.

9.2.3 - Impact on the Environment

Ponds

- the alignments have been established to avoid the major ponds.

- S3 and S4 are the only alignments which pass near an environmentally sensitive pond. Both are a short distance downstream of the dam structure and would not directly impact the pond, although there may be some undesirable impact related to the potential for development of a park area at the pond.
o Watercourses

- The middle Strasburg Creek is the principal creek in the area with several pond areas and continuous flow. However, the north and south branches do have identified flood plain areas that are crossed by all alignments.

- S1 and S2 cross the main creek and the south branch at separate locations.

- S3 and S4 cross the main creek downstream of the confluence of the main and south branches - however, there are two crossings of the floodplain which require culverts or structures.

- N1 and N2 cross the floodplain of the north branch at a wide location, although no problems are anticipated.

o Woodlots

- S1 and S2 are located to skirt the two major woodlot areas south of Huron Road.

- Both alignments have significant cut and fill sections to the south of Strasburg Creek - however, the alignments are sufficiently far west to avoid an impact on the woodlot.

- To avoid the treed area, S2 requires a long curved alignment which encroaches slightly farther west into the proposed industrial area west of the woodlot. S1 provides a more direct alignment in this area.

- S1 and S2 require tree removal over a 450 metre section crossing the south branch of Strasburg Creek. However, this area consists largely of reforestation and has not been identified as a valuable wooded area.
- S3 and S4 traverse a 550 metre length of wooded area downstream of the dam and pond on the main branch of Strasburg Creek.

- N1 affects a wooded ridge area immediately north of existing Huron Road. The area is also crossed by alignment W1. A considerable cut would be required for both alignments. However, for the area to be practical for industrial development it is expected that tree removal and extensive regrading would be necessary in any event.

- The other alignments do not impact any wooded areas.

Topography

- In most areas the alignments traverse flat or gently rolling terrain with little cut/fill requirements and consequently no negative impact on access to adjacent property. However, there are several sections of more rugged topography where the extent of cuts and fills may influence access, depending on the degree to which the areas are ultimately regraded to accommodate development.

- S1 and S2 have considerable cuts and fills adjacent to the wooded area between Strasburg Creek and the Hydro easement.

- N1 north of Huron Road and E1, adjacent to Strasburg Creek require significant cuts - however, development here is expected to require extensive regrading.

Archaeology

- Most of the proposed alignments pose minimal threat to historic and prehistoric archeological remains, either totally bypassing any areas of likely development or simply transecting linear emplacements such as roads or millraces. However, significant threats to archeological resources can be predicted at several points along some proposed alignments.
- Alignments E2 and E3 pass through a critical area of archeological remains. Historic remains of the New Aberdeen Settlement exist adjacent to existing Huron Road from the conjunction of E2 and E3 alignments to the L. Battler property on the north side and to the P.G. Schultz property on the south. Additional remains located adjacent existing Huron Road on the L.A. and B.J. Ross property are threatened by the W5 alignment.

- Some remains along existing Huron Road have been damaged by maintenance roadwork.

- Although alignments E1, S3 and S4 run adjacent to mill pond dams (period waterworks) located north and south of existing Huron Road, neither archeological structure is impacted.

- Alignment S1 threatens remains of the New Aberdeen settlement south of its intersection with existing Huron Road. Although no documented structures would be damaged by the alignment, potential remains which have not yet been unearthed may be threatened.

- It is possible that alignments S3 and S4 might result in damage to the environs of the Sawyer's house, excavated in 1975 and located just north of the conjunction of the alignments.

- Two unconfirmed pre-historic sites may be threatened by proposed road alignments. One potential site is located near the convergence of N3 and N4 alignments. The other is located in the area just southeast of the proposed intersection of Strasburg Road and Stauffer Drive. Hence, damage to remains that may exist is possible by alignments in these areas.
Unconfirmed reports of pre-historic sites, when combined with soils, topography and documented pre-historic settlement patterns in the adjacent region, suggest that there is high potential for the location of additional native sites in the planning area. As well, New Aberdeen, as a shortspan 19th century industrial village, is perhaps unique in its degree of preservation and its significant historical and archeological importance. Hence, it has been urged by archeological specialists that corridor surveys along the alternative alignment selected be conducted to avoid last minute discoveries which could delay construction.

Specifically, a corridor survey would involve a registered archaeological consultant inventory of archaeological and historic remains, if any, within the right-of-way of the recommended alignments. The survey could not be carried out until the spring but would involve one or more of the following activities depending on the existing ground conditions within the R.O.W.:

- active agricultural area - walk plowed fields for visual surface inspection;
- pasture areas - test pit sampling or contract plowing and observations as above;
- woods - test pit sampling.

Test pit sampling would involve hand shovelling test pits 50 cm square by 10 cm to 15 cm deep (down to subsoil). The number of test pits required would be based on a grid pattern of 10 m separation between test pits over the entire R.O.W.

Archaeologists state that the findings of anything short of an Indian burial ground would not likely require the realignment of a route. However, close co-operation with the archaeological society to arrange for the removal of any remains found either during or prior to construction would be necessary.
9.2.4 - Impact on Existing Residential Properties

(a) Proximity of Alignments to Residential Properties

- The N-S alignments have no impact on existing residential development except for three relatively new, large houses on the south side of Huron Road. S4 is immediately adjacent to one property and would have the effect of isolating these three properties from the proposed residential development which would all be east of the new Strasburg alignment.

- S3 would permit additional residential development as a buffer between the road alignment and the three houses.

- There are at least fifteen occupied houses on Huron Road east of Strasburg Creek. The majority are located on the south side, many of which are in good condition and which would be incorporated into the proposed residential development of the area. Most houses are within 15 m of the road allowance and would retain access from existing Huron Road.

- E1, E2 and E4 alignments together with H1 would place the road at least one lot depth to the north of existing Huron Road, permitting new development fronting on existing Huron and backing on the new alignment to form a buffer between existing homes and the new alignment. The H2 alignment would place the road on the present alignment adjacent to the homes east of Trillium Drive.

- West of Strasburg Creek there is a cluster of 7 houses near the Plains Road intersection. Several are located on large parcels of land and are well set back from the existing road. The impact of the road is expected to be short term as this area is expected to undergo eventual redevelopment for industrial uses. All alignments avoid this area, except W5 (existing Huron).
- Two houses front on Huron Road immediately east of Westmount Road and two immediately west. The two on the east side of Westmount are part of a group which are designated to remain residential. The homes to the west are outside the limit of proposed development, and are therefore, expected to remain residential for some time.

- The W2-A, W4-A, and W5-A alternatives would provide a buffer (in the form of new residential development) between the existing houses east of Westmount Road and the new road. However, the two houses to the west of Westmount Road would now back onto the new road, rather than fronting on the existing alignment. With proper privacy or noise treatments, this would be acceptable.

- W2, W4 and W5 would directly impact these houses.

(b) Exposure to Arterial Traffic

- W5 - E3 which follow existing Huron Road would result in all remaining residential properties fronting on and having direct access to the arterial road. Additional residential development proposed on the south side of Huron Road east of new Strasburg Road would likely follow the same pattern, resulting in a considerable number of residential units with direct access to the arterial.

- West of Strasburg the existing dwellings would retain direct access - however, in the long term, industrial redevelopment will alter this.

- S4 would be immediately adjacent to one existing residential property at Huron Road.

- All other alignments would not require direct residential access.
(c) Property Requirements

- At this stage in the planning process, a detailed determination of property requirements is not practical. However, a general assessment was undertaken.

- In most cases, residential development exists on only one side of Huron Road, so that road allowance widenings could be taken partly or entirely on the side where new development occurs.

- On the E3 (existing) alignment there would be a major impact on the one property on the north side of Huron Road at existing Strasburg Road and the one property at Riehn Drive. At least one house on the south side would be removed. Both properties would be expected to develop industrially in accordance with the land use plans for the area.

d) Noise Impact

The Ontario Noise Prediction Model was used to determine future noise levels generated by traffic along the alternative alignments and existing roadways. Projected ultimate traffic volumes and the established roadway design standards were used as input to the model.

The impact of road traffic noise from site generated traffic on existing dwellings in the study area can only be assessed in terms of the increase in noise levels indoors and in the outdoor recreational area, above the noise levels generated by projected ultimate background traffic, herein referred to as the ambient noise levels. The alternative alignment(s) which minimizes the impact is the preferred alignment.
The impact of noise on new residential development can be assessed according to guidelines established by the Ministry of the Environment. However, no specific guidelines have been established by which it can be determined if an impact on existing housing is significant and at what point noise control features should be incorporated into the existing dwellings by the developers.

Therefore, for the purpose of this assessment it has been assumed that:

(1) an increase in noise levels up to a level of 60 dBA can be considered a minimal impact.

(2) an increase in noise levels to greater than 60 dBA but less than 65 dBA can be considered a noticeable impact.

(3) an increase in noise levels to beyond 65 dBA is a significant impact.

The following noise assessments were conducted for those residential groupings identified in Figure 9.1:

Group 1

Group 1 consists of the dwellings located in the northeast quadrant of the intersection of Westmount Road and Huron Road.

The projected traffic volumes along Westmount Road will likely result in an appreciable impact generating noise levels of approximately 62 dBA, L eq. in the rear yards of dwellings fronting that road. This is approximately 8 dBA above the projected ambient conditions. Traffic volumes along any of the alternative alignments will not increase this value.
Traffic volumes along Westmount Road will result in noise levels of approximately 53 to 56 dBA in the rear yard of dwellings fronting on the existing Huron Road alignment. Traffic along alignments W5, W4 or W2 would have a noticeable impact on these dwellings and would increase this value to approximately 62dBA, 8dBA greater than the projected ambient level. Traffic along alignment A would have a lesser impact and would increase the value to approximately 57 to 59dBA, 3 to 5dBA greater than the projected ambient condition. Traffic along alignments W1 and W3 would not affect the noise levels in the rear yards of these dwellings.

**Group 2**

Group 2 consists of the residences located in the vicinity of the intersection of Huron Road and Plains Road.

Traffic along the existing Huron Road alignment would result in a noticeable impact on these dwellings with noise levels of approximately 60 to 63dBA in the rear yards. However, eventual industrial redevelopment will likely occur before the ultimate traffic volumes occur, hence the impact can be considered short-term. This is approximately 7 to 10dBA greater than the projected ambient value.

All of the remaining alignments, W1, W2, W3 and W4 have essentially no impact. Traffic along these alignments would result in noise levels less than the ambient value.

**Group 3**

Group 3 consists of the dwellings located along Huron Road just east of the H.E.P.C. easement.
The traffic along the existing Huron Road alignment (including alignments W4 and W3) would result in a noticeable impact on these dwellings with noise levels of approximately 63dBA in the rear yard areas of dwellings fronting on that alignment which are not set back significantly from the roadway. This is approximately 10dBA above the projected ambient noise level.

Traffic along alignments W1 and W2 will result in a lesser impact. Levels of 58 to 61dBA would be experienced in the rear yard area exposed directly to traffic along these alignments. This is approximately 5 to 8dBA above the ambient value.

Traffic along the north-south alignment S1 will not impact these dwellings.

Group 4

Group 4 consists of the residences located near the intersection of Huron Road and alignment alternative N4.

Traffic along the existing alignment of Huron Road would result in a noticeable impact with noise levels of approximately 61 to 63dBA in the rear yards of dwellings fronting the roadway. This is approximately 8 to 10dBA above the ambient value. Traffic along the north-south alignment alternative S4, would not increase this noise level with one exception. The noise level in the rear yard of the dwelling adjacent to the S4 alignment would increase to 64dBA.

Traffic along the north-south alignments S2 and S3 would not increase the noise levels.

Traffic along alignment alternatives E1 and E2 would have no impact and would result in noise levels of approximately 52 to 54dBA in the rear yard areas of dwellings fronting on the existing Huron Road. This is equivalent to the projected ambient value.
Traffic along alignment alternative S4 would have a noticeable impact and would increase these values by up to 7dBA depending on the distance of the dwelling from the S4 alignment. Traffic along the S2 and S4 alignments would have a minimal impact and would increase these values by only 2 to 4dBA.

**Group 5**

This group consists of the residences located near the intersection of Huron Road and Trillium Drive.

The traffic along alignment E3 would result in noise levels of up to 63dBA in the rear years of these dwellings. This is approximately 5 to 7dBA greater than the ambient value and represents a noticeable impact.

Traffic along alignment H2 would result in noise levels ranging from 52 to 63dBA in the rear yard areas. The higher values would be achieved as the alignment coincided with the existing Huron Road Alignment and represent a noticeable impact.

Traffic along alignment H1 would result in noise levels of 52 to 62dBA. The higher values would be achieved where the rear yards of several dwellings are exposed directly to traffic noise from the alignment. Again, there is a noticeable impact.

Traffic on the north-south alignments would not contribute noticeably to the noise levels for this group of dwellings.

The impacts can be considered minimal. Upon final selection of the preferred alignments, the impact of noise on residences along the alignments should be assessed in more detail.

It should be noted that in several cases, the introduction of intervening structures between proposed alignments and the existing dwellings will help to minimize the affect of road traffic noise on the dwellings.
Future residential development will incorporate noise control features into the individual units and the development site and may also help to minimize the affect of road traffic noise on the existing dwellings.

9.2.5 - Impact on Potential Development

- N4 - S4 is a relatively straight alignment which crosses most development parcels perpendicularly and parallels most property lines. It follows the previously proposed realignment of Strasburg Road south of Bleam's Road and is compatible with the subdivision planning recently completed east of Strasburg Road and south of Bleam's Road. Although it severs the properties immediately north of existing Huron, the resulting parcels are readily developable.

- The existing house on the south side of Huron Road at the tight curve west of Trillium Drive would have to be removed to provide an acceptable horizontal alignment for E-3.

- S4 isolates the existing three houses fronting on the south side of Huron Road from the proposed residential development east of Strasburg Road, and limits the westerly extension of proposed residential development compared to alignments S1 or S2. S3 similarly limits the residential expansion, but does permit incorporation of the existing three houses into the residential area.

- N1 is most compatible with industrial development as it crosses all properties perpendicularly.

- N2 and N3 have more curvilinear alignments which may create some minor inefficiencies in lotting, although both coincide with the lot line between the two large properties on the north side of Huron Road.
W5 - E3 follows existing Huron Road which coincides with property holdings and permits maximum flexibility for development. However, if the existing residential properties fronting on the south side set the pattern for the proposed future residential development (east of Strasburg Road), industrial uses will be opposite residential development fronting on an arterial road rather than opposite rear-lotted residential development on alternative east-west alignments.

E1 would permit the development of residential uses between E1 and existing Huron Road east of Strasburg Road. Existing Huron Road would be retained as a local street with residential frontage. New residential development on the north side of existing Huron Road would back onto the E1 alignment, and adequate privacy and noise attenuation could be provided.

With the E2 or E4 alignment, similar development (to E1) would occur, although some minor inefficiencies in lotting would occur in a small triangular parcel where E2 or E4 connect to existing Huron Road. The gas pipeline on the existing Huron Road alignment requires the retention of at least an easement which places some restriction on the development in the area where E2 or E4 connect to existing Huron Road. The E4 alignment results in the triangular development parcel being east of Strasburg Road, so that it could be developed residually, whereas with E2 industrial development would occur in the triangle. Residential development would be more practical than industrial in such an irregular parcel.

Because of the creek locations and the desire not to construct an additional crossing, the proposed residential area south of Huron Road and west of the north branch of Strasburg Creek would be connected to the existing residential area east of Biehn Drive only via Huron Road. No additional east-west road is proposed across the north branch between Huron Road and the main branch of Strasburg Creek. The E1, E2 and E4 alignments could permit this section of Huron Road to be developed as a local residential street if connected to the H1 alignment.
The H1 alignment has the advantage (compared to H2) that existing Huron Road east of Trillium Drive can be retained as a residential street with new development on the north side backing on to the H1 alignment.

- W1 is suitable for industrial development.

- W3 and W4 result in some inefficiencies in lot configurations adjacent to the Hydro easement.

- W2 and W4 result in significant lotting inefficiencies.

- W1 and W3 will result in some complication and inefficiency for possible future development west of Westmount Road.

- The W3-A, W4-A, and W5-A alternatives east of Westmount Road were proposed to remove the road from the existing homes (which are proposed to remain) at the northeast corner of Westmount/Huron. The concept would permit the development of new residential properties (with adequate privacy and noise attenuation) fronting on existing Huron Road, which would become a cul-de-sac at Westmount Road. However, the alignments would continue west of Westmount Road immediately south of existing residential properties on the south side of Huron Road. These alignments introduce some inefficiencies where the alignments connect to existing Huron Road.

- Industrial Service Centre development is proposed at the intersection of the Huron Road and Strasburg Road alignments. The N2/N3 alignments provide the best opportunity for this development since they cross Huron Road in a relatively level area where good access can be provided. The N1/N5 alignments cross in a relatively rugged area where both Strasburg Road and Huron Road are on a 4% grade. The N4 alignment would result in the service centre development opposite existing residential development.
9.2.6 - Traffic and Transit Service

- All alignments have been designed to satisfy the minimum design criteria for horizontal and vertical alignment.

- However, straight and direct alignments such as N1-S1 or N4-S4 provide generally safer, more efficient traffic operations with less potential restriction on access to adjacent property.

- All north-south alignments are generally acceptable. Alignments N3 and S2 are slightly less direct than others. In particular, S2 requires two long, reverse curves south of Huron Road which will require super-elevation and can be expected to restrict direct access and limit the location of intersections.

- All east-west alignments are generally acceptable, however, W4 is less desirable than others.

○ Centrality to Development

- Balanced traffic access and good transit penetration of the area are best provided by a Strasburg alignment which is close to the midpoint between Westmount Road and Homer Watson Boulevard. Therefore, N1-S1 is preferred from this perspective. N3 and N4 are the least desirable.

○ Staging of Construction

- With respect to the potential for staged construction N3, N4, and N5 are preferred. Construction of the section from Huron Road to existing Strasburg Road would provide a continuous new route north of Huron Road. However, with N1 and N2, the entire alignment must be completed to function as an arterial route. It would be necessary to maintain existing Stasburg Road south of Bleam's Road until the new alignment is completed.
- South of Huron Road, there is no potential for staged construction, however, the need for a through connection to Stauffer Drive is a long term requirement, which could be implemented as development proceeds. Therefore, construction of segments south of Huron Road would be acceptable.

- With respect to Huron Road, E2, E3, E4, W4, and W5 offer the only significant potential for staged construction.

- W1 and W3 alignments require the extension west of Westmount Road to complete the continuous function of Huron Road. Without that connection, existing Huron (W5) would continue to function as the major road.

0 Transit Circulation

- N1 and N2 alignments are most central to the development area and therefore, provide better transit coverage with routes on Strasburg Road and on Homer Watson Boulevard.

- However, the size of the industrial development area west of Strasburg Road is expected to require a bus service on the collector streets to provide service within a reasonable walking distance of most industry, regardless of the alignment selected for Strasburg Road.

- The Huron Road alternatives are not particularly sensitive to transit considerations.

9.2.7 - Geometric Design

The proposed alignments are designed to suit the developments in the study area both horizontally and vertically. The intersections with other roads and the crossings at the utilities and the creek are significant factors in terms of the construction costs.
Horizontal and Vertical Alignments

Strasburg Road

Alternatives N1, N2, N4, S1 and S4 are relatively straight with horizontal curve radius 500 m or greater. S2 and S3 each have a curve of 250 m radius which will require superelevation and would restrict access and intersection locations. However, these curves exceed the desirable design standard of 190 m for the 70 km/h design speed.

Vertically, all alternatives are comparable except S1 and S2 which require more cut and fill in the vicinity of the Hydro line.

Huron Road

All alternatives are quite straight forward horizontally except W4, W5 and E3/H2 which require 200 m to 300 m radius curves.

The vertical alignment for all alternatives are quite similar except W5 and E3 which require minimum grading since they conform to the existing Huron Road. W1 and W2 require extra cut and fill just east of the middle Strasburg Creek.

With respect to horizontal and vertical alignment, N4/S4 and N1/S1 are the first and second choice for Strasburg Road because they cover the shortest distance and do not require excessive grading. For Huron Road, horizontally, W2/E1 is the most direct route. Vertically, W5/E3 the existing Huron Road is the best alignment because of minimum grading requirements.

Intersections

Although both alternatives N1/S1 and N4/S4 for Strasburg Road intersect the proposed Huron Road alignments at about 70° they are still better than the other alignments. For alignments S2 and S3 there are combinations of grade and tight radius horizontal curves immediately south of the intersection.
W1/E1 of Huron Road intersects N1 at a location where extensive cut is required although the grading for development is also expected to require significant cutting. W5/E3 intersects both alignments N1 and N4 at a 70° angle and on a grade.

9.3 Optional Alignments for Huron Road

9.3.1 'A' Alternative

At Westmount Road the 'A' alternative was considered as an option to avoid the two houses on the north side of Huron Road at Westmount Road. The 'A' alternative would move the road farther from the two houses east of Westmount, and permit the development of intervening new residential lots which could be provided with noise attenuation adjacent to the new road. However, it should be noted that the projected noise levels in the rear yards of the two houses would be only 62dBA with the existing alignment. The 'A' alternative is not desirable for the two houses west of Westmount where it would be directly south of the rear yards, although privacy and noise attenuation features could be included.

The 'A' alternatives have the advantage of eliminating direct access from four residential lots to Huron Road.

The 'A' alternatives would cost approximately $350,000 more than the existing alignment because of the additional property and road construction requirements.

In consideration of the costs and the marginal benefit, it is recommended that the 'A' alternative be rejected.

9.3.2 H1 - H2 Alternatives

The H1-H2 alternatives were evaluated on the basis of providing an at-grade intersection with Homer Watson Boulevard, at least initially, because of the cost of a grade separation. It is apparent that a decision to proceed with a grade separation for a railway spur line cannot be made at this time. However, if such a grade separation is provided in future, the intersection could also be grade-separated.
The H2 alignment follows existing Huron Road as far east as Biehn Drive where it swings to the north and rises to intersect Homer Watson Boulevard. In order to meet the grade at Homer Watson Boulevard, the grade of H2 will be raised at the Biehn Drive intersection. Therefore, in the planning of the residential expansion of Pioneer Park the potential for relocating Biehn Drive westerly to intersect Huron Road at Trillium Drive should be considered.

With the H2 alignment, the three existing residential lots east of Biehn Drive could be provided access via a service road connection to Biehn Drive, although these properties could eventually redevelop based on a cul-de-sac street running east from Biehn Drive. Industrial development on the north side of the H2 alignment could benefit from access to the rail spur line. Since the lands north of H2 (except the Turner property which would be required for either the H1 or H2 alignment) are under the control of the City of Kitchener, the site could be developed with access only to Trillium Drive and no access from Huron Road. Rear-lotted residential development on the south side of H2 would also have no access.

The H1 alignment has its main advantage over H2 in that it permits the retention of existing Huron Road as a local residential street connecting existing Pioneer Park (via Biehn Drive and Black Walnut Drive) to the proposed expansion south of Huron Road and west of Strasburg Creek (east branch). However, H1 presents two major difficulties which result in it being judged inferior to H2:

1) The alignment is adjacent to the rail spur at Trillium Drive and would require changes to the grade on Trillium Drive such that a connection of Trillium Drive to both the H1 alignment and existing Huron Road could not be provided within acceptable design standards. This link from existing Huron Road to H1 would provide the only access west of Doon Village Road from the residential area to Homer Watson Boulevard (via Huron Road). Therefore its elimination is undesirable.
2) Because of the proximity of the H1 alignment to the parallel rail spur alignment, an at-grade intersection at Homer Watson Boulevard could not be maintained if the rail line is constructed. The intersection would have to be temporarily relocated during construction of the underpass for the rail line and permanently converted to a grade separated intersection using the underpass.

In summary, the H2 alignment permits an at-grade intersection at Homer Watson Boulevard as well as connections to both the industrial and residential areas. The H2 alignment would have some negative affect on the existing and proposed residential development on the south side, but would permit the development of industrial uses with a rail spur easement on the north side. The industrial development would not have direct access to this high-volume section of Huron Road.

In conclusion, the H2 alignment is preferable to the H1 alignment.

9.3.3 - E2 and E4 Alternatives

The E4 alternative was included at the request of one of the developer representatives to minimize the negative impacts related to irregularly-shaped development parcels.

The comparison of the two alternatives is dependent on the selected alignment for Strasburg Road. If the N2 or N3 alignments are selected, then the E4 alignment would connect to the existing Huron Road immediately east of Strasburg Road. Existing Huron Road would be converted to a cul-de-sac east of existing Strasburg Road with residential frontage. However, E4 would have a slightly greater impact on the existing residential than would the E2 alignment.
The E2 alignment would leave a triangle-shaped parcel between E4 and existing Huron Road to the west of Strasburg Road. The need to maintain an easement for the gas line along existing Huron Road would place a constraint on practical industrial development in that parcel.

With the E4 alignment, a similar triangle-shaped parcel would remain east of Strasburg Road. However, residential development could be more easily implemented on such a small, irregularly-shaped parcel east of Strasburg Road than could industrial development to the west of Strasburg Road with the E2 alignment.

With the N1 alignment for Strasburg Road, the E4 alignment can be relocated westerly a short distance to reduce the impact on the existing residential development.

In conclusion the E4 is preferred to E2. The evaluation was undertaken for the E4 alignment.

9.4 Evaluation

As outlined in Section 9.1, seven major criteria, each with a number of sub-criteria were selected for purposes of the evaluation of the alternatives. In Section 9.2, a summary of the impact of each alignment on the criteria was compiled.

In this section, each alignment has been measured against each sub-criteria to determine whether it has poor, fair, or good performance. With respect to the major criteria of construction cost and right-of-way requirements, the actual cost, or length and area are indicated. The results of the evaluation are summarized in Table 9.3 in numerical form. It should be noted that no attempt has been made to weight the criteria. All have been judged basically equal in importance. Table 9.4 graphically indicates a summary of the evaluation based on the major criteria groupings.
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<td>R.G.W. Requirements</td>
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<td>- street length</td>
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<tr>
<td>- % of length with R.G.W. greater than 20 m</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
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<td>20%</td>
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**Legend**
- Good = 5
- Fair = 3
- Poor = 1
### Table 9.4(1)

**Evaluation Summary**

<table>
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<tr>
<th>Criteria</th>
<th>Strasburg Road</th>
<th>Alignments</th>
<th>Huron Road</th>
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<tr>
<td></td>
<td>N1- S1</td>
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<td>Impact On Environment</td>
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<td>Archaeology</td>
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<tr>
<td>Impact On Existing Residential</td>
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<td>Proximity</td>
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<td>Noise</td>
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<tr>
<td>Property Requirements</td>
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<tr>
<td>Impact On Potential Development</td>
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<td>Development Staging</td>
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<td>Residential Expansion</td>
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<td>Traffic and Transit Service</td>
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<td>Centrality of alignment</td>
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<td>Horizontal alignment</td>
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</tr>
<tr>
<td>Intersections</td>
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<td>●</td>
<td>○</td>
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<tr>
<td>Cost ($ millions)</td>
<td>4.64</td>
<td>4.79</td>
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<td>R.O.W. Requirements</td>
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<tr>
<td>Length (km)</td>
<td>4.1</td>
<td>4.2</td>
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<tr>
<td>% of length with R.O.W.</td>
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<tr>
<td>greater than 30 m</td>
<td>30%</td>
<td>24%</td>
<td>20%</td>
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<tr>
<td>Rank (2)</td>
<td>3</td>
<td>4</td>
<td>6</td>
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</table>

(1) Table 9.4 is based on the numerical summary in Table 9.3.

- **Good** - corresponds to a score of 75% - 100% of possible
- **Fair** - corresponds to a score of 50% - 75% of possible
- **Poor** - corresponds to a score of 0% - 50% of possible

(2) Rank based on numerical rating in Table 9.3.
9.4.1 - Impact on Environment

For Strasburg Road, all alignments were closely rated, with N3-S2/N2-S2 slightly preferred and N1-S1 slightly worse. All others were equal.

For Huron Road alignments W3-E4, W3-E3, W4-E4 and W4-E3 were judged equal, and slightly better than W5-E4 or W5-E3. W1-E1 and W2-E1 scored significantly lower because of the new creek crossing required near the pond, and less compatibility with the topography.

9.4.2 - Impact on Existing Residential

For Strasburg Road, all alignments had little impact on existing residential development, except at Huron Road. N1-S1 and N5-S1 scored highest with virtually no impact.

For Huron Road, W1-E1 and W3-E4 were significantly better than the other alignments because they avoid all existing development. W5-E3 (existing) had the lowest score.

9.4.3 - Impact on Potential Development

For Strasburg Road three alignments scored highly (N3-S2, N2-S2 and N5-S1) because of compatibility with planned industrial and residential development.

For Huron Road, W5-E4 and W5-E3 were found to be most compatible.

9.4.4 - Traffic and Transit Service

For Strasburg Road, N5-S1 ranked highest, with N1-S1 a close second. For Huron Road, W3-E3 and W3-E4 were first, with W1-E1 and W4-E3 second.
9.4.5 - Geometric Design

For Strasburg Road, N4-S4 and N2-S3 rated highest, with N3-S3 second. For Huron Road most alignments were similar, although W5-E3 was significantly better.

9.4.6 - Cost and R.O.W. Requirements

In the case of Strasburg Road, the estimated construction costs are similar for all alignments, ranging from $4.35 million for N4-S4 to $4.79 million for N2-S2. At $4.5 million, N3-S2 is the next least expensive.

For Huron Road, the cost variance is much greater. The two W4 and two W5 alignments have almost the same cost at the low end of the range between $3.27 million and $3.32 million. The W1, W2, and W3 alignments are significantly more costly, ranging from $3.46 million to $4.68 million.

R.O.W. Requirements

For Strasburg Road, all alignments have comparable lengths. Each alignment was reviewed to determine the approximate length which would require a R.O.W. width in excess of 30 m to accommodate cuts and fills. Although this gives a general indication, area grading to accommodate development may reduce this impact in most areas. Alignments N3-S2 and N5-S1 both require more than 30 m R.O.W. for less than 20% of the total length.

For Huron Road all alignments have comparable lengths, except the W1 and W3 alternatives which are over 30% longer. With respect to R.O.W. requirements, less than 10% of the R.O.W. is greater than 30 m for W3-E3 and W5-E4. The other alignments range from 10% - 20%.
9.5 Recommended Alignments

For the Huron Road alternatives, several alignments had comparable scores (Table 9.3) at the high end of the range. However, the W1 and W3 alternatives require much higher expenditures. Among the lower cost alternatives, alignment W5-E4 was judged the preferred alignment for the following key reasons:

- it utilizes much of the existing road which has generally acceptable horizontal and vertical alignments
- it is most compatible with existing property boundaries and therefore facilitates staged development
- it utilizes the existing crossing of the main branch of the Strasburg Creek
- it avoids direct impact on the group of residential properties which are expected to remain between Strasburg Road and Trillium Drive

For the Strasburg Road alternatives, most alignments had similar overall ratings with similar costs. However, alignment N3-S2 was judged marginally better for the following principal reasons:

- south of Huron Road, the alignment avoids a significant woodlot.
- the Strasburg-Huron intersection is located so that a reasonable angle of intersection and grades can be provided. The alternative S1 intersection would require 4% grades on both roads
- to the north of Huron Road, the alignment utilizes much of existing Strasburg Road, thereby facilitating staged development, and the alignment incorporates the alignment planning previously undertaken south of Blem's Road
although the alignment is more curvilinear and less direct than N1-S1, it exceeds the 70 km/h design standards while satisfying several planning and development considerations.

Conclusions

The recommended alignments are:

N3-S2 for Strasburg Road

W5-E4-H2 for Huron Road
10. **RECOMMENDED ROUTE**

The plan and profile drawings of the recommended routes are indicated on Plates 1 to 9 at 1:200 scale.
APPENDIX A

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LIST OF AGENCIES CONTACTED

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APPENDIX B

MAP OF
ALTERNATIVE ROAD AND RAIL ALIGNMENTS