the
WATER HAULER'S BULLETIN

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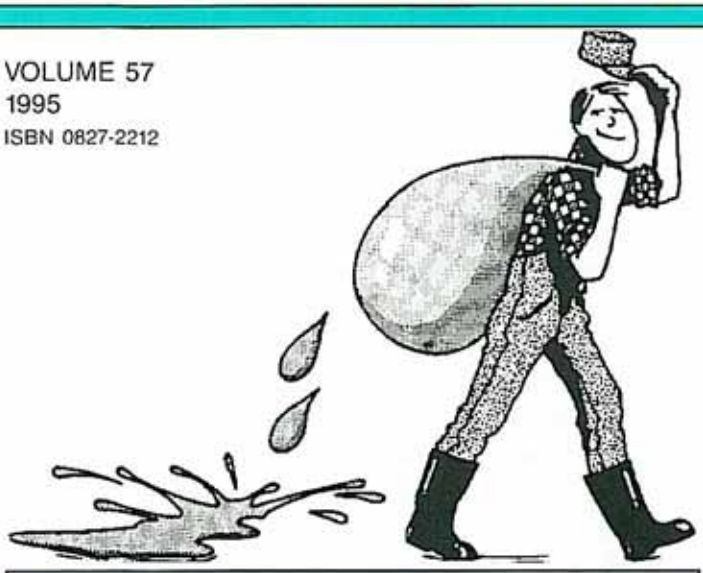

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GLOBAL POSITIONING SYSTEM

The Next Utility?

The applications are almost limitless for the new Global Positioning System or "GPS" and may include some for irrigation districts. Developed by the United States Department of Defence, GPS is fast giving the world a new standard for defining locations and elevations. Still unknown to millions of people, GPS satellite navigation is now hands on for many Alberta companies involved in geodetic survey.

GPS is based on 24 satellites orbiting the earth at a high altitude. By using the satellites as man-made stars and measuring distances from them to a point on earth (with the use of highly sophisticated computers) every square metre of the earth's surface has its own unique address. Position is measured and calculated mathematically from at least four of the satellites.

GPS is a complex system which can be used to achieve position accuracies ranging from 100 metres to a few millimetres depending on the equipment used and procedures followed. Generally higher accuracies correspond with higher costs and more complex observation and processing.

GPS unit sits on top of sled being pulled by ATV.

For several years now, surveyors can calculate positions right down to the last centimetre. The technique called "differential GPS" has the ability to determine elevations or orthometric heights. A monitor or stationary station is located at a known benchmark. The station begins receiving signals from a number of satellites simultaneously. A surveyor places the second remote station at the unknown elevation point, pushes a button and begins receiving signals from the same satellites and the monitor station. The remote station's computer calculates the height and location of the station by using the knowns: location and elevation of the benchmark at the monitor station, the time it takes for the radio signal to travel from the satellites to both the monitor and the remote station. Within a split second the information is recorded. The result of all this technology is a survey system of unsurpassed accuracy. In fact, the United States Dept. of Defense intentionally add deliberate errors to the system available to the public.

GPS will soon be a basic utility that almost everyone will use in one way or another. Alberta Agriculture, Food and Rural Development's conservation and development branch uses the GPS system with its salinity monitoring program. Curt Livergood, one of the branches system operators says the all-terrain vehicle (ATV) mounted GPS unit is driven back and forth across a field pulling a sled containing an EM38 conductively meter.

Historically, says Livergood, our EM38 surveys were conducted by walking transect lines across an affected area. The instrument was placed on the ground, readings taken from the meter and manually recorded. This method was not only time consuming and labor intense but generated a limited number of data points.

Utilizing the GPS assisted mapping system dramatically reduces mapping time and provides many more data points, says Livergood. "A quarter section can be mapped in a couple of hours. Compare that to two or three days using the old conventional survey methods," states Livergood.

With a GPS survey system, one surveyor can do the work of a three-person crew, in a fraction of the time required by conventional techniques. Getting the right equipment for your particular use requires a careful analysis of how you'll use the receiver, what kind of information you want to obtain and how much your budget will allow, concludes Livergood.

For more information please contact Curt Livergood, Technologist, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. Telephone (403) 381-5858. ■

STILLING WELLS MADE EASY

"In order to obtain an accurate water level measurement in flowing water, some form of stilling well must be constructed," says electronics technologist, Brian Cook with Alberta Agriculture, Food and Rural Development (AAFRD). Stilling wells perform several functions:

1. Still the current and calm any surface waves or ripples to provide a smooth surface for water level measurement.
2. Protect the float and counter weight, other sensors, and often the datalogger from weather and vandalism.
3. Provide housing for the datalogger, sensors, staff gauge and benchmark.

Over the past 12 years, AAFRD developed two basic styles of stilling wells that are easy to construct and light on the pocket book. One is set in the channel (Figure 1) the other is dug into the bank (Figure 2). Steel or metal stilling wells were found to be unacceptable, as metal floats were magnetically attracted to the side of the well. In highly conductive soils or water, galvanic voltages can destroy electronic equipment. "All of our stilling wells are constructed from PVC pipe, because it is easy to work with and weatherproof. Most are constructed from scrap or surplus pieces of PVC pipe ranging in size from 350 to 500 mm in diameter and 2 to 4 m long. All of our stilling wells are fitted with a locking weatherproof lid or cap. A shelf to mount the datalogger is cut from a 2 x 8 plank to fit the inside of the pipe. This shelf is held in place with 4 - 50 mm

Figure 1

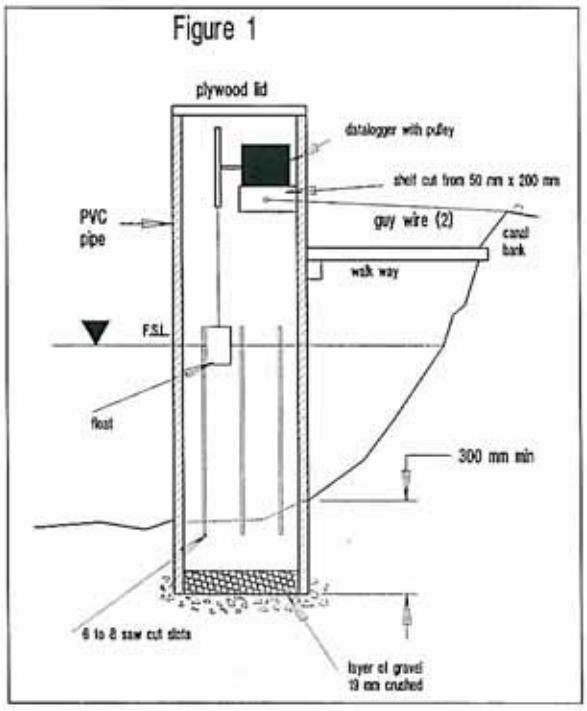
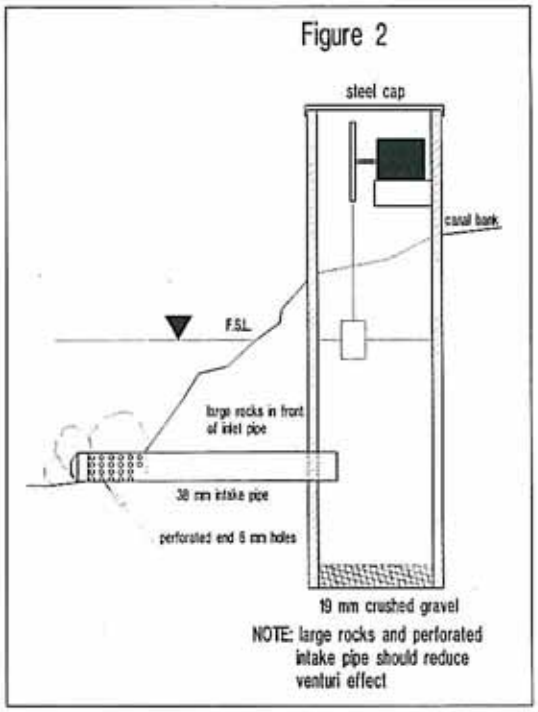


Figure 2



long wood screws. The stilling wells are bedded in gravel for stability. A silt trap is made by setting the bottom of the pipe at least 300 mm below the canal bed," states Cook.

The in-channel stilling wells have 6 or 8 - 3 mm skillsaw-cut slots, cut from just below the bedgrade to just above the full supply level (fsl). Evenly-spaced slots around the diameter of the pipe reduce any draw down caused by the difference in the velocity of the water between the inside and outside of the well. If the well is out in the stream, a walkway between the bank and stilling well is constructed from 2 x 10 planks. Two guy wires are then installed to hold the well tight to the walkway and prevent the well from shifting.

The in-bank stilling wells are dug into the bank with a level trench leading to the bed of the canal for the 38 mm intake pipe. All excavations are backfilled and compacted to prevent erosion and to support the stilling well. To prevent a moderate or high velocity flow in the canal from creating a draw-down in the well, the end of the intake pipe is capped and perforated with 6 mm holes. Large rocks placed upstream of the inlet reduce the canal velocity.

Finally says Cook, a staff gauge is mounted on the inside or outside of the well. A benchmark is then established on some convenient point on the well. The well and staff gauge are referenced to a survey datum.

For more information please contact Brian Cook, Electronics Technologist, Irrigation Branch, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. Telephone (403) 381-5877.

TREATMENT OF IRRIGATION WATER IS REQUIRED FOR DOMESTIC USE

Irrigation canals provide drinking water to hundreds of farm families and approximately 50 communities in southern Alberta. A reliable and safe water supply is essential for the health and well-being of all residents. Water obtained from municipal sources has received adequate treatment to make it safe for human consumption. Raw water from lakes, canals, dugouts and wells, however, generally needs to be treated to make it fit for drinking. Water originating from snowmelt in the pristine environment of the Rocky Mountains even needs treatment for domestic use. Testing of raw water supplies is recommended to ascertain chemical and microbiological constituents and to determine appropriate treatment methods.

Surface water quality monitoring was conducted in the Lethbridge Northern Irrigation District (LNID) and the Bow River Irrigation District (BRID) in 1994, as part of two block studies initiated by irrigation branch, Alberta Agriculture, Food and Rural Development. A multi-agency, CAESA-funded Farmstead Water Quality Survey of 100 drinking water sources in LNID was also carried out in 1994. These studies confirmed the need to treat raw water supplies. Coliform bacteria counts exceeded Canadian drinking water guidelines in most surface water sources and in a number of shallow wells. Irrigation water diverted from rivers into irrigation canals already contained sufficient coliform bacteria to warrant treatment prior to drinking. High coliform bacteria counts usually indicate that other disease-causing organisms are present.

Local health units do not recommend use of surface water for human consumption without proper treatment.

Drinking untreated water may lead to serious health problems. Organisms that cause several well-known diseases

Irrigation canals deliver water for domestic use to thousands of farm families.

are: E. coli, typhoid, shigella, campylobacter and giardia. Symptoms of infection include severe or recurring diarrhea, stomach pain/cramps, nausea and/or vomiting. People at greatest risk are children, pregnant women, the elderly, and those who have a weak immune system.

Filtration and disinfection are normally required to ensure domestic water supplies are safe to drink. A sand filter is used to take out particle matter. A chlorine unit or ultraviolet light are also used to kill any disease-producing organisms in the water supply. Treatment may also be required to reduce hardness or to remove iron.

Individual or private users of surface water should regularly test the quality of their drinking water. Necessary treatment equipment should be installed and used to provide a safe and reliable water supply.

Local health authorities may be contacted for assistance in testing of raw water supplies, for interpretation of chemical and bacteriological results and in use of appropriate treatment systems. For more information, please contact Brian Dalshaug or Pat Potter, Barons-Eureka-Warner Health Unit at (403) 327-6507, or Rod Bennett or Graeme Greenlee, Irrigation Branch at (403) 381-5121. ■

PROTECT YOUR DISTRICT AND YOURSELF — "A PROACTIVE RESPONSE TO ENVIRONMENTAL LEGISLATION"

In 1992 the Government of Alberta completed a consolidation of environmental laws and regulations by legislating into force the Environmental Protection and Enhancement Act (EPEA)[1]. This new legislation, in addition to combining the environmental compliance and regulatory provisions of 9 other Alberta statutes, brought into effect a higher expectation of environmental stewardship, an expanded role for the public in ensuring protection of the environment, and provisions for updated offences and increased penalties.

The objectives of the EPEA are to:

- respond to public input,
- streamline and simplify environmental laws and regulations,
- provide for effective inter-governmental cooperation,
- provide for an integrated approach to air, land and water, and
- facilitate public access through a "single-window" approach.

The EPEA also embodies the concept of "polluter pay." Offences and penalties detailed in the EPEA now expose individuals, corporations and even the elected officials of irrigation districts, to the potential of personal liability if requirements of the EPEA are not met. In the most severe offences, penalties can range as high as $1,000,000 per day for corporations, $100,000 per day for individuals, and imprisonment of up to 2 years. In addition, the costs of remedial measures to correct environmental harm can also be required from those causing the environmental harm.

In order to continue to show a proactive response to legislation affecting irrigation districts, the Alberta Irrigation Projects Association (AIPA) established an Ad hoc Committee to review environmental legislation and recommend environmental policies and procedures that would protect irrigation districts from liability while demonstrating com-

[1]The Environmental Protection and Enhancement Act (EPEA) (Alberta, Chapter E-13.3, S.A. 1992) was assented to on June 26, 1992. The application of the EPEA came into full effect along with its regulations on September 1, 1993. Amendments to the EPEA were given Royal Assent on June 1, 1994 under the Environmental Protection and Enhancement Amendment Act, 1994.

pliance with the "spirit and letter" of the legislation. The Ad hoc Committee was made up of representatives from four irrigation districts: Dave Hill, Chairman (Eastern Irrigation District), Gail Sarka (St. Mary River Irrigation District), Glen Brown (Bow River Irrigation District) and Dale Baumback (Lethbridge Northern Irrigation District). They were assisted from a legal perspective by Tom MacLachlan of Virtue and Company.

Over a 12-month period, the AIPA Committee reviewed 26 pieces of federal legislation and 40 pieces of provincial legislation in determining the overall environmental compliance obligations of Alberta's irrigation districts. The report of the AIPA Ad hoc Committee was approved by the directors of the AIPA at their Annual Meeting in Lethbridge on November 21, 1994. This report is included in two documents: "Demonstrating Stewardship — An Environmental Policies and Procedures Manual for Alberta's Irrigation Districts" and "Environmental Compliance Procedures and Checklists — A Guide to Meeting the Test of Due Diligence."

"When we started our task we were concerned that the new approach to environmental protection could end up costing irrigation districts a substantial amount of money on an ongoing basis," says Hill who chaired the AIPA Ad hoc Committee. "We were pleased to discover that in most instances common sense still prevails, and irrigation districts can be protected from liability if they adopt policies and procedures that demonstrate due diligence." In order to be able to rely on the principles of due diligence as a protection from extreme financial liability has meant that irrigation districts need to have a well-rounded understanding of environmental laws and regulations. In addition they need to institute policies and procedures that, *"establishes on a balance of probabilities"* that the irrigation district *"took all reasonable steps to prevent*[2]" the commission of an offence.

With the AIPAs acceptance of the Ad hoc Committees report, the focus of effort now shifts to individual irrigation districts.

[2]Section 215, EPEA

Dairy farm effluent being pumped into an irrigation canal. The new requirements in EPEA to "report" substance releases requires irrigation district staff to report any substance release or spill that may harm the environment, or effect human health and safety or property.

The materials produced by the AIPA are in a format that allows them to be adopted and amended by individual irrigation districts to represent their individual circumstances. In addition to the reports, the AIPA also hosted an initial training seminar for elected officials and irrigation districts management personnel. The immediate task in front of irrigation districts will be adapting to new approval requirements for some specified activities, and developing release reporting and emergency response procedures to deal with the potential for environmental damage to take place within an area under their control.

"The AIPA is satisfied that a practical, grass-roots approach to environmental compliance offers us the opportunity to show leadership and demonstrate stewardship for the natural resources entrusted to our care," says Stan Klassen, executive director of the association. "Our irrigation districts are prepared to do their part in protecting and enhancing the environment and in ensuring that the benefits of water management and irrigated agriculture are enjoyed by future generations of Albertans."

For more information about the specifics of the AIPAs reports please contact Mr. Stan Klassen, Executive Director, Alberta Irrigation Projects Association, P.O. Box 278, 1210 - 36 Street North, Lethbridge, Alberta, Canada T1J 3Y7. Telephone (403) 328-3063 or Fax (403) 327-1043. ■

A GEOGRAPHIC INFORMATION SYSTEM FOR THE EASTERN IRRIGATION DISTRICT

Editor's Note: This is the first of 3 parts regarding the GIS of the Eastern Irrigation District.

Part 1 — A High Tech Approach to Integrated Planning

The Eastern Irrigation District (EID) is nearing the end of its first year of experience in implementing a Geographic Information System (GIS). The decision to implement a "high tech" solution for integrated planning makes it possible for the EID to respond promptly to complex water and land management issues, now and into the future.

The EID GIS is based on newly acquired aerial photography. The air photos exist in "hard copy" format as well as digital images in the GIS. In addition to the photographic images, the photos were the basis for computing contours for the entire EID region. They have also been vital in "tracing" the location of all canals, drains, reservoirs and other water bodies in the EID. This data has also been combined with other facilities in the region, in particular with oil and gas facilities that crisscross the EID irrigation system.

Running the GIS has exposed the EID to the leading edge of desktop computer technology. "To date the computer package to run the GIS has cost about $30,000" comments Mark Porter, the EIDs GIS guru. "Data for each township requires disk storage of about 200 megabytes. This means that our current data storage requirements are now in excess of 15 gigabytes. This was unheard of in desktop applications just a couple of years ago." The EIDs computer system is a DELL 486 DX2-66 MHZ tower with 32 MB of system RAM, 17 GB of external SCSI data storage (in a separate tower), a 17" high resolution colour monitor with a graphics accelerator card working under DOS 6.2 and Windows for Workgroups)™ 3.11.

The GIS is already demonstrating benefits. The aerial photographs, contours and parcel mapping data are being used as part of the design process for projects funded under the Irrigation Rehabilitation and Expansion Program, the EIDs Capital Works Program and some maintenance projects. The full colour maps have become the standard for the review and approval of projects by the district and for meetings with landowners. The EID has done little to advise its water users of the availability of the data and the photos, but word-of-mouth is already creating a significant demand for map products.

Mark Porter demonstrates EID's geographic information package on 486 Dell computer.

As more and more of the district's technical data is added to the GIS, its long-term value will increase. A major advantage of this "high tech" solution to information management is the ability to display and visually evaluate many of the land components that affect decision making.

For further information or a demonstration of the EIDs GIS please contact Mark Porter, Eastern Irrigation District, P.O. Bag 8, 550 Industrial Road, Brooks, Alberta, Canada T1R 1B2. Telephone (403) 362-1400 or Fax (403) 362-6206. ■

WHO'S TELLING THE IRRIGATION STORY?

"I'm looking for some information on irrigation."
"Can you tell me how much water is used by irrigation?"
"Can I get a breakdown of all the irrigation acreages?"
"What are the cropping patterns under irrigation?"
"How much money does irrigation generate?"
"What is irrigation's impact on soil and wildlife?"
etc. etc.

The questions keep on coming but the bigger question is, "where is the answer coming from?" "I can't believe the dramatic increase in inquiries that we have received in the last year or two," says Wally Chinn, head of the farm irrigation management section for Alberta Agriculture, Food and Rural Development (AAFRD). "In attempting to respond to all of the inquiries, it has become quite apparent for some time that there has been a real dearth of information available to the general public about the irrigation industry in Alberta." Chinn indicates that the growing public concern with the environment and such issues as further develop-

ment of water storage structures seems to have fuelled the public's interest in the effects and contributions of irrigation.

Although there are many bits and pieces of factual, technical and statistical information around, it has been quite scattered and ad hoc in a lot of respects. This has been particularly prevalent in the school settings when resource materials for instruction has been sought by teachers. In fact, some of the printed material available has been more global in nature and unfortunately negatively biased against irrigation.

The young students of today become our leading citizenry of tomorrow and so they are an important group to be informed correctly. "That is one of the reasons why we embarked on the production of an 'entertaining' but informative poster like *Irrigation In Our Environment,*" says Chinn. (See Figure 1.)

This cartoon-like poster was developed by AAFRD in conjunction with the Soil and Water Conservation Society through funding from the Recreation, Parks and Wildlife Foundation. The posters are 280 mm x 430 mm (11" x 17") in size, printed on heavy-weight bond, suitable for colouring on the picture side and with reference codes to specific information printed on the reverse side, in appropriate language for the age group. The printed information gives an overview of the source, conveyance and application of irrigation water and how new technology is improving the way in which water is managed. In addition, information is provided to illustrate some of the secondary benefits from the use of the water.

This product is the latest in a series of such posters that are available and touch on such additional subjects as:

"Water Erosion Prevention"
"Wind Erosion Prevention"
"Land Reclamation—Pipelines"
"Rangelands For All Of Us" and
"Sustainable Agriculture"

All of these posters are available in the same format and can be obtained through AAFRD. The "Irrigation In Our Environment" poster is also available through all irrigation branch offices as well as the Alberta Irrigation Projects Association office. The posters are allowed to be copied as long as they are copied in their entirety with the source acknowledged. To complement these, there are elementary puppet shows developed as well.

There is no doubt that there is much more that the irrigation industry needs to do to get its information together and available for distribution. Educating young school-aged children is just one step in that all important process as resource management issues draw much more public attention.

For further information, please contact Wally Chinn, Irrigation Branch, Alberta Agriculture, Food & Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. Telephone (403) 381-5864. ■

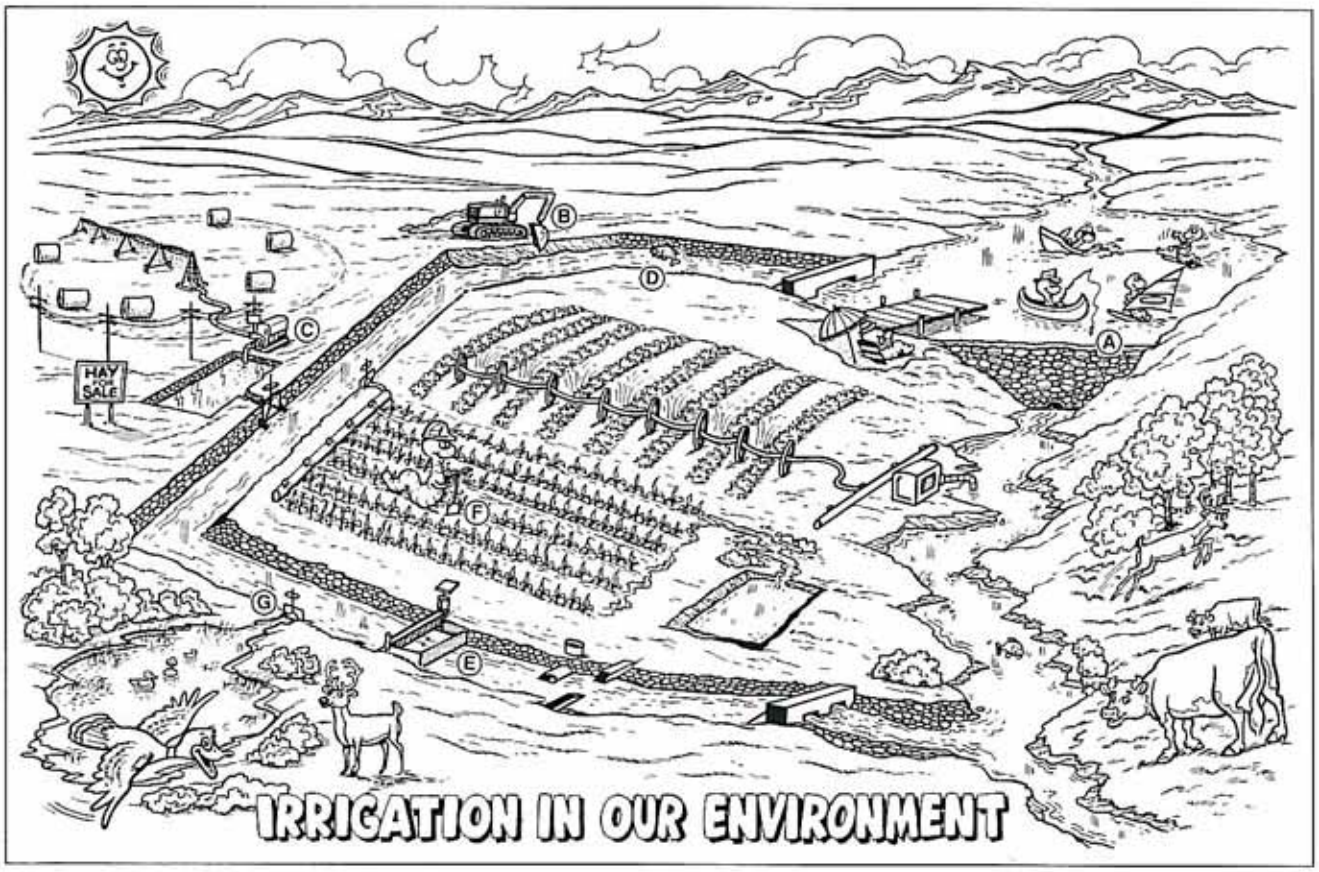


Figure 1

NEW COATING ON THE HORIZON

How do you stop corrosion on exposed metal parts on irrigation structures? Although there is no simple answer, there is a new product on the market that may provide the protection required and ensure extra years of serviceable life over traditional painted services. ArmorThane® is a polyurethane coating that when sprayed on exposed metal parts, drys to a tough flexible waterproof coating. Precon Precast Products Ltd. is using the product to coat exposed metal parts on precast structures being delivered to the Western Irrigation District.

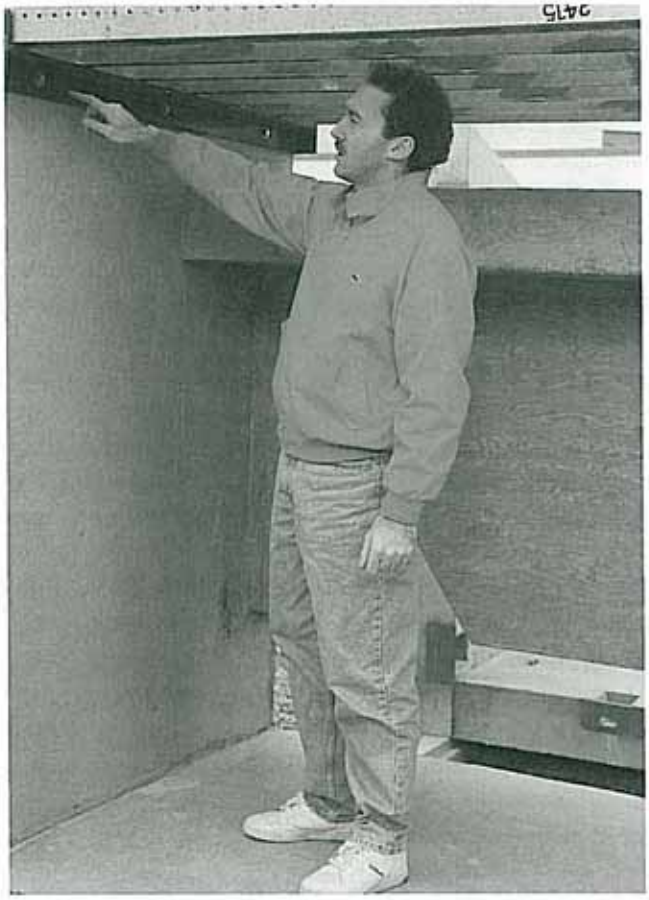
Metal parts on irrigation structures are often subjected to a combination of underwater and atmospheric exposure. Portions of the metal may be completely submerged and the remainder exposed to direct sunlight, thus imposing exacting requirements on the protective coating. Steuart Scott of Scott Industries, the supplier of ArmorThane® says "In fact, this intermittent exposure is the most corrosive of any commonly encountered on structures because both oxygen and moisture are in plentiful supply."

The first requisite for coating iron or steel is proper cleaning of the surface. Some coatings are more tolerant than others to the presence of foreign matter such as rust, scale, dust or dirt. Nearly all coatings will benefit in durability by application to a clean surface, and in many cases it will mean the difference between success and failure of the coating job.

The choice of cleaning method depends on a number of factors. Factors to be considered are: the size and shape of the object, whether it can be removed and done in a shop or if it's going to be periodically underwater. Sand blasting is the preferred method says Scott. Wire brushing, scraping and cleaning with a rotary grinder are acceptable if the job isn't too large states Scott.

ArmorThane® is applied as a plural component spray using isocyanate, polyol blend resin and chain extenders. The coating is applied continuously in multiple passes until the desired thickness is achieved. "Usually we spray the coating on to a depth of 2 or 3 mm and it costs between $50-60 per square metre," says Scott. ArmorThane® is available in many colors and can be mixed to suit a certain shade. The coating begins setting up in a couple of seconds, is tack free in 3-5 minutes and can be walked on in 30 minutes. Total curing occurs in 24 hours.

The coating is very resistant to abrasion and can be used where severe wear is a problem. If the coating is damaged, ArmorThane® has produced a patch kit that can be used to repair small abrasions. "The physical properties of ArmorThane® are impressive" says Svat Jonas, P. Eng. research engineer with the irrigation branch. "It has an elongation factor of 250-300% and remains flexible at very low temperatures. I would like to begin evaluating the product for repair of cracked concrete slip-form lining."



Steuart Scott points to angle support bracket that has been ArmorThane® coated.

For more information please contact Steuart Scott, Scott Industries, 2, 3205 - 6 Avenue North, Lethbridge, Alberta, Canada T1H 5C1. Telephone (403) 329-3218. ■

THE WATER HAULER'S BULLETIN

Designed to provide the operation and management personnel of Irrigation Districts with items of interest in their line of work. Comments are welcome. Please contact Duncan Lloyd, editor, at Area Code (403) 381-5539, Lethbridge.

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