TSB NEWSLETTER

TECHNICAL STANDARDS BRANCH VOLUME 5, ISSUE 2, DEC. 2006

Welcome to the Alberta Infrastructure and Transportation Technical Standards Branch (TSB) Newsletter.

One challenge everyone in this department is always facing….how do we keep everyone else in the loop about what is important and about what is going on….without being guilty of information overload and circulating unwanted information.

TSB uses Regional "tours", Tech Talks, conferences, seminars, training courses, one on one contacts, and email to inform you about important new developments: however, these vehicles are only part of the technology transfer / learning / information exchange process.

This newsletter is another vehicle to keep you informed. It is published whenever there are enough articles of interest. Hopefully it fills in some of the gaps in the information exchange process. The articles in this edition are technical in nature (but not "very" technical), current, and hopefully of sufficient length to keep you in the know with respect to trial projects, new materials, and advances in planning, design, construction and maintenance techniques.

Each article refers you to either the location of a detailed report and/or to the names of "key people" should you need additional information.

The material in the newsletter is not designed to and should not replace the more detailed reports produced at the end of trial projects, materials testing, and research efforts.

TSB hopes that this newsletter keeps you up to speed on key current events.

So enjoy this newsletter and
enjoy your oncoming holiday season!

Wishing you success and all of the best for 2007.

Allan Kwan
Editor-In-Chief

Nur Versi *Roger Skirrow* *Ron Stoski*
Associate Editors

IN THIS ISSUE

A Star is Born

Bruce Blue
Surfacing and Aggregates

Many years ago, 1954 to be precise, the department quietly purchased several parcels of land (Figure 1) in the northwest corner of Calgary, dubbed Spy Hills, for future development of a research park. During a needs assessment in 2000, property administrators confirmed that not only was Calgary developing in different directions, but that the current trends limited the potential redevelopment of the lands for another 50 years. Since the City no longer required a research park, the lands were declared surplus.

Development Area SEC 28 33-25-2-5

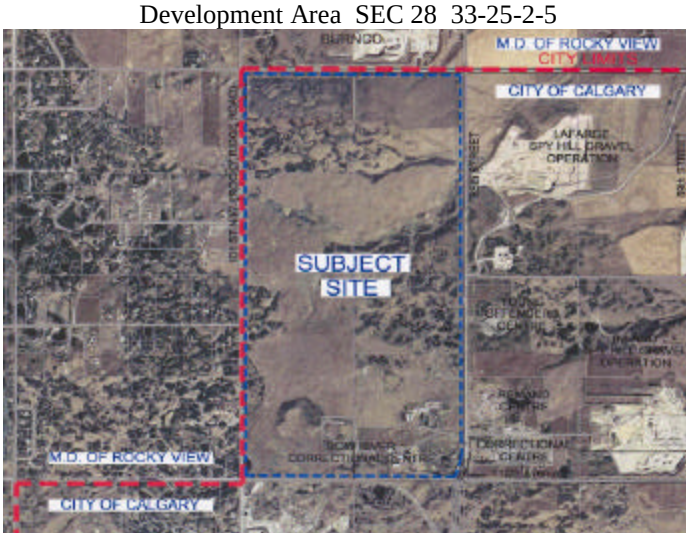

Figure 1

During the circulation process for potential saleable lands, Surface Engineering and Aggregates believed that Spy Hills contained gravel because there were existing pits to the east and north. We were also aware of a recent aggregate depletion model for the city and surrounding area that indicated the general area contained a lot of gravel, but much of it was already sterilized by urban and county residential development and the existing permitted pits could be depleted in ten years. At about the same time, the Alberta Sand and Gravel Association wrote the minister about not sterilizing potentially gravel-bearing lands.

Our records indicated that most of our local sources were nearing depletion and that we would need to secure new supplies or be prepared to pay higher prices for local gravel. Knowing that gravel is a non-renewable resource, we decided to determine if a case could be made to use whatever gravel could be found, prior to the sale of the lands. So we tested the Spy Hills deposit in 2001 and discovered it contained 85 million tonnes of aggregate. As it turns out, this is the single largest aggregate source in operation in the province covering a section and a half of land. That's enough gravel to twin one out of every four highways in Alberta, or supply the local Calgary market for 9 years, based on current consumption rates. Or, it could be used to maintain 1100 km of highways in the surrounding area for the next 50 years.

In 2002, a consultant was hired to complete various studies and engage the public and local authorities, and current lease holders, University of Calgary, to get their buy–in on the project. That process took over 3 years and cost the department about $1 million. During this time, the department looked at the best method for managing and operating the pit. After presenting a business case to use the gravel we need and protecting as much as we can for private use, and considering the long-term development within the City, approval was given to move forward with opening the pit.

The department developed a project agreement, whereby the proponent was allowed to sell aggregate to third parties, thus generating revenue to the department all the while ensuring aggregates were stripped and available for use by the department, free of charge. To ensure the timely use of the aggregate and accommodate the eventual redevelopment of the lands, minimum extraction quantities were established. All costs to develop the pit were to be carried by the successful bidder.

The contract was awarded in 2005 to BLV, a joint venture of Burnco, Lafarge, and Volker Stevin. The pit opened for business in the spring of 2006 without a hitch. Berms are in place, the pit is over 20 metres deep, and gravel removal for department and private projects are ongoing.

To avoid confusion with other local pits with the same name, the pit formerly known as the Spy Hills source was renamed as the Stoney Trail Aggregate Resource … and so a **STAR** was born!

To view the studies and details of pit development refer to the following department web site:
http://www.infratrans.gov.ab.ca/INFTRA_Content/docType182/Production/spyhill.htm

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Hydrotechnical Design Guidelines For Stream Crossings

Des Williamson
Bridge Engineering

Sizing of bridge-size structures over streams involves key hydrotechnical design parameters, such as flow depth (Y), mean flow velocity (V), and discharge (Q). Prior to 1970, these parameters were usually developed based on historic flood observations and the nature of the channel being crossed. Between about 1970 and 2000, as published runoff data-sets became larger and analytical tools became more powerful, statistical techniques became the main approach to developing these parameters. Hydrologic modeling has been found unsuitable for natural basins due to the complex physical processes and limited availability of required data.

The statistical approach involves assignment of probabilities to flows at gauging stations and transferring these flows to the crossing site based on a ratio of drainage areas. Although these techniques became prevalent, they could often result in a wide range of parameters that were often not consistent with the physical nature of the basin and channel being crossed. The main problem with this approach is that the technique is a mathematical process that does not consider the available physical information. The result was that many proposed structures were either much larger or smaller than the streams they were crossing.

In an effort to improve the consistency of the design parameters, a new approach was sought that accounted for the physics of the basin and channel and considered all of the available historical high-water data. After a few years of development and a few interim steps, the department's current Hydrotechnical Design Guidelines were published in March 2002. These guidelines incorporate three components – channel capacity, historic observations, and basin runoff potential. For any given site, one of these three components may govern.

The channel capacity technique involves assigning a flow depth to typical channel geometry that exceeds the bank height by a specified amount, to ensure that over-bank storage is activated. Analysis of the largest observed historic events at many of the larger stream crossings in the AIT inventory indicated that most of the highest events were generally in the range of one metre above the top of bank. This is consistent with the fact that once the top of bank has been exceeded, significant storage can be activated adjacent to the channel, which has a routing impact on the peak flows. Once the typical channel geometry is determined and the design flow depth assigned, simple hydraulic calculations can be used to derive V and Q. This component guarantees an opening that is compatible with the channel being crossed for a wide range of flow conditions.

The historic observations component involves examining available high-water data for a crossing site and nearby crossings. This data may include direct flood observations collected by AIT or other agencies, high-water marks noted during site inspections, information from local residents, previous engineering reports, historic photos and air photos, and anecdotal information based on the operation of previous crossings at the site. If confirmed high-water data notes an historic elevation in excess of the channel capacity estimate, then it would govern the design of the crossing. Historic data can also provide guidance on identification of typical channel geometry (e.g. bank height) at sites where some judgment is required. Other operational issues that may affect the design will also be uncovered during this phase. These may include blockage due to ice and drift, or ongoing river processes such as lateral erosion or streambed degradation. This component guarantees that all available historic information will have been considered in the crossing design, resulting in a defendable process.

The basin runoff potential component involves checking if there is enough potential supply of runoff from the basin to reach the values determined from the channel capacity technique. A unit discharge based on the AIT Runoff Depth map (developed from all extreme runoff events recorded at gauging stations and distributed based on eco-districts) is applied to the gross drainage area of the basin

to estimate an upper bound to runoff assuming a well drained basin and no limitation due to channel capacity. If this flow estimate is lower than the channel capacity value, then this component will govern. Typically, this component only governs for small basins with relatively steep channels.

To improve the acceptance and application of these new guidelines, an array of database and analytical tools were developed. One important tool is the AIT Hydrotechnical Information System (HIS). This tool provides easy access to compiled historic information for all crossings on a given stream, as well as providing a stream profile and drainage areas. Other tools include some hydraulics calculation tools to identify relevant gauging data and historic storms in the area.

These new guidelines have been a significant change to industry practice. Significant effort was required to document and communicate the problems with the previous technique to both departmental and consultant personnel. One of the most difficult concepts to communicate was the abandonment of the "1 in 100 year" designation of design flow, which has been common in many hydrotechnical engineering fields for many years. This was followed by several seminars to communicate the new approach. The interim steps in the process unfortunately added some complication and confusion to gaining adoption for the new approach.

In the 4 years since publication of the new guidelines, adoption and understanding has increased. This has been supported by continual updating of the HIS data and project specific advice and comments. Examples of application of these guidelines have been provided for many sites, covering a wide range of structure types and sizes.

The focus on the channel and historic information led to more consistent and defendable designs, and the new techniques and associated tools have reduced the required effort.

When questionable parameters arise, discussion is now related to appropriate physical parameters, rather than theoretical distributions and transfer exponents. Efforts are now being directed towards enhancing the HIS data-sets for completeness and accuracy, including the application of GIS tools and data.

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Another Successful Intersection Rut Repair (we hope)

Marta Juhasz
Surfacing and Aggregates

In general, the department's pavement surfacing strategies do not usually look at specialized intersection treatments to prevent rutting. Yet there are numerous intersections where, due to heavy truck traffic and stop conditions, the pavement is rutting well before the next rehabilitation is programmed even though the majority of the pavement away from the intersection is performing well. Two such intersections were rehabilitated in the Stony Plain district in 2004 and are performing well to date.

Another two intersections in the Calgary district were rehabilitated in 2006. Select lanes at these intersections, along Hwy 1:12 though Strathmore at Hwy 817:04 and at Lakeside Boulevard, had severely rutted (up to 35 mm) since paving in 1997. Operationally, the ruts were accumulating water during rain and snow during winter creating potential safety hazards, as well as creating a rough ride for cross traffic.

A more formal design approach was undertaken for the severely rutted Hwy (Photo 1) intersection rehabilitation.

Photo 1 – Hwy 1:10 Severe Rutting

EBA Engineering Consultants Ltd. (EBA) was hired to carry out a rutting mitigation assessment and develop rehabilitation options (Table 1). These options included concrete and stone mastic asphalt as well as the department's standard mix.

OPTION	Design Alternative (by Treatment Zone)			
	Zone 1 (150 mm repair depth)	Zone 2 (150 mm repair depth)	Zone 3 (60 mm repair depth)	Estimated Service Life (Years)
1	125 mm Portland Cement Concrete White-topping		60 mm Mix Type H1 w/ PG 58-31	20
2	150 mm Stone Mastic Asphalt (SMA) w/ PG 76-31		60 mm SMA w/ PG 76-31	15
3	150 mm Mix Type H1 w/ PG 76-31		60 mm Mix Type H1 w/ 76-31	12
4	150 mm Mix Type H1 w/ PG 58-31		60 mm Mix Type H1 w/ 58-31	7
5	60 mm Mix Type H1 w/ PG 58-31			4

Table 1 – Proposed Rehabilitation Options

A value engineering type session was undertaken with EBA and department staff to evaluate the proposed treatments service lives and constructability. The rehabilitation options were ranked using evaluation criteria and weighting factors developed during the session (Table 2).

OPTION	Net Present Worth from Lifecycle Cost Analysis	Life Cycle Cost	Traffic Disruption	Initial Cost	Contractor Capability	TOTAL	RANK
		Weighting					
		60%	20%	10%	10%	100	
1	267,000	2.2	1.0	1.0	1.0	1.55	4
2	240,000	2.7	2.5	1.6	1.5	1.94	2
3	223,000	3.0	2.5	2.0	2.5	2.25	1
4	271,000	2.2	2.5	2.2	3.0	1.83	3
5	338,000	1.0	3.0	3.0	3.0	1.20	5

Table 2 - Proposed Rehabilitation Options Evaluation Matrix

Rehabilitation option 3 ranked as the best option. This 60 and 150 mm mill and inlay, using an H1 mix type and a highly polymer modified PG 76-31 asphalt cement for added rut resistance, was constructed by the maintenance contractor, Volker Stevin. Volker Stevin was able to produce this mix from one of their Calgary asphalt plants. To help ensure a quality product, a maintenance paving specification was developed for this project that included quality assurance testing as well as bonuses and penalties.

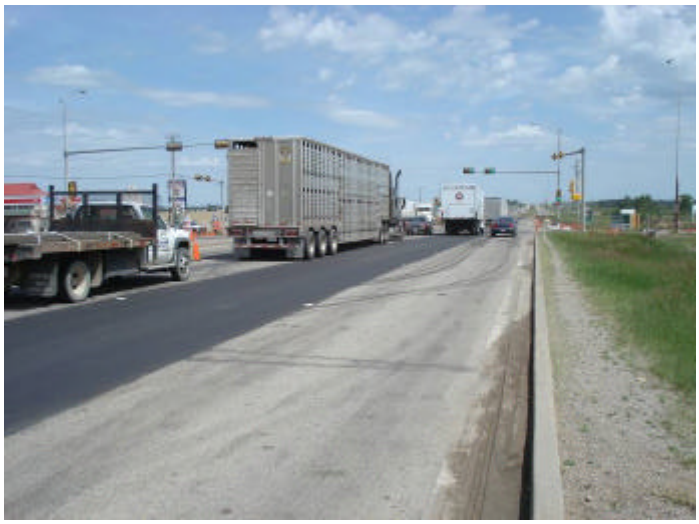

Photo 2 – Finished Product Hwy 1:12 EBOL at Lakeside Blvd.

A report documenting this project is available. For more information, please contact:

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Environment Canada's Proposed Regulation to Reduce Emissions of Volatile Organic Compounds (VOCs) From Traffic Markings

Joe Filice
Geotechnical and Materials

Background

Alberta Infrastructure and Transportation (AIT) places annually over 3 million litres of traffic paint on the province's highway system. AIT traditionally used alkyd based traffic paints that use solvent. These paints have Volatile Organic Compound (VOC) contents of about 450 g/l. VOCs are known precursors to particulate matter and ground level ozone, commonly referred to as smog. The health effects of exposure to VOCs, both acute and long term, are well documented – asthma, atherosclerosis and bronchial disease, as well as cardiovascular disease.[1] Partly in response to increased environmental pressure to reduce VOCs in traffic markings, AIT has increased the usage of waterborne based traffic paints, which use water rather than solvents. Waterborne paints have a VOC content of less than 150 g/l.

All traffic paints contain pigments, volatile vehicles such as solvent or water, and non-volatile vehicles such as resins-drying oils that cure by oxidation after evaporation of the solvent. Alkyd paints have an advantage over waterborne paints in that alkyd paints can be applied at temperatures as low as 0ºC while waterborne paints can only be applied at temperatures above 10ºC. This in effect means that alkyd paints can be applied earlier and later during the year when cold temperatures prohibit the use of waterborne paints, effectively increasing the line painting season by 2 or 3 months. This permits our maintenance and construction contractors some flexibility in scheduling line painting activities.

An interesting challenge has been presented by Environment Canada: they propose to mandate a maximum VOC content limit of 150 g/l for traffic markings. Environment Canada will have this regulation published in early 2007 and the effective date for achievement of the VOC content limit for traffic markings will be 3 years after the regulation comes into force (thus sometime in 2010). Since current alkyd traffic paint formulations contain 3 times the VOCs of waterborne traffic paints it is expected that a further shift toward the use of waterborne traffic paint or other low VOC alternative will be required in order to comply with these environmental targets.

Alberta is presently about 30% in compliance with the Environment Canada target and is well situated to achieve the mandated target during warm weather months, when the temperature is greater than 10^{o}C. Low temperature traffic paints that meet federal environmental standards for VOC are currently being developed by industry and tested by AIT. In the spring of 2006, AIT approved 3 low temperature waterborne traffic paint formulations for usage on department projects. Alternatives to traffic paint lines, such as durable markings like epoxies, MMA, and thermoplastics exist that presently meet the proposed 150 g/l VOC limit. These products are already included on the AIT products list. Due to the high cost of these durable markings, 10 to 30 times the cost of paint, these products are not considered to be cost effective for wide spread usage. Durable markings may be appropriate for urban settings with high traffic volumes.

Environment Canada – Traffic Markings (EC-TM) Working Group

Most provincial transportation agencies are not in as good a position as AIT to meet the VOC regulations. In addition, there was concern among paint manufacturers related to potential loss of income and increased expenses to switch production away from high VOC paint formulations. Applicators also had concerns about expenses related to retrofitting their equipment to be able to apply low VOC paints and whether sufficient industry capacity existed to apply all paints during warm weather. These concerns were brought back to Environment Canada as part of their industry consultation process. In response a working group comprised of representatives from Environment Canada, provincial transportation ministries, manufacturers and applicators was put together in April 2006. The Environment Canada – Traffic Markings (EC-TM) Working Group mission is to address concerns related to the proposed VOC limit for traffic markings.

The EC-TM Working group held a meeting in Gateneau, Quebec on September 7, 2006. The meeting was set up to finalize the strategic plan for implementing the use of low VOC traffic marking coatings and to compile a list of alternatives. The strategic plan was presented to the Chief Engineers Council during the TAC meeting in Charlottetown on September 17, 2006. The strategic plan incorporated some of the feedback received from the Chief Engineers Council and was distributed to all stakeholders for comments by October 31, 2006. Environment Canada is planning to finalize the strategic plan document by the end of December 2006.

The strategic plan includes: environmental concerns with existing traffic markings; implication of the strategy; strategic time line; approvals and testing of new products; issues arising from changeover to low VOC products and, implementation plan development and path forward. The List of Alternatives include information on the many types of products such as cost of materials, durability, VOC, type of application, advantages and disadvantages, and test deck testing results.

Web link to Environment Canada's Working Group on Traffic Marking Proceedings - http://www.ec.gc.ca/nopp/voc/docs/trafficMtg/en/index.cfm

Challenges

The traffic paint industry requires time to develop new products that will eventually meet the new requirements, and it will take time for the department to evaluate these new formulations to ensure that they meet our approval criteria. New traffic paint formulations must be thoroughly evaluated in order to find appropriate alternative traffic paint formulations. The overall process to approve compliant traffic paint can take from 3 to 5 years.

Paint manufacturers are currently developing new formulations that will meet the 150 g/l limit. The new formulations currently being developed are low temperature, low VOC water-based traffic paint and low VOC solvent based traffic markings. At this time low VOC solvent based paints are acetone-based. Both of these new traffic paint formulations will need to be applied in colder temperatures, <10^{o}C.

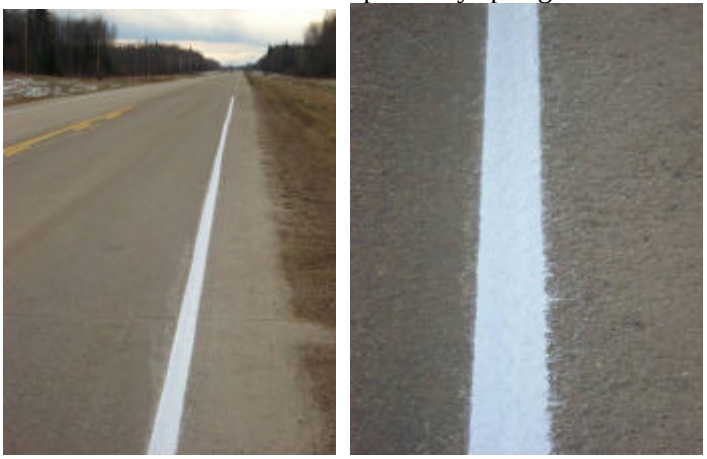
Alberta's Road Service Test Evaluation

Low temperature waterborne traffic paint formulations were applied in the fall of 2005 to the AIT test deck to replicate cold temperature application conditions (<10^{o}C). These low temperature traffic paints performed well over the winter of 2005/06 on the AIT test deck and approved for use in Alberta. AIT was the first jurisdiction to apply and test low temperature, low VOC waterborne traffic paints on test deck during cold weather application (0^{o}C).

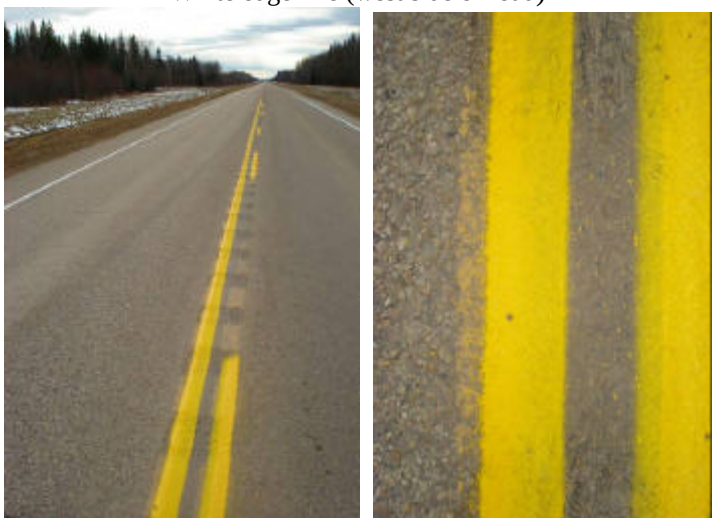
AIT has invited traffic paint manufacturers to submit low temperature, low VOC paint formulations for application to test deck in November 2006. To encourage development of low temperature, low VOC traffic paint formulations, the department has waived the normal test deck fee. In response to this request, manufacturers have submitted 22 compliant new traffic paint formulations to the department for testing in the 2006/07 season. The new formulations submitted comprise of 14 waterborne (7 white & 7 yellow) and 8 acetone based (4 white & 4 yellow) traffic paints. These formulations will be applied to the AIT test deck during cold temperature application, <10^{o}C. The new compliant traffic paint formulations will be evaluated for a period of 6 months to determine their performance such as the durability and retro-reflectivity of the markings. Formulations that perform on the AIT test deck will be listed as Approved Products on the AIT Products List and can be used on the department funded projects.

Trial Project

AIT applied low temperature, low VOC waterborne traffic paint to a trial project in the fall of 2006. The application temperature was between 2 and 4^{o}C. This low temperature, low VOC traffic paint formulation was approved in the spring of 2006 based on its performance on the AIT test deck. Further evaluation of this trial project will be carried out throughout the winter months. Performance results will be completed by spring of 2007.



White edge line (west side of road)



Yellow centerline

Path Forward

Timeline for Cold Temperature Testing of Traffic Marking Products

Timeline	Activities specific to traffic markings
Fall 2006	Application of marking products with low VOCs at cold temperatures
Spring 2007	1st Evaluation results of applied test products
Fall 2007	Application of new products developed for low temperature application
Spring 2008	2nd Evaluation results of applied test products

These steps should be repeated annually, sharing all test and evaluation data with all jurisdictions by holding semi-annual EC-TM Working Group meetings and conference calls until 2010. This will allow discussion of results, approval and testing of new products, cost of alternatives and application, discussion of the strategic direction and monitoring progress and results.

Strategic Timeline

Environment Canada will publish the regulations on VOC's for traffic markings in 2007. The regulations will come into force on the day they are registered.

The effective date for the VOC content limit for traffic markings will be on or about January 1st, 2010.

Traffic marking products manufactured prior to the applicable effective date for achieving the VOC content limit may be sold, supplied, or offered for sale for up to 1 year after this applicable effective date comes into force. Thus, the sell-through period for traffic marking products with VOC content higher than 150 g/l will end on December 31, 2010. After this the sale of non-compliant traffic markings will be prohibited

Conclusion

Alberta Infrastructure and Transportation will continue to evaluate new traffic paint formulations that will meet the new VOC regulation as they become available. Alberta is well situated and at the forefront in advancing the use of low temperature, low VOC traffic paint formulations. AIT is proactive in applying low temperature; low VOC traffic paints to its test deck. The first trial application of low temperature, low VOC paint was conducted in the fall of 2005 with very positive results. These low temperature, low VOC traffic paint formulations were approved for use based on their test deck performance.

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Conference on Soft Soils

Roger Skirrow
Geotechnical and Materials

The Canadian Geotechnical Society/International Association of Hydrogeologist Annual Conference and 4th International Conference on Soft Soils, was held in Vancouver, B.C. October 2-6, 2006.

About 650 people from geotechnical and hydrogeologic academia, consultants, government, industry specialists and exhibitors attended the three day conference and associated 2 day soft soils conference.

Technical presentations are the bread-and-butter of the CGS conference, and this one was true to form. Six concurrent technical sessions were run with about 200 papers delivered in rapid fire 12 minute presentations. Topics included pile foundations, geosynthetics, slope stability, forest geotechnique, lifelines and aging infrastructure, groundwater protection, site characterization, data collection, contaminated soils, case histories, mining geotechnique, seismology, soil behavior and a dozen other topics. Of special note were two panel discussion sessions related to the implications of changes to the National Building Code of Canada on geotechnical seismic design.

The conference was held at the Fairmont Vancouver hotel in beautiful downtown Vancouver. The local color night was held at the Vancouver Aquarium and was highlighted by performances from porpoises and beluga whales. This year's conference title was Sea to Sky Geotechnique 2006, to coincide with the ongoing upgrading of the Sea to Sky highway from Vancouver to Whistler, site for the alpine events of the 2010 Olympics. A tour of the highway construction on Thursday was a conference highlight. Other tours included the Canada Line Rapid Transit project and the Britannia Mine remediation site. Meetings for the Professional Practice Committee and the Transportation Geotechnique Committee were attended. Many opportunities were found to meet informally with colleagues to discuss matters of shared interest and develop collaborative projects (U of A rail hazard characterization project, Alberta Geological Survey InSAR and LIDAR projects).

A CD copy, as well as a hard copy of the proceedings is available on a loan basis from: Roger Skirrow

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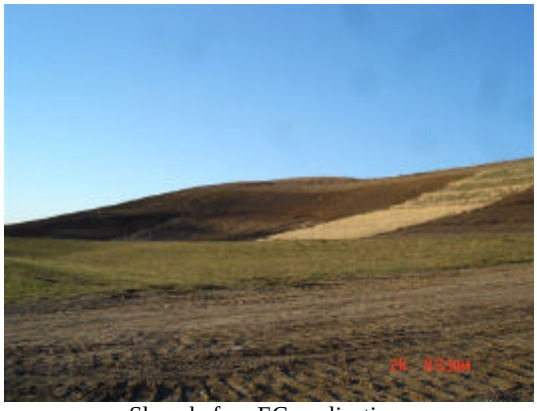
Application and Evaluation of New Erosion Control Products on West Slope McGregor South Dam

Fred Cheng
Geotechnical and Materials

Erosion is the wearing away of the surface by running water, wind or ice, where as erosion control is the application of any temporary or permanent measures to reduce erosion. As part of road and bridge construction, AIT applies numerous erosion and sediment control Best Management Practices (BMPs) and products to slopes and ditches throughout the province. Over time, new products have been developed - AIT's New Products Evaluation Committee (NPEC) is responsible for their review and approval for use on our highway infrastructures. To view the department New Products Evaluation Process and the Products List click the following link: http://www.infratrans.gov.ab.ca/Technical_Resources/Product_Development_%26_Acceptance_Testing/index.htm

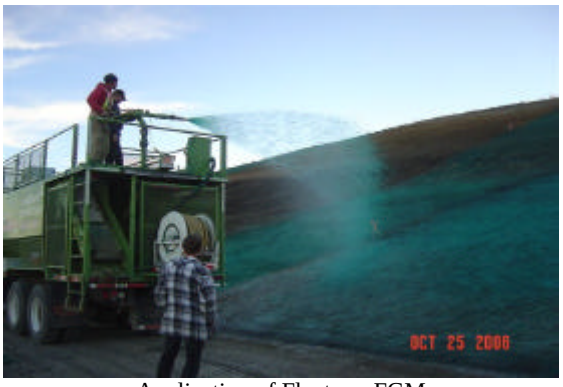
Three new Erosion Control Products

Three new erosion control products have been approved by the NPEC. These products (Flexterra FGM, Agri-Boost and Silt Stop) were applied and evaluated on the west slope of the McGregor South Dam.



Slope before EC applications

Flexterra FGM (Flexible Growth Medium) is a new product to AIT. It is composed of long strand wood fibres mulch and reinforcement fibres in a slurry mixture that is hydraulically applied onto bare soil surfaces. The advantage, as claimed by the manufacturer, is that it requires no curing period and upon application forms an intimate bond with the soil surface to create a continuous, absorbent and flexible erosion resistant blanket that allows for rapid germination and plant growth. Flexterra is applied similar to standard hydro-seeding and this is its first Alberta application.

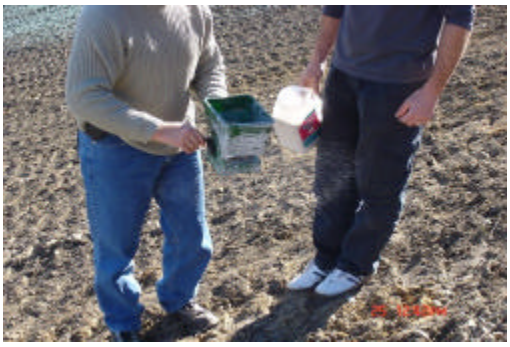


Application of Flexterra FGM

Agri-Boost is a soil amendment consisting of palletized alfalfa that is applied evenly (blown on by blower or seeding machine) on bare soil. The Agri-Boost pellets are worked 5 to 8 mm into the soil by roto-tilling or disking. Seed will then be applied on the loose soil surface and disked into the soil. Agri-Boost has been used on AIT projects elsewhere in the province (H40:34 test plots) and has found to be very successful in promoting grass catch.

Application of Agri-Boost

Silt Stop is a co-polymer polyacrylamide (PAM) applied to soil surface to reduce mass erosion and eliminate fine soil particle suspension and promote vegetation establishment. Silt Stop has been applied on a slope on H897:02 last year and grass catch has been quite successful. Seed and Silt Stop are mixed and applied dry onto the slope by a handheld seed applicator.



Application of Silt Stop

Project Background

The west slope forms part of the valley wall that makes up the McGregor Reservoir and is located west of the South Dam. A large landslide has occurred on the west slope that was feared to affect the South Dam and a new hydraulic structure below. Instrumentation was installed and the integrity of the slope, South Dam and structures are being monitored. The debris was removed and the slope shaped and reduced to a 1:3 slope. Revegetation of the slope to prevent erosion is the eventual outcome of this study.

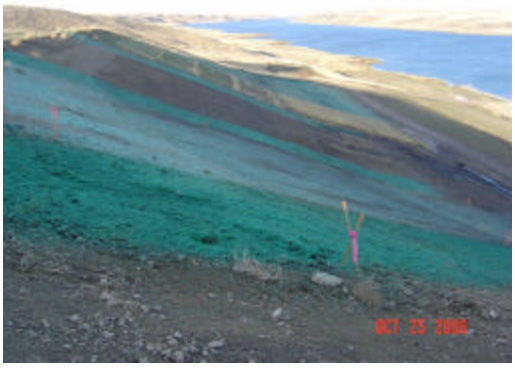
As part of Major Capital Projects and Environmental Management Services' on-going study on the effectiveness of erosion control materials and seed mixes, these three new erosion control products were chosen to be applied on the west slope of the McGregor South Dam. Last November (2005), standard hydro-seeding and compost were tested on 2 test plots on the north end of the west slope. Standard hydro-seeding was applied but the seed and mulch were short lived as strong winds have blown most of them away. Compost was also applied (after patched up failed areas in spring due to runoff erosion) but the result was very good as grass started to catch.

Application of standard hydro-seeding on buffers

The slope material is predominately till, silty, gravelly and with a narrow coal layer near to the bottom of the slope. Seepage is also existent at the bottom and center of the slope. Soil samples have been analyzed for soil quality and nutritional values for plant growth. The soil has been found to be slightly saline. A special native seed mix was designed by Carlene Godwin, P. Ag. that would adapt best under these soil and climate conditions.

The slope surface is trapezoidal and has an area of approximately 18,000 m^2, measuring 180m (top), 250m (bottom) and 83m (height). Three vertical test plots of 30m in width have been staked with 10m buffers separating that are being hydro seeded as control plots.

The application of the three erosion products on each of these plots were completed on October 24 to 25, under generally good weather conditions, sunny but sometimes windy, with daytime highs around 5 degrees. All buffer strips and bare areas (outside the 3 test plots) were hydro-seeded to prevent slope erosion.



Slope after all EC products applications

Product	Distributor/ Contractor	Area (m^2)	Cost
Agri-Boost	Agri-Boost Inc./Top Gun	3,000	$6,400
Flexterra FGM (test plot)	Nilex/Bos Scaping	3,000	$4,950
Silt Stop	Clearflow Consulting	3,000	$3,811
Standard hydro-seed – buffer–north plot	Nilex/Bos Scaping	5,700	$1,930
Total project cost			$17,091

Project Cost

The effectiveness of erosion control will be monitored closely by local personnel, Charlie Murphy, especially after major rainfall events, and Edmonton staff. Grass germination, rooting, seedling density and related characteristics will be closely monitored by Carlene Godwin in spring and summer of 2007.

Acknowledgement

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Brian Soutar of Major Capital Projects and
Carlene Godwin of Environmental Management Services.

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Alberta RWIS Provides Valuable Winter Road Information To Maintenance Crews and Travelers

Beata Bielkiewicz
Highway Operations

Alberta RWIS project was initiated in 2004 as part of the national vision to establish RWIS network along National Highway System across Canada.

Presently, the network consists of 63 stations installed along major highway corridors (Highway 1, 2, 3, 16, 43 and 63). Two-thirds of the constructed stations are operating and delivering information on current weather and surface conditions to RWIS users. The information is also used to generate localized forecasts on weather and pavement conditions.

Ultimately, the RWIS network will have 75 environmental sensing stations deployed along 3,500+ km of Alberta highways by October 2007.

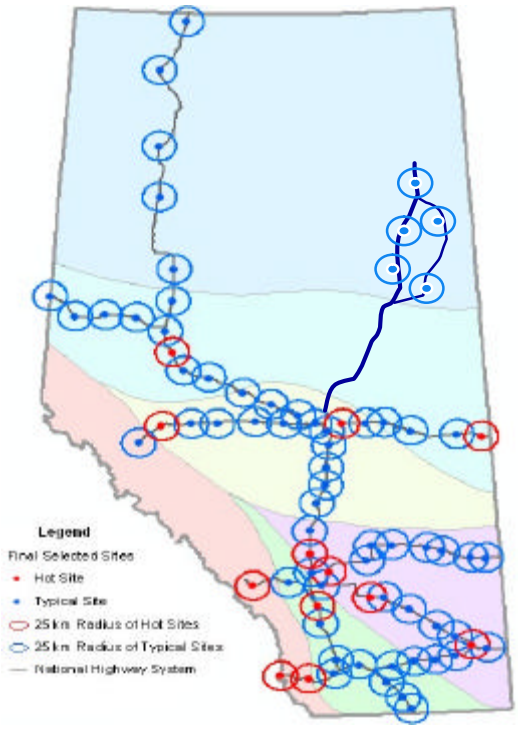

Figure 1 – RWIS Network Map

The system operation is based on automated Environmental Sensing Stations (ESS) equipped with pavement and atmospheric sensors. The sensors measure pavement temperature, moisture presence and chemical concentration of liquid on the road surface, air temperature, wind speed, precipitation, relative humidity, and barometric pressure.

Each ESS station is also equipped with a Remote Processing Unit (RPU), which logs the readings from all sensors in a database against time and sensor type. A central data server collects this information from the site on a regular basis and uploads the information to the password-protected web site. During winter season, real-time data is polled every 20 minutes (7 days per week, 24 hours per day). In addition, two types of atmospheric and pavement conditions forecasts are published daily: a 24 hour detailed and a 3-5 days general forecast.

RWIS Role in Winter Maintenance

The RWIS information is primarily used by highway maintenance contractors during winter to make decisions on suitable roadway treatment. RWIS is not a stand–alone decision making tool, it does not implicitly indicate whether a spreader or plow should be dispatched. Maintenance managers use the RWIS information in conjunction with field and operational experience.

The variables in the decision process include: type of chemicals or abrasives that will be used, their concentration, timing of the material application, number and length of roadway segments that require treatment and whether pre-wetting is required.

In the past, maintenance contractors used methods of snow and ice control that were reactive, such as applying chemicals and plowing after heavy snow falls. The reactive approach to ice and snow control translated into the over-application of chemicals and abrasives.

Using RWIS information (in particular forecasted pavement temperature) maintenance contractors can employ proactive methods to keep the roadway surface in satisfactory conditions.

In the “anti-icing” method, chemicals are applied prior to the start of precipitation or the freezing event to prevent ice and snow from bonding to the pavement. Significantly less chemical is required to prevent bonding rather than melting through accumulated hard pack ice to break the bond.

The fine tuning of maintenance responses allows for any or all of the following:

- optimized application rates for chemicals and abrasives;
- reduced spring clean-up of abrasives;
- “just in time” proactive response at onset of the winter storm event;
- timely release of maintenance crews;

– more effective use of equipment.

Current winter maintenance practices largely involve the businesses of road patrolling. Patrollers check snow accumulation, test roadway surface for slippery conditions, do visual checks of sky conditions, visibility and monitor effectiveness of operations and progression of road conditions toward clean pavement surface.

With the continuous access to the RWIS data from their PC stations, maintenance contractors can reduce time spent on patrolling roads. The result is the increased efficiency and effectiveness of highway winter maintenance work. Other consequential benefits of having improved winter road maintenance include improved traffic flow, reduced fuel consumption, reduced accident rates, and by using less material to clear the roadway there is a reduced negative impact on the environment.

Based on studies done by other jurisdictions the benefit-cost ratio (B/C) of the RWIS system could vary from 5:1 to 20:1. Minnesota's Department of Transportation (Mn/DOT) has phased their state-wide RWIS over three years. A benefit cost study conducted by the DOT agency determined a B/C of 11:1 (mainly benefits to the public were considered). In Finland, the evaluation of the effectiveness of the RWIS system resulted in a B/C ratio of 5:1. Alberta Infrastructure and Transportation plans to do similar evaluation of the benefit-cost ratio of the RWIS in the future.

RWIS Information Supports Traveler System

The road condition information provided by the RWIS system has also been integrated into a traveler information system.

The video images of various highway locations captured by cameras installed at RWIS stations along with the sensor readings are transmitted from the central server to the Alberta Motor Association's (AMA) Road Report web site. Drivers looking for up-to-the-minute information about winter road conditions can select any of the operating ESS. The camera images and sensor readings are updated every 20 minutes.

Travelers appear to be using the web information to assess current traffic conditions when they plan their trips. Road visibility, precipitation, temperature, wind speed and presence of traffic congestion are all factors that may influence travelers' decisions.

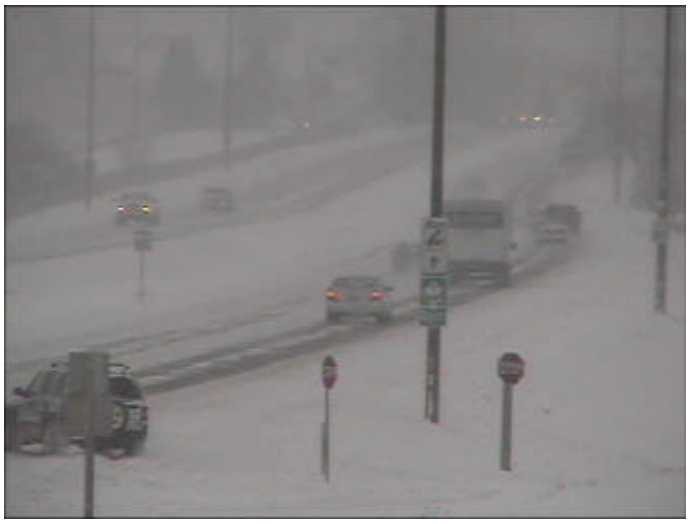

Figure 2 – Highway 1 through Medicine Hat Captured by Video Camera on November 27th, 2006

AMA indicated that demand for this type of travelers' information is very high. Based on the recently complied statistical data by the agency, 1.4 million page visits to the AMA Road Report site were recorded during four winter months in 2005/06. This year, the number of people using the site increased to 2.1 million during first 1.5 months.

The Traveler Information System enhanced with the RWIS information has the potential to deliver numerous benefits including less delay to public, improved movement of goods, improved safety, reduced operator costs and reduced energy consumption.

The RWIS system and methods used in the winter road maintenance were previously described in the following TSB Newsletter articles:
"Road Weather Information System", February 2003,
"Pre-wetting" - February 2003 and
"To Salt or Not to Salt" May 2002.

For more information on the Alberta RWIS network please contact:

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Technology Transfer //\\ Technical Training (T4)
Ron Stoski
Geotechnical and Materials

Training Courses ……...Calendar of Events
January 2007 to April 2007

Technical training and upgrading has been identified as an important way to improve job skills of new and old employees and to keep up to date in your field.

TSB will be delivering and/or arranging for the following technical training courses:

Bridge Engineering Courses

EIM LiveLink Hands-On Training for Region Staff: Peace River, Grande Prairie, Barrhead, Stony Plain, Red Deer, Calgary, and Lethbridge - January 2007

BIM Class B	April 23-27, 2007 September 10-14, 2007.
BIM Field Training	October 2-4, 2007.

Surface Engineering Courses

Materials for Construction Engineers including Pavement Design /Preservation for Construction Engineers and Pavement Management for Construction Engineers: February 26 – March 2 – 2007

Highway Planning and Design Courses

Network Expansion Support System (NESS) training sessions in Calgary, Lethbridge, Red Deer, Peace River and Barrhead – January – Dates - TBA

Course and Seminar Summary - **April –Dec. 2006**

The following courses and seminars **were arranged for/delivered** by TSB **between April 1, 2006 and December 11, 2006.**

- Pavement Preservation April 10 to 12
- BIM Class B Bridge Inspection Course April 24 to 28,
- Highway Design Guidelines Overview May 10 and 11
- BIM Class A Bridge Inspection Course June 5 to 9
- BIM Class B Bridge Inspection Course, Sept 11 – 15
- Bio-engineering and Bio-technical Streambank and Stabilization Techniques Workshop: Classroom and Field September 26 to 28
- BIM Field Training Program - October 11 to 13
- Roundabout Training, November 15 to17
- Air Quality Management, November 30

Similarly, maintenance contractors and department employees were updated on the Automatic Vehicle Location System and Road Weather Information System were well received in Peace River, Grande Prairie, Edson, Stony Plain, Vermilion, Hanna, Edmonton, Red Deer, Athabasca, Lethbridge, and Calgary in September of 2006.

The calendar of technical training courses and events is updated every two months and posted under Technical Resources, Technology Transfer, Courses Seminars and Events:http://www.infratrans.gov.ab.ca/INFTRA_Content/docType256/Production/courses.pdf

For additional information and/or suggestions please contact:

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