Ottawa

DILLON CONSULTING

Terry Fox Drive Extension

March Road to Kanata Avenue

2013 Canadian Consulting Engineering Awards

Dillon Consulting Limited

Project title / Data Sheet

Member Submitting:	Dillon Consulting Limited
Contact Person:	Michael Flainek, M.Eng., P.Eng.
Contact Phone Number:	613.745.2213, ext. 3051
Contact E-mail:	mflainek@dillon.ca
Project Title:	Terry Fox Drive Extension
Component of Project Submitted:	Design and Construction
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Location of Project:	Ottawa, Ontario
Project Owner:	City of Ottawa Steven Stoddard, P.Eng., Project Manager Infrastructure Services Branch
Project Client:	Same as Project Owner

Names of Other Consultants and their Contribution:

- Golder Associates – Geotechnical Engineering, Archaeological
- Stantec – Surveying
- CRM Group – Archaeological
- AECOM – Rail Crossing Design

Names of Contractors and their Contribution:

- Karson Konstruction – General Contractor
- Karson Asphalt Paving – Asphalt
- Karson Aggregates – Granulars
- Thomas Cavanagh Construction Limited - Sewers
- Total Fence – Wildlife Fence
- Davis Landscape & Design Inc. - Reforestation

Name of Agencies/Companies Involved:

- Infrastructure Canada
- Fisheries and Oceans Canada
- Environment Canada
- Algonquins of Ontario
- Mississippi Valley Conservation
- Ministry of the Environment
- Ministry of Natural Resources
- Ministry of Tourism, Culture and Sport
- Hydro One Networks Inc.
- Hydro Ottawa
- Rail Term

Project Owner: City of Ottawa

Steven Stoddard, P.Eng.,
Senior Project Manager
Infrastructure Services
100 Constellation Crescent
Ottawa, Ontario K2G 6J8
Tel.: 613.580.2424
Fax: 613.580.2587
Steven.Stoddard@ottawa.ca

Contractors:

Karson Konstruction
3725 Carp Road, Carp, ON
K0A 1L0
Tel.: 613.839.2816
Fax: 613.839.2403
dmohr@karson.ca
Contact: Dave Mohr, Construction Manager

Karson Asphalt Paving (KAP)
Spratt Asphalt Plant, 2300 Carp Road,
Carp, ON K0A 1L0
Tel.: 613.836.3216
ppellietier@karson.ca
Contact: Peter Pellietier , KAP Manager

Karson aggregates
3725 Carp Road, Carp, ON K0A 1L0
Tel.: 613.839.2816 Fax. 613.839.2403
eschulz@karson.ca
Contact: Erwin Schulz, Vice President

Thomas Cavanagh Construction Limited
909 Cavanagh Rd., Ashton, ON K0A 1B0
Tel.: 613.257.2918 Fax: 613.253.0071
mail@thomascavanagh.ca
Contact: Tom Cavanagh

Total Fence
1740 Queensdale Avenue, Ottawa, ON K1T 1J6
Tel.: 613.733.9303 Fax: 613.733.7033
http://www.totalfence.ca

Davis Landscape & Design Inc.
3000 Rushmore Road, Richmond, ON K0A 2Z0
Tel.: 613.838.8744 Fax: 613.838.5779
jim@davislandscaping.com
Contact: Jim Holdcroft

Additional Consultants:

Golder Associates Ltd.
32 Steacie Drive, Kanata, Ontario K2K 2A9
Tel.: 613.592.9600 Fax: 613.592.9601
Bruce_Goddard@golder.com
Contact: Bruce Goddard, Geotechnical Engineer

Stantec Geomatics Ltd
1505 Laperrier Avenue, Ottawa, Ontario K1Z 7T1
Tel.: 613.722.4420 Fax: 613.722.2799
travis.hartwick@stantec.com
Contact: Travis Hartwick, Managing Principal

Cultural resources management group limited
6040 Almon St, Halifax, NS B3K 1T8
Tel.: 902.453.4972 Fax: 902.446.3066
bstewart@crmgroup.ns.ca
Contact: Bruce Stewart, Senior Consultant

AECOM
5080 Commerce Boulevard, Mississauga, ON L4W 4P2
Tel.: 905.238.0007 Fax: 905.238.0038 www.aecom.com
kathy.escandon@aecom.com
Contact: Kathy Escandon, Technical Services Engineering

DILLON CONSULTING

235 Yorkland Blvd.
Suite 800
Toronto, Ontario
Canada
M2J 4Y8
Telephone
(416) 229-4646
Fax
(416) 229-4692

Executive Summary

The City of Ottawa had completed the two ends of Terry Fox Drive, but the biggest challenge was the route through the virgin forests of the South March Highlands. Dillon blended the science of road ecology with environmental planning and transportation engineering to build a four-lane roadway that was smooth, interesting and efficient, while minimizing the impacts to wildlife, wetlands, forest and floodplains, garnering praise and appreciation from the community.

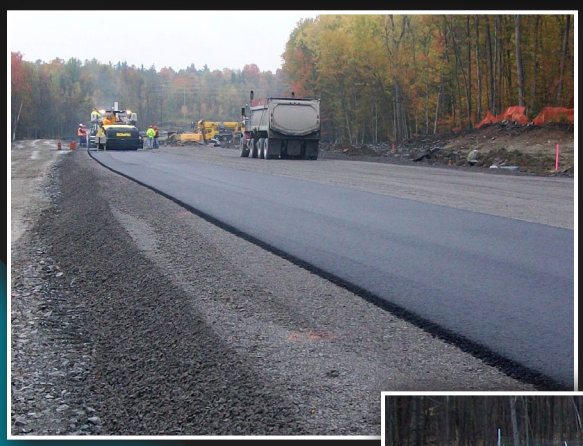
Innovation

Dillon's hydraulic engineer was able to rationalize the location of the roadbed within the Carp River floodplain, a very flat river known for extensive flooding that damages property and restricts growth. A significant challenge was met by incremental modeling of the offset cut on the opposite side of the river, allowing for flood protection within the road infrastructure, without sacrificing public safety. An eight ha constructed wetland was built in the reshaped floodplain, to offset wetland losses.

The road traversed through old growth forests, significant wetlands, rocky ridges and recognized wildlife corridors as well as the floodplain, so reducing the environmental impacts were a challenge and the potential cumulative impacts of the project were significant. Dillon was able to narrow the footprint of the roadbed by reducing the road height, accepting steeper gradients through the ridges to cut less rock and eliminating four stormwater management ponds, replaced with advanced oil-grit separators within the roadway, saving one hectare of wetland habitats.

Minimizing the long-term residual impacts and improving sustainability, the roadbed was built to the four-lane ultimate, yet just two lanes were surfaced, paved and put into service. Intersections, culverts, fill slopes, pole lines and an at-grade level rail crossing were all built to the four-lane objective, which will save Ottawa time, money and manages the risk of additional approvals when all four lanes are needed to meet future traffic growth expectations. This innovation provided space for planned water, sanitary, storm and utility servicing to meet the future growth needs, and in the future there will be no need to close the road while these services are installed.

The deep clay soils identified in the Carp River floodplain required a significant period of pre-loading to establish solid foundations for the roadbed and embedded structures. Conventional pre-loading called for five metre depths of granular materials, over two areas of over 300 metres each. Due to the tight schedule, Dillon and Golder Associates' called for the installation of over one hundred deeply drilled wick-drains and along with the granular surcharge material aggressively forced water from the ground. Experts from Alberta were mobilized to Ottawa to install the wick drains. With this technology, the pre-loading period was shortened from 18 months to five. The wick drain technology, not only saved time for the Contractor, but also saved the City considerable cost, effort and materials, so they were able to meet the stimulus funding time constraints.

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COMPLEXITY

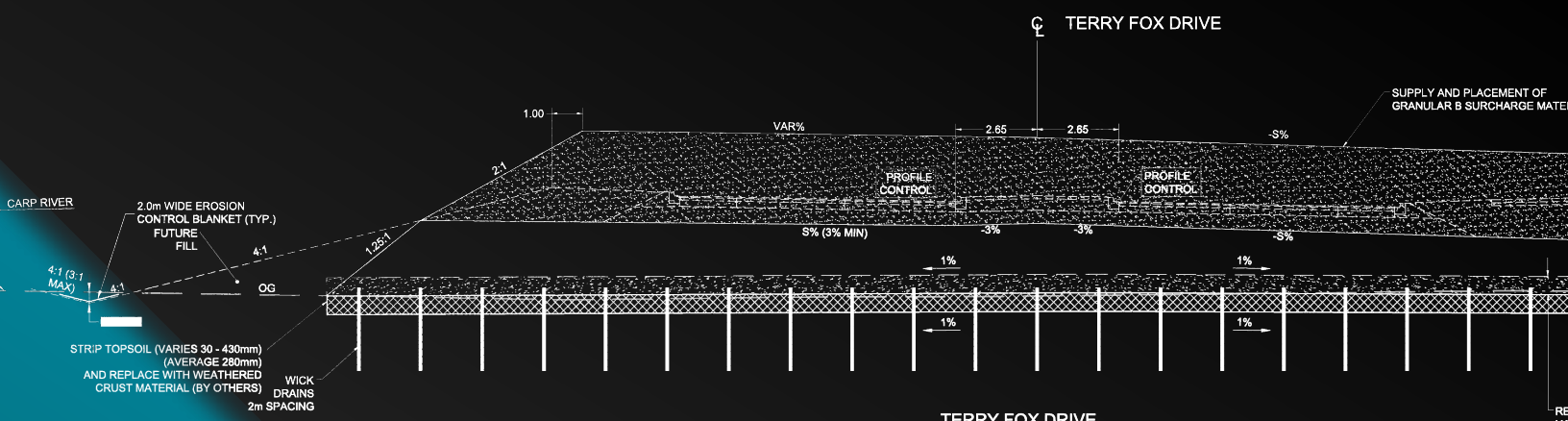
The final piece of Terry Fox Drive, was the most technically complex, as the planned alignment climbed from the flat clay floodplains of the Carp River, into the gneiss ridges, forests and marsh wetlands of the South March Highlands, a well-recognized area of natural beauty, biodiversity and untouched land. Significant Wetlands, five Species at Risk, and old-growth forests were to be bisected by a long planned road that would define the future urban boundaries of the City. The new connection of Terry Fox Drive had to respect the natural diversity of the South March Highlands and the needs of its' unique wildlife while meeting the transportation needs of the community.

To provide passage for wildlife, Dillon designed a series of six hydraulic and four dry terrestrial culverts, an integrated system of walls, skylights and special-built fencing to avoid road strikes, the single greatest killer of turtles and small mammals. Recognizing that such an ambitious undertaking was unique, Dillon implemented the radical approach of integrating animal needs into a roadway design from first principles. Follow up research studies are proving the validity of the wildlife culverts, already demonstrating that they work! In 2012, Dillon Road Ecologist made over 2,300 observations of 24 wildlife species moving through the ten culverts. Ten infrared 'trail cameras' are mounted inside the culverts, capturing high definition images of frogs, snakes, fishers, porcupine, beavers and Blanding's turtle. Dillon has proven that given the right configuration and little choice, many species of wildlife will use small box culverts, and that the ecological impacts of roads need not be significant with innovative planning and engineering.

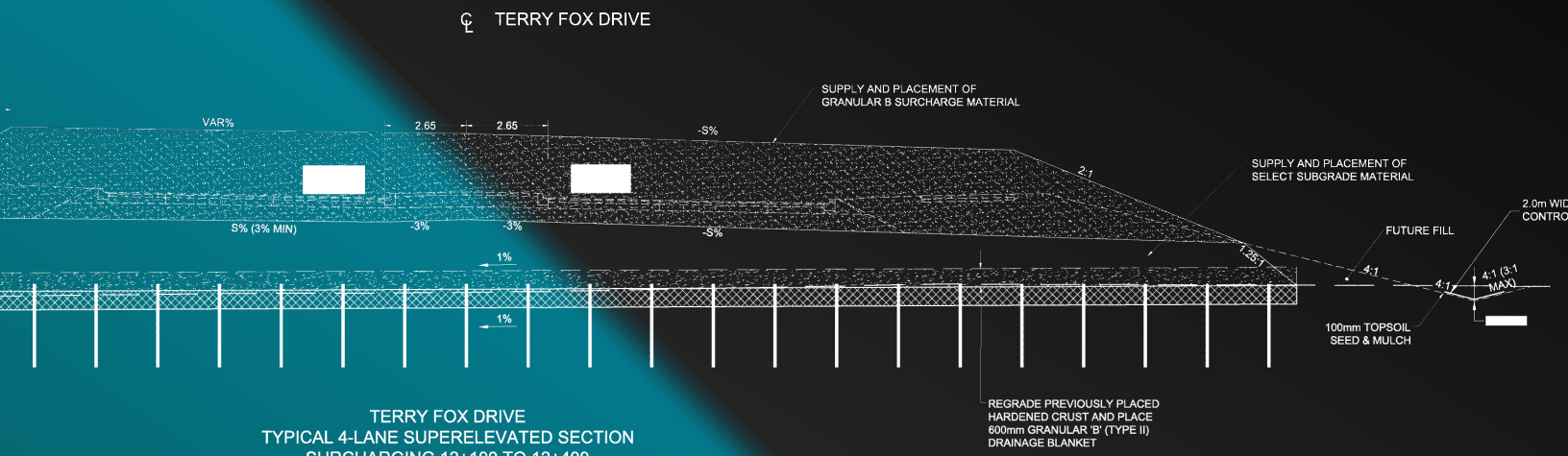
SOCIAL AND ECONOMIC BENEFITS

With the completion of the $44 M Terry Fox Drive, that created 550 person-years of employment, future generations of people and wildlife can both now depend on the roadway to provide safe passage for where they need to go to complete their life ambitions. Despite the terrain challenges, the Contractors, Dillon, sub-consultants, and City staff were able to complete the work to open the road to traffic by July 21, 2011, just 30 months after receiving the assignment, benefitting the community greatly. The road was opened to praise from City Councilor Marianne Wilkinson who said "It's a beautiful road that goes through some very pretty area". Today, the public enjoys the road, either driving, walking or cycling over the ridges with a spectacular view of the Gatineau Hills laid out before them.

After 16 years of planning and design, the final 5.4 kilometre roadway completes the vision of Terry Fox Drive as an arterial roadway which improves the safety of commuter's access to and from Highway 417 and adjacent development, and improves the level of service over the old roadway systems that it replaced. The narrow, winding Goulbourn Forced Road can now be rebuilt and improved without inhibiting the daily productivity of commuters. The design and construction of the roadway is an engineering standout for the complex innovative solutions implemented towards reducing the impact on the terrain and wildlife through which it travels. Not only is it a "beautiful road", but by building in practical, inexpensive wildlife passages it is contributing to reducing the road mortalities of Blanding's turtle, an important endangered species.



TERRY FOX DRIVE
TYPICAL 4-LANE SUPERELEVATED SECTION
SURCHARGING 13+225 TO 13+475



TERRY FOX DRIVE
TYPICAL 4-LANE SUPERELEVATED SECTION
SURCHARGING 12+100 TO 12+400

ENVIRONMENTAL IMPACT

As a potential barrier in an area of virgin forest, a road was needed that would allow for the free movement of animals, back and forth between woodlots, streams and wetlands. Five Species at Risk were found, the most significant being a population of endangered Blanding's turtle, but smaller mammals, amphibians and other reptiles were also being harmed by local roads, negatively affecting their populations. Dillon thought we could do better as the responsible stewards of the land, and we have done better.

Legislation, regulators and the public all wanted a sustainable solution where the road wouldn't impact these valued wildlife populations, so Dillon developed the integrated Wildlife Guide System of culverts, complete with modified catch-basins as skylights, amour stone barrier walls, and small mesh fencing, designed to guide the animals into the culverts and safely through to the other side of the roadway. It's been a great success! While Blanding's turtles continue to be killed on nearby roads, after two years of monitoring, there have been no mortalities on this roadway, and the overall wildlife data can now demonstrate statistically significant decreased levels of road mortalities.

Beyond the plants and animals, impacts to their critical physical habitats were reduced, new habitats constructed and the long term ramifications of global climate change were considered. The 10 ha of cleared forest were partially offset by reforesting two ha of the Carp River floodplain and eight ha of constructed wetlands. Over time, these new habitats will become colonized with successive populations of flora and fauna, while sequestering atmospheric Carbon.

MEETING CLIENT'S NEEDS

The objective was complex and the timing was tight. The task was to design and build a new 5.4 kilometre section of four-lane modified urban cross-sectional roadway with signalized intersections, including a two lane portion of the ultimate four lane cross-section through virgin forest, connecting two arterial roadways, which replaced an aging two-lane roadway that twists and dips through the wetlands of northern Kanata. Meeting that objective for the client was indeed challenging and required that Dillon's engineers and ecologists work closely on a design solution that avoided the best parts of the South March Highlands Conservation Forest and Carp River floodplains.

Dillon achieved this by reducing the ultimate footprint for part of the roadway by building a four-lane base with a two-lane surface, sufficient to accommodate traffic for the next ten years. We eliminated costly stormwater management ponds planned to go in the wetlands, choosing instead to use oil-grit separator technology built within the roadbed footprint. With an alignment that had been pushed into the Carp River floodplain, Dillon found a multi-purpose solution by completing an offsetting cut of similar volume to the road embankment, and then restored the cut by building an eight ha swamp wetland, suitable for turtles and amphibians, to compensate for wetland losses elsewhere on the project. Altering the road vertical profile, managing the ecosystem and building out the ultimate footprint, allowed the City to manage the risk of future expansions. For Dillon's client at the City, Project Manager Steven Stoddard, P.Eng., this was a significant, sustainable benefit.

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