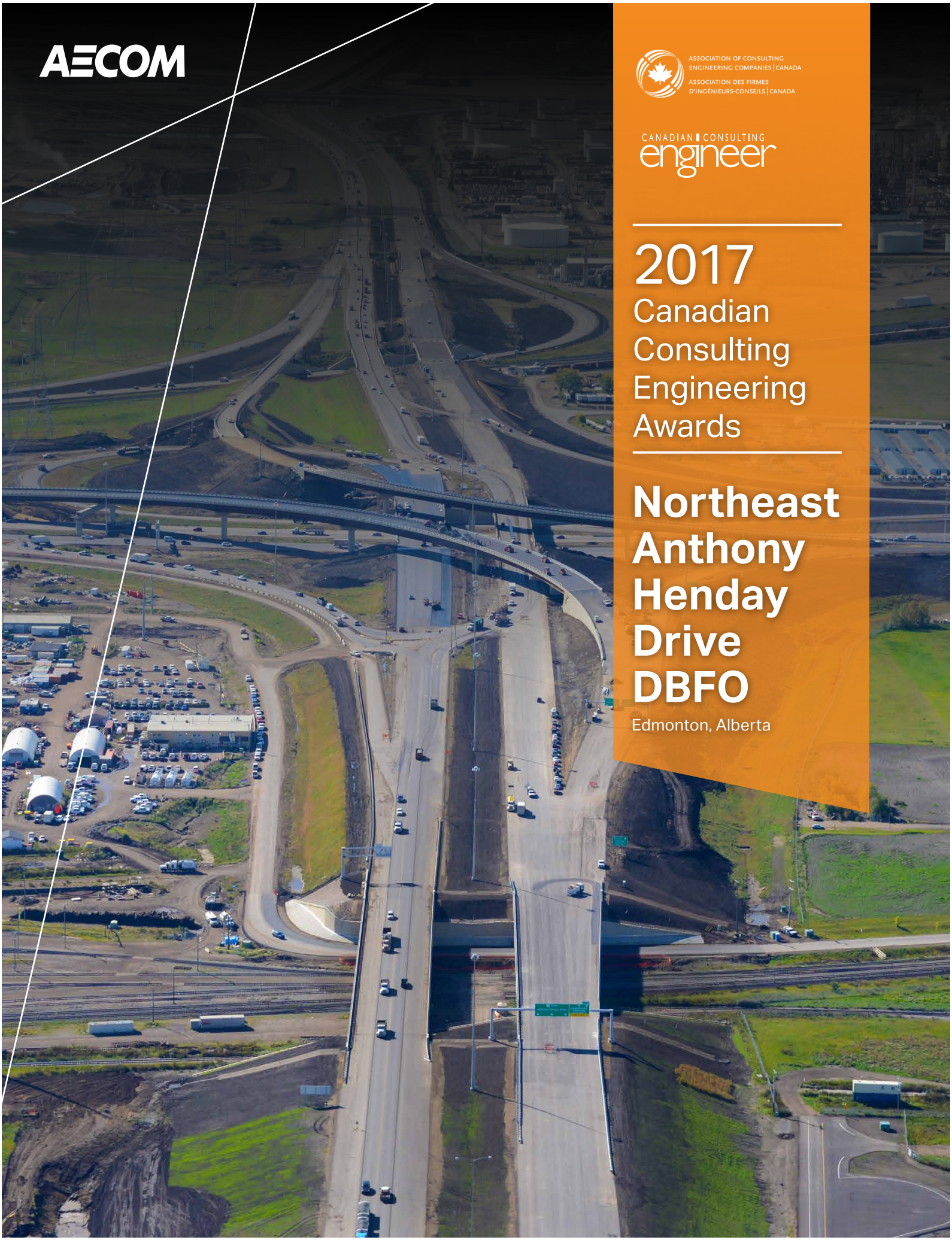

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Northeast Anthony Henday Drive DBFO

Edmonton, Alberta

Four years of detours, traffic snarls, varying speed limits, and stop-and-start driving has come to an end for drivers in Edmonton, Alberta, Canada, with the completion of the northeast stretch of Anthony Henday Drive.

With an economical design, integrated management approach and close coordination with the construction group, AECOM reduced time, costs and associated risks to deliver a successful project.

Summary

The Northeast Anthony Henday Drive is a $1.8-billion P3 project involving 27 km of new 8-lane freeway with 46 bridge structures to complete Edmonton's ring road. Construction of bridges over old mines, numerous major pipeline relocations, the North Saskatchewan River crossing, replacement of interchange and rail bridges while maintaining service were challenges faced by Capital City Link and contractor FDAL.

At award, this was the largest transportation contract ever signed by the Alberta Government.

The roadway system is an integral component of Edmonton's ring road as well as the province's overall transportation network.

Innovation

As one of the busiest roads in Western Canada the Anthony Henday Drive roads encircling the City of Edmonton has been created with the interests of stakeholders in mind, such as the Alberta Government, the Federal Department of National Defense, and the numerous daily commuters.

A multi-discipline design approach was taken to reduce bridge spans through the use of mechanically stabilized earth (MSE) walls, which allowed use of integral abutment designs that eliminated the bridge bearings and expansion joints, and reduced superstructure depths. Geotechnical designers developed options appropriate for soil conditions at each site, and the MSE walls allowed interchange profiles to be optimized, reducing fill heights and eliminating encroachment outside the road right-of-way or maintaining separation from utility right-of-ways.

A unique combination of retaining walls ranging from shallow footings to pile supported walls along with down slope stabilization piles were used for the North Saskatchewan River bridges to maintain a steeper headslope, reduce bridge length and excavation while accommodating pedestrians and wildlife on separate pathways.

Bridge foundations over an old mine site where there were voids at variable depths had to be designed to accommodate potential collapse of voids. Designs varied from raft foundations to deep piles with casings that penetrated through the mined areas into the bedrock below.

The pavement engineering utilized a special modeling program to evaluate pavement design options and resulted in an innovative use of existing materials, reducing the use of non-renewable aggregate resources and lowering greenhouse gas emissions without sacrificing pavement quality and performance. Pavement design was optimized with the performance models developed specifically for the project, using historical performance data from adjacent highways. Materials were selected to eliminate the potential for low temperature induced cracking, reducing future maintenance, rehabilitation activities, and delays to the traveling public.

Preserving our environment: safe wildlife passage was maintained and integrated along the North Saskatchewan River corridor.

Replacement of impacted wetlands was a requirement of the Provincial Water Act, however, the Federal Department of National Defense had a designated Bird Hazard Zone over portions of the project that prohibited creation of habitat for waterfowl. Environmental, drainage and landscape designers developed designs with limited open water, longer narrow channels, and plantings to deter birds that could be potential hazards for aircraft bird strikes.

To promote barrier-free design and avoid future costs, ditches, back slopes and appurtenances were constructed and installed in permanent locations. The pavement structure was limited to requirements called for at this stage.

Complexity

Multi-discipline Complex Project

The Northeast Anthony Henday Drive project consisted of 27 km of 8-lane divided freeway with 189 lane km of roadway, 9 service interchanges, 7 grade separations, 46 bridge structures with 12 bridges constructed while existing roadways remained operational,103 overhead sign structures, and 70 impacted wetlands.

The design team who worked for the construction group Flatiron-Dragados-Aecon-LaFarge JV (FDAL) was constantly challenged to be innovative in achieving the most cost-effective designs, while meeting technical requirements and an aggressive project schedule.

Aggressive Timeline

To advance construction, design and approval procurement commenced upon notification of Preferred Proponent. A design deliverable management program and fully-integrated design and construction schedule was developed and monitored weekly, as design and construction were executed concurrently. Planning and design of the bridge structures accommodated an aggressive construction schedule, with structures designed to allow earthworks and bridges to be built independently.

Utility Coordination

Over 500 utilities, including many major pipelines, needed protection or relocation which required close coordination between design disciplines, contractor and the many utility companies. An extensive hydrovac program was undertaken and designs were modified to avoid conflicts to the extent possible.

Partnership among client, design, management and construction interests

Design leads, construction management, operation and maintenance representatives and concession managers were co-located on site. Designers and the contractor discussed design challenges daily to produce constructible, technically-compliant designs. Formal contractor reviews were completed on all design packages at 4 stages during the design development, and weekly meetings were held with Alberta Transportation to review submittal packages.

Looking South from CN mainline crossing Yellowhead Tr.

At North Saskatchwan River looking east at Yellowhead Tr.

Social and/or Economic Benefits

The Northeast Anthony Henday freeway forms the final link on a heavily travelled commuter and truck bypass route that carries more than 105,000 vehicles per day and has significantly improved commuting around Edmonton and the movement of goods and services around the province.

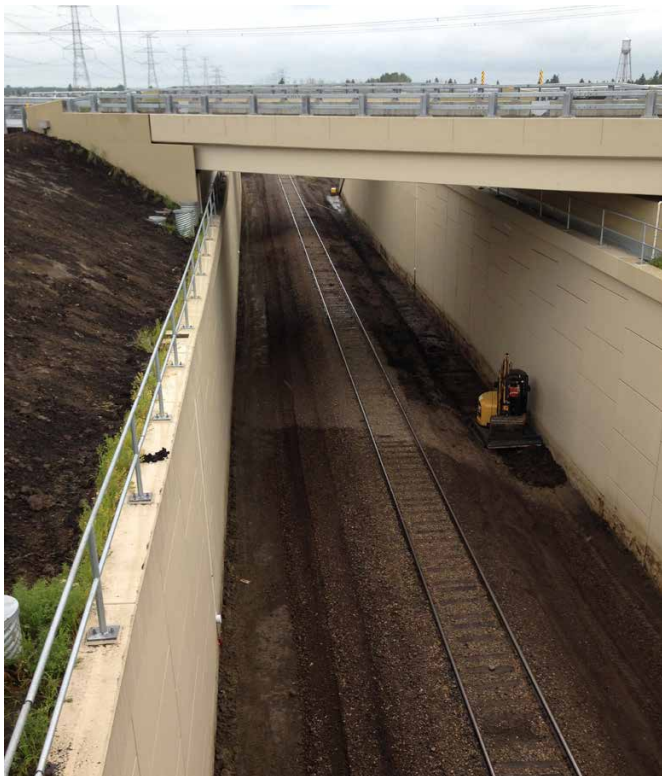
Reduced congestion equates to reduced greenhouse gas emissions due to reduced idling time.

NEAHD increases development potential in adjacent areas, through better access to the rest of the city. Surrounding communities will see an increase in property value, resulting from shorter commute times and easier access. Traffic will have an alternative to the signalized Yellowhead Trail corridor through Edmonton and free flow roadways have fewer collisions resulting in safer, more efficient highways.

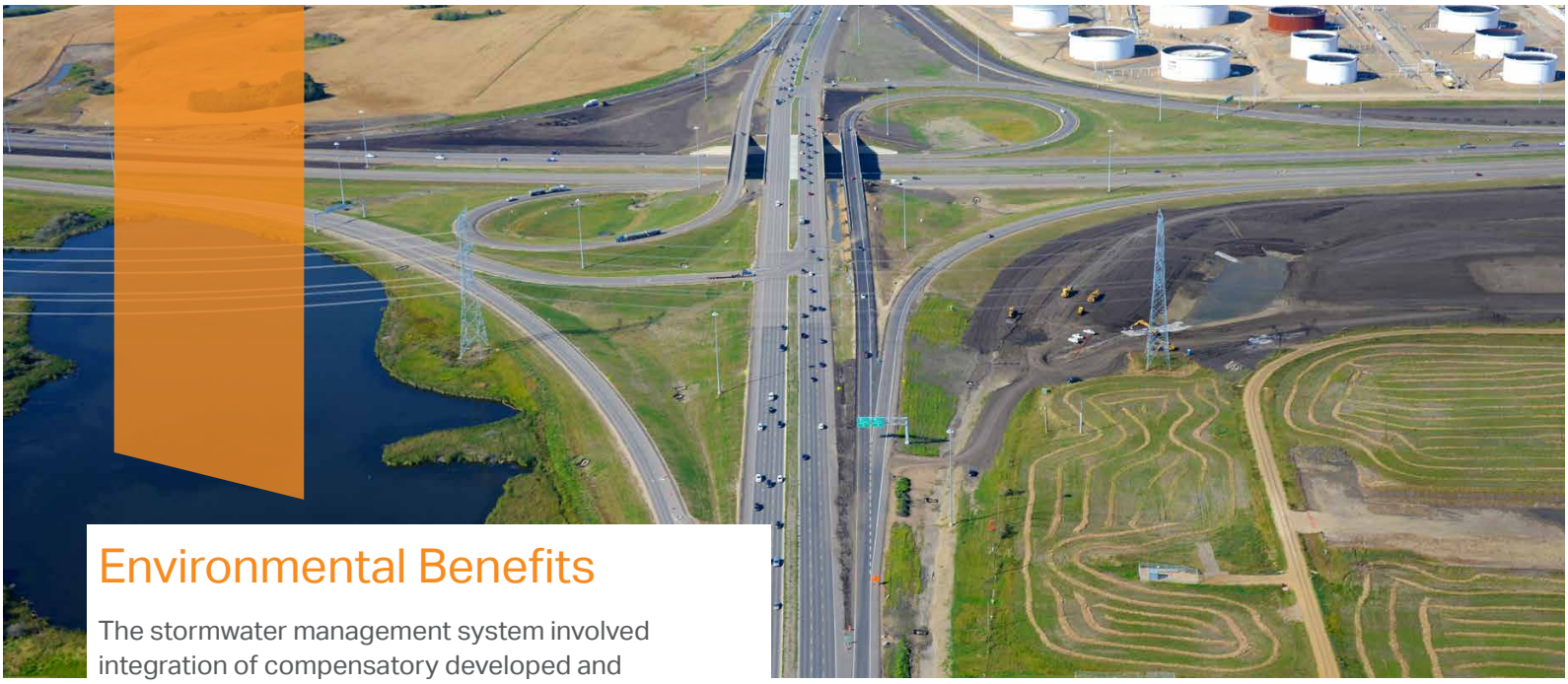
Advancement of knowledge

Technical knowledge was advanced by merging engineering and construction knowledge and resulted in development of economical designs. Optimization of bridge areas, construction of bridge foundations over old mines, pavement designs and staging of roadway pavements, and working together with Environmental Regulators resulted in a much better understanding of bridge, roadway, drainage and utility constructability.

The freeway is improving commuting around Edmonton, and the movement of goods and services around the province.



CN Rail crossing adjacent to 18th Street.



Environmental Benefits

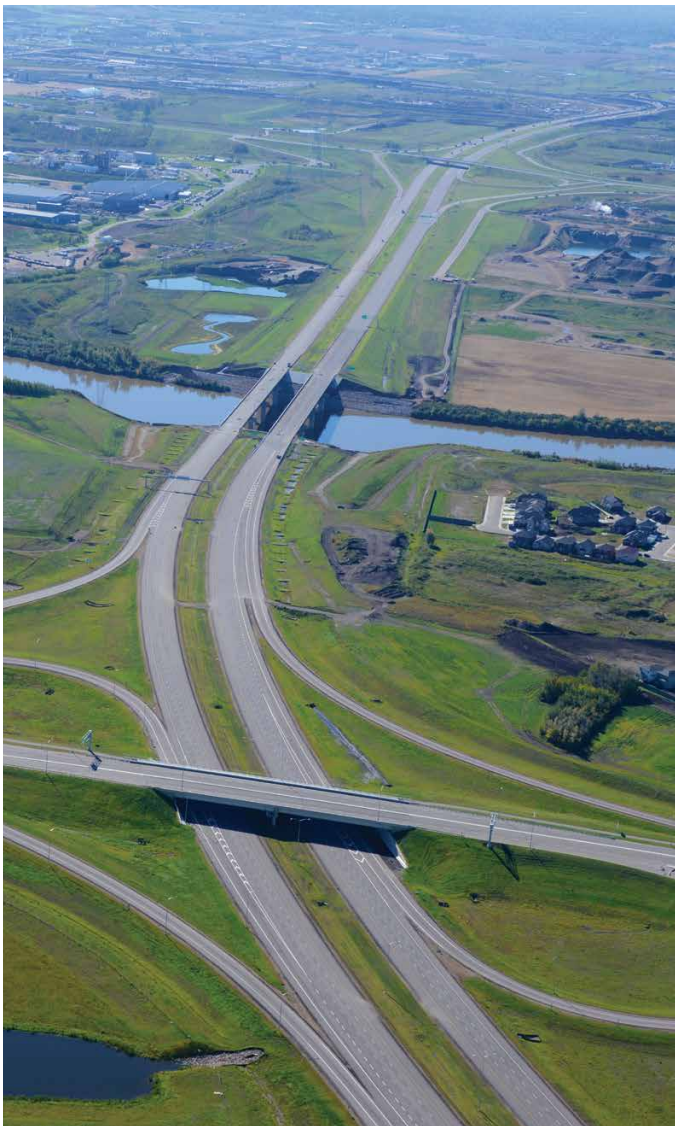
The stormwater management system involved integration of compensatory developed and constructed wetlands with stormwater management objectives and features.

There were 24 hectares of existing wetlands that could not be avoided by the roadway and ditching geometries. In accordance with the provincial Wetland Management in the Settled Area of Alberta, these needed to be compensated for at a 3 to 1 ratio, resulting in approximately 73 hectares of wetland habitat compensation. This was achieved through the construction of 12 naturalized stormwater management facilities that created 50 ha of newly constructed wetland habitat. The remainder of required compensation was achieved through a financial contribution to Ducks Unlimited Canada's Cooking Lake Initiative.

A detailed study of the Sturgeon fish species in the area of the North Saskatchewan River bridges was conducted, and fish habitat compensation was developed accordingly in the North Saskatchewan River.

AECOM provided hydrological and hydraulic modeling and environmental design for the naturalized stormwater management facilities that function as constructed wetlands, and are designed to achieve 85% removal of particle sizes greater than or equal to 75 microns.

Previously installed culverts were well above the stream bed of creeks and were largely impassible for fish species. New drainage structures on several natural creeks resulted in improvements to fish habitat, as the new structures were counter sunk to facilitate habitat connectivity. Storm ponds adjacent to the community of Sherwood Park were oversized and used to correct pre-existing stormwater storage shortfalls.



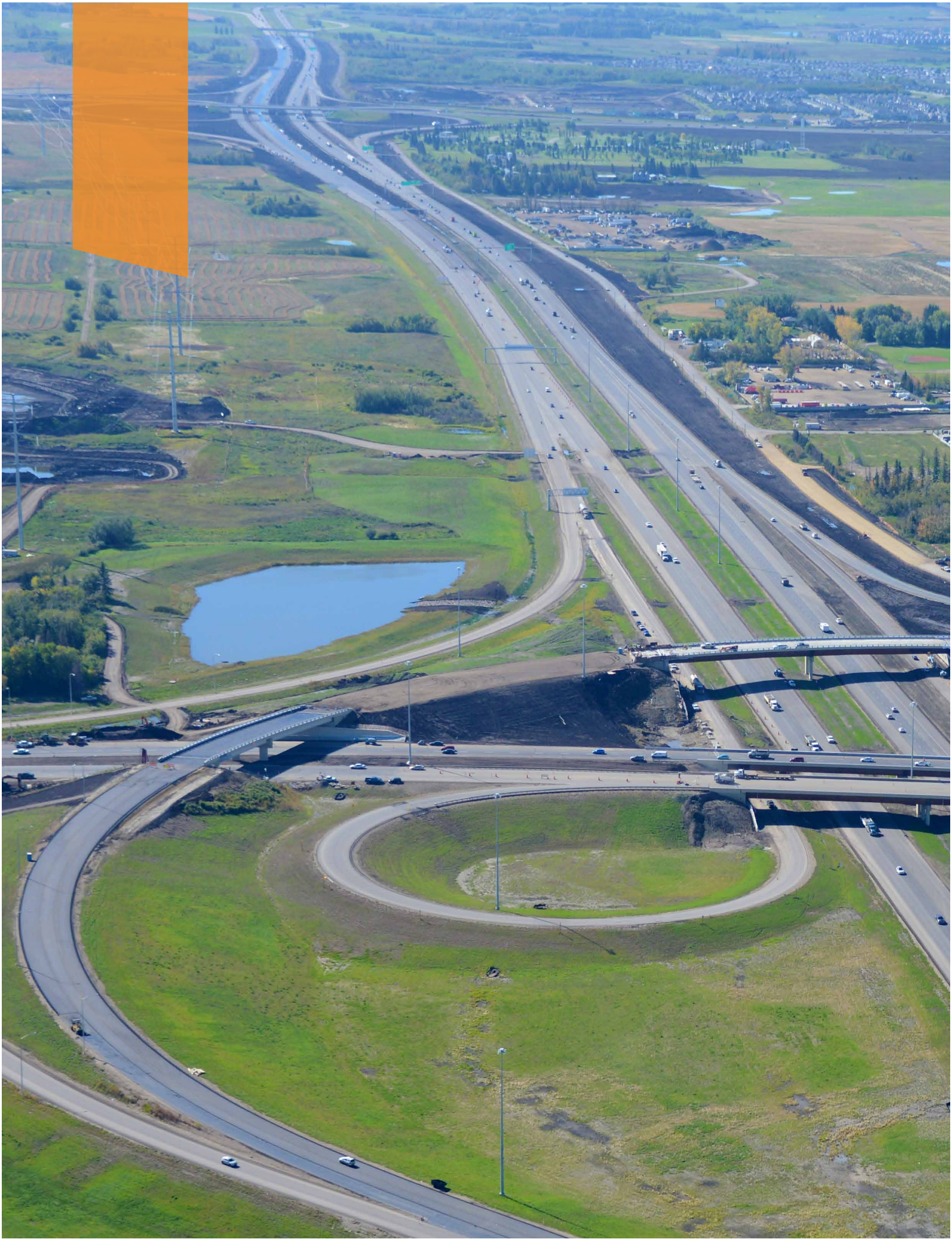
153 Avenue Interchange looking South to river crossing.

Meeting Client's Needs

The Alberta Government needed the final link of the ring road to be constructed within a set time and with price certainty. The Northeast Anthony Henday Project was delivered on time and on budget under a lump sum contract, with a defined 30-year operations and maintenance component that warrantees the project. The success of the P3 model paired with the concurrent design build concept of this project provided the Province of Alberta and Alberta Transportation with a unique way to fund and quickly complete future large-scale projects.

Risk reduction is a major objective on complex P3 projects. Under a P3 model, the infrastructure is maintained by the Concession for the 30-year concession period. As such, they have a responsibility to ensure the infrastructure will be in good standing throughout the maintenance period and at the time of hand back. Within such a scenario, the Concession has a vested interest to ensure the products are of a high quality to minimize its overall maintenance costs, reducing long term risks attributed to Alberta in a conventional bid-build.

Opportunity for the Alberta Industry lies in recognizing the combined experiences of engineering consultants and contractors can be injected into Department processes to suit the P3 delivery model which requires construction to proceed ahead of all design work being completed. Northeast Anthony Henday Drive not only acts as a successful case study for transportation projects, but the project management and funding partnerships formed can also be applied to other construction-based traditional design bid build projects.



The roadway system is an integral component of Edmonton's ring road as well as the province's overall transportation network.

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About AECOM

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