the WATER HAULER'S BULLETIN

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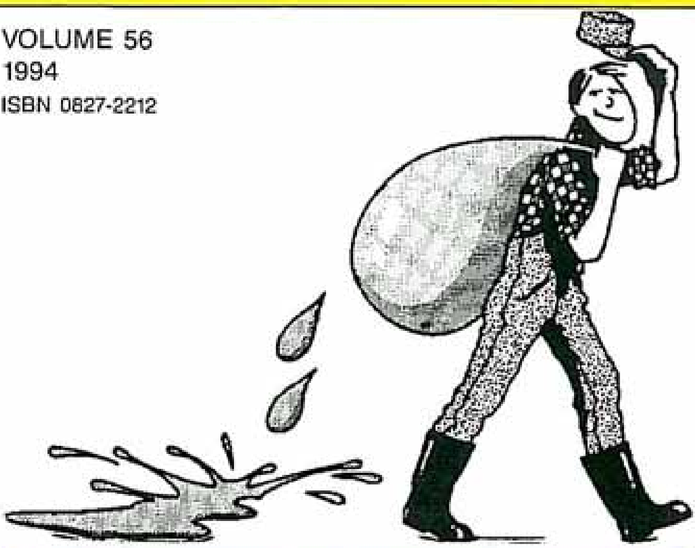

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NEW SELF-PROPELLED SCREEN SOLVES LID HEADACHE

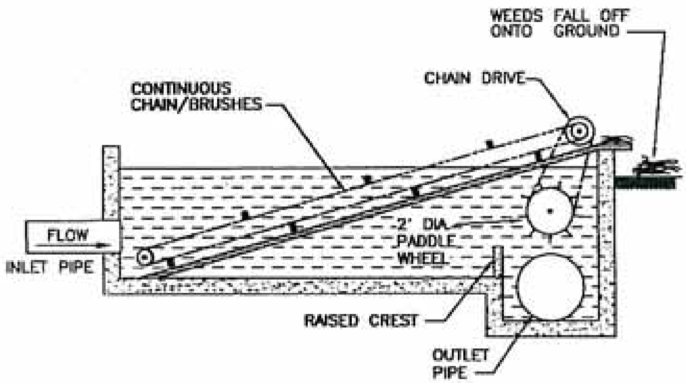
Like everyone else, the Leavitt Irrigation District (LID) runs into aquatic weed problems that plug irrigation equipment. Some are very serious, while others are less so. Bart Leavitt, district board chairman, feels their new self-propelled travelling screen has solved one major headache.

The screen was built to provide additional screening for a buried pipeline off the main canal. Floating vegetation was getting through the coarse screen in the canal and plugging the finer screen in front of the pipeline. "Often we had to clean the fine screen three times a day. It's hard work and time consuming," states Leavitt.

Leavitt remembers seeing various types of commercial screens in his travels around southern Alberta irrigation systems, but opted to design his own. A metal fabrication shop in Cardston (Southern Equipment Ltd.) was contracted to build the prototype.

The galvanized unit was placed in a rectangular reinforced concrete box structure. The catenary-type chain drive brush screen is driven by the paddle wheel. When flows are unrestricted the wheel remains submerged and

Grates have been removed to show brushes.



does not turn. The paddle wheel only begins turning and activating the brushes, says Leavitt, as the screen becomes plugged and insufficient water volumes exposes the wheel.

As the continuous chain of loaded brushes travels up and over the top, the weeds fall off or are removed by the scraper. The weed pile that accumulates on the ground adjacent to the structure must be manually forked away, says Leavitt.

Leavitt feels the one big advantage their screen has over many others is that it isn't continuously turning when there isn't a weed problem. Our screen will last a lot longer than some of the other continuous turning types. Maintenance after one full season has been nil and that's the way Leavitt likes it. We don't need equipment that requires a lot of special attention and repairs concludes Leavitt.

For more information, please contact Bart Leavitt, District Board Chairman, General Delivery, Leavitt, Alberta, Canada T0K 0K0. Telephone (403) 653-2397. ■

WHAT'S NEW IN IRRIGATED CROP PRODUCTION?

If you have asked this question in the past and couldn't come up with anything new, then you won't want to miss the "Innovations In Irrigated Crop Production" seminar. This one-day seminar is being held in Taber on November 29, 1994 and will be highlighted by four internationally known speakers.

Have you ever thought about starting your pivot and letting a computer and space satellites operate it? Well that could be the way of the future if Ian McCann, of Precision Irrigation Control Systems, has his way. McCann and his associates have been developing the computer programs and the satellite linkages to tie an irrigation system into a precision farming operation.

So, what is precision farming and what makes it of interest to the farm? Precision farming starts with detailed mapping of the farm. Using a Global Positioning System (GPS), every square metre of the farm is pinpointed with an exact location and elevation. The farm's entire line of equipment is attached to a GPS receiver. Exact measurements of seed, fertilizer, chemical and yield are taken for every metre of the field. Once this information is collected and a yield map constructed, the farm operator can make adjustments to the operation by changing inputs throughout the field. This may mean adding fertilizer in some areas, extra seed in others or spot spraying bad areas in the field.

Equipment for precision farming such as sprayers and seeders is being developed all over North America but until now, no one has done anything with the irrigation system.

The system McCann has developed requires a pivot to have two to three times as many sprinklers as a normal system. Each of the sprinklers is wired to an electric solenoid valve which can start or stop the sprinkler as required. This whole system is then wired to a central computer which controls the speed of the pivot and which sprinklers are operating.

Just think, you can now run your pivot through that low spot and have the sprinklers in that area shut off while the rest of the system keeps operating. Or, how about irrigating the side of a hill without worrying about runoff and still getting the required amount of water into the soil?

Roger Hohm, one of the seminar organizers says, "This may be of interest to Irrigation District Board Members and Managers as the way they deliver water may have to change in the future."

For more information on this futuristic idea you will have to come to the "Innovations In Irrigated Crop Production" seminar in Taber on November 29, 1994. If you need more information on the seminar, contact either Roger Hohm (381-5856) or Rob Dunn (381-5119) in Lethbridge, or Jack Payne (223-7909) in Taber. ■

DETERMINING TRENDS IN SOIL SALINITY

Soil salinity in semi-arid environments is a major concern to the sustainability of agriculture worldwide. Soil salinity on irrigated and rainfed land in southern Alberta is no exception. Although salinity occurs naturally, agricultural practices have caused expansion of soil salinity. On irrigated land, seeping canals and application of water in excess of crop requirements has caused the water table to rise, bringing salts to the soil surface. The widespread use of summerfallow on rainfed dryland results in percolation of excess rainwater through the soil root zone, which surfaces downslope and causes the development of saline seeps.

Various studies have attempted to address the state of change in soil salinity over time. Some have attempted to determine differences in the extent of salinity over time but the technology used to map saline areas changed, making direct comparisons unreliable. Most studies have addressed specific controls for soil salinity, such as lining of irrigation canals and subsurface drainage on irrigated land, and use of deep rooted alfalfa and continuous cropping on rainfed land. Specific research shows that these controls can be effective, but there is limited information as to how salinity is changing in general.

According to Frank Hecker, supervisor of land classification with Alberta Agriculture, Food and Rural Development (AAFRD), "We generally know what will and will not work to control soil salinity, where they will work and why. We do not know, however, what broad changes in the extent and severity of salinity that is occurring at present and why." Having this information allows better targeting of resources devoted to controlling soil salinity. For this reason, a long-term salinity mapping and monitoring program is being established by AAFRD as part of the newly developed business plan. The program has specific objectives of determining the change in the severity and extent of soil salinity on irrigated and rainfed land. The focus is on change, rather than existing levels.

The monitoring program will be conducted in representative irrigated and rainfed areas in southern Alberta. Salinity maps published in 1991 for irrigated land and maps being produced for rainfed land as of 1993 will provide baseline salinity information for the program. A number of rainfed and irrigated sites will be randomly selected based on the existing salinity maps. About 60 rainfed and irrigated sites will be mapped each year for several years to form the baseline data. In subsequent years the saline areas will be remapped to determine if any change has occurred.

EM-38 electromagnetic conductivity meter being pulled across field measuring soil salinity.

Saline areas will be mapped using a combination of soil sampling and an automated EM-38 electromagnetic conductivity meter. The soil samples are used to measure the change in severity of salinity and to calibrate the EM-38 readings to standard units of salinity. Maps produced using the EM-38 will be used to determine any change in extent of salinity.

Over the long term, we will get some answers as to how salinity is changing over time.

The advantage of mapping and then remapping over several years is that the effect of any one year of unusual climate on soil salinity, such as the very wet 1993, will be dampened out over longer term.

For more information please contact Frank Hecker, Supervisor of Land Classification, Land Evaluation and Reclamation Branch at (403) 381-5890, or Don Wentz, Soil Salinity Specialist, Conservation and Development Branch at (403) 381-5862; both of Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. Frank is coordinating mapping on irrigated land and Don is coordinating mapping on rainfed land.

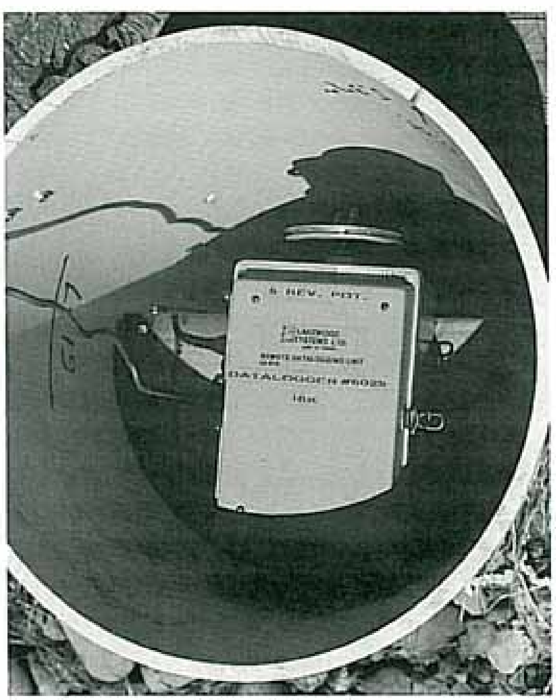
IRRIGATION BLOCK STUDY

True to the pioneering spirit of its early irrigators, Alberta is still home to innovators that plan for the future. Alberta's long-standing position as leader in large scale irrigation led naturally to a commitment by the Alberta Water Resources Commission, irrigation branch, land evaluation and reclamation branch, Bow River Irrigation District (BRID) and the Lethbridge Northern Irrigation District (LNID) to financially support a multi-agency "block study."

An "irrigation block study" says Jack Ganesh, P. Eng., one of the study's project leaders, "can be simply defined as monitoring the amount and quality of water entering and leaving an irrigation block and returning to the river. In addition supplementary data such as weather, farm inputs and ditchrider practices are factored into the equation."

The study involves five components:

1. To collect field data to calibrate the Irrigation District Model (IDM) for both irrigation districts at their present level of on-farm and district management.
2. To test the accuracy of the IDM as presently calibrated against actual field data collected for an irrigation block.
3. From the detailed block study, evaluate the irrigation district's present water allocation criteria.
4. Develop and test new management strategies to manage inflow, reduce return flows, and improve on-farm use.
5. Determine the quality of water entering the block from the main canal, from drains coming into the block, and drain water originating within the block.



Datalogger shown inside stilling well.

The primary objective is to calibrate the existing IDM computer model and use it to estimate return flows in all the irrigation districts. "The blocks" says Ganesh "allow us to work with the districts to develop and test new water management strategies to handle inflow, reduce return flow and improve on-farm water use. Surface water quality which is always an environmental concern, is being monitored to evaluate the effects of irrigation."

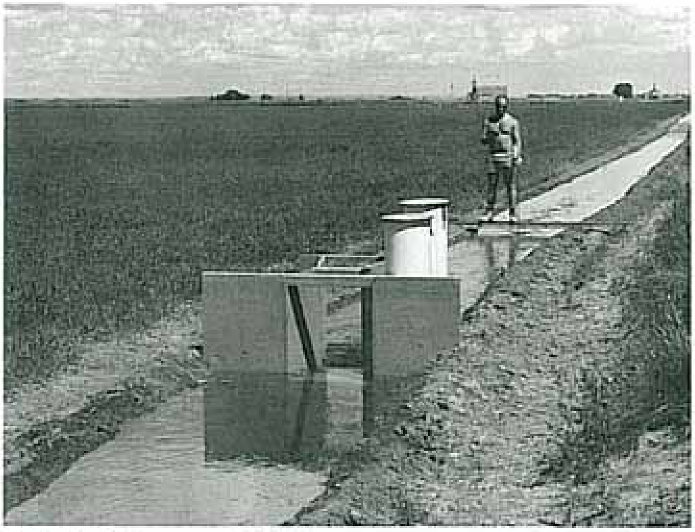
The results of this study will be pivotal to the review of water licences for irrigation districts by the year 2000. In 1990, Alberta set limits for irrigation expansion of the irrigation districts based on limiting water supply and losses in the districts' conveyance systems. These limits were set using the best available water supply, diversion, return flow and other information. However, the limits are subject for review by the year 2000, says Ganesh. A district acreage limit can be raised and the water licence revised if the Province is satisfied that this will not increase the risk to the farmers and sufficient water is available.

Return flow is the largest loss component, so most of the extra water is expected to come from its reduction. There is no reliable return flow information available and the cost of obtaining it is prohibitive (Irrigation Hydrometric Study, 1993). A less expensive method is to measure flows in major drains and to use the IDM for estimation of the return flows in smaller unmeasured drains. The IDM was developed by Alberta Environmental Protection.

"The study area in BRID requires a great deal of instrumentation to measure inflows and outflows for both the delivery canals and on-farm. One half of the block is irrigated by gravity and the other half by sprinkler. Sprinkler irrigation is again divided equally between side-roll systems and centre pivots. For gravity fields, modified cutthroat flumes measure flow in each head ditch. Return flows from fields are monitored at existing drop structures located in the district's drains. Fifteen dataloggers in stilling wells monitor canal and drain flows. Flows in farm head ditches are measured with 23 cutthroat flumes and 19 dataloggers. In addition, there are 10 flow meters installed on sprinkler systems," states Ganesh.

The LNID block is served essentially by a concrete lined canal, and sprinkler irrigated except for one small parcel. Six stations, using dataloggers in stilling wells (one includes a broad-crested weir), monitor inflows and outflows in the canal system. Propeller meters connected to the downstream end of the farmer's pump monitor on-farm usage.

"Surface water quality monitoring is being done at 6 sites within and 3 sites outside the BRID block," states Graeme Greenlee, P. Ag., another of the project leaders. Two sites are provided with automatic water samplers and the others



Technologist Lawrence Schinkel measures accuracy of Cutthroat Flume.

are manually sampled. In the LNID block, which started a year later, only 2 surface water quality sampling sites are being monitored.

"Surface water samples are collected weekly and analyzed for pH, electrical conductivity (EC), soluble cations (calcium, magnesium, sodium, potassium), soluble anions (sulfate, chloride, carbonate, bicarbonate, nitrate, phosphate), six trace elements (arsenic, cadmium, copper, lead, mercury, selenium), total and fecal coliforms. Sodium absorption ratio (SAR) and total dissolved solids (TDS) are calculated," concludes Greenlee.

Inputs for the model such as soil type, spring soil moisture, crop type, method of irrigation for each irrigation unit and weather data are collected electronically or manually. "We are poised to test the model with data from the BRID block," states Ganesh. "Hopefully, with technical support from Alberta Environmental Protection, we will have our first shot at calibrating the model soon," he adds.

"The overall assessment so far is that the study is going fine and will be completed before 1998. Problems have arisen but we either solved them or worked around them. The two irrigation districts are excellent partners — having built all the weirs and flumes, supplied and installed stilling wells and accessories. The operating staff are very supportive and most farmers in the blocks are very cooperative," concludes Ganesh.

For more information please contact Jack Ganesh, P. Eng. [(403) 381-5869], Bob Riewe, P. Ag. [(403) 381-5868], both of the Irrigation Branch; or Graeme Greenlee, P. Ag. [(403) 381-5893] of the Land Evaluation and Reclamation Branch; all of Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. ■

NO MORE ICE CREAM PAILS

If you have ever used empty ice cream pails to plug off outlet pipes on a border dyke irrigation system, you know how frustrating it can be says Eastern Irrigation District (EID) divisional superintendent, Jim Meador. "They are hard to get on without getting your fingers pinched, won't seal properly, crack easily and are blown away by the wind." Fortunately for Meador, a farmer/inventor named Ron Hallman was experiencing the same frustrations.

In his farm shop, Hallman began what he describes as the "trial and error method of invention." "I had an idea for a gate that would fit on the upstream end of a pipe but when I built the first prototype models I couldn't get them to seal properly." Persistence paid off for Hallman for soon he had a metal bolt-on, spring-loaded gate frame with a plastic gate having no seals that was watertight.

The one model will fit any 200-250 mm OD pipe whether it is steel or PVC. It's important though, says Hallman, that the front edge of the pipe that the plastic gate seats against is smooth. The coil spring holds the gate in either the fully open or closed position.

Operation of the gate is as easy as hooking a shovel under the lifting bracket and giving it a slight tug. Closing it is just as easy. "Both operations are performed from the bank with no need to get your feet wet," says Meader. I can set 25 gates in less than 20 minutes and this includes the time it takes me to walk between the border dykes.

Hallman has successfully marketed his gate commercially for just over a year. Its low price of $36.00 and ease of operation makes the gate valve an attractive alternative to the problems associated with the four-litre ice cream pail.

For more information please contact Ron Hallman, Box 37, Rainier, Alberta, Canada TOJ 2MO. Telephone (403) 362-3870. ■

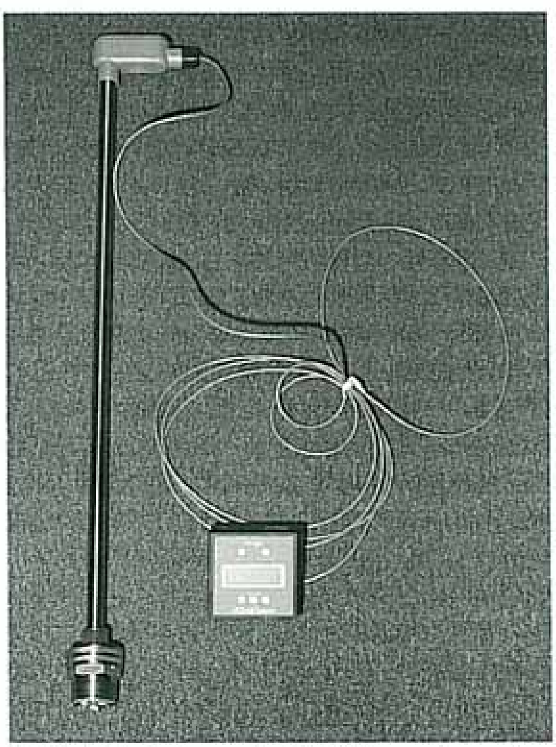
Ron Hallman demonstrates ease at which gate can be opened and closed.

SEAFLOW HOT TAP INSERTION METER

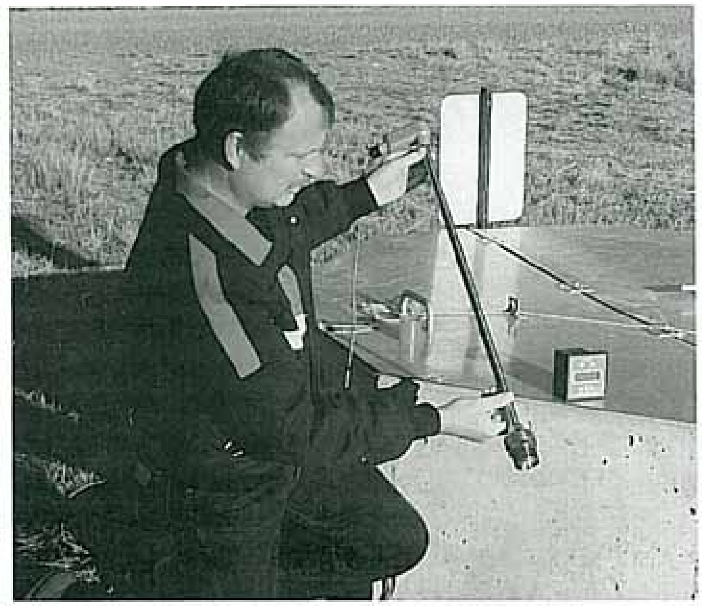
Steve Topping, P. Eng., district engineer with the Bow River Irrigation District (BRID) has been looking at testing flow meters for measuring flows in their irrigation pipelines for some time. He thinks he's found one that suits their needs and bank account. The meter is a Seaflow IP series insertion meter.

"The BRID's problem" says Topping, "is one of having a lot of pipelines and not knowing at any given time just how much water is being diverted into them. Some of our pipelines serve over three-thousand acres. Operation of the main canal and other major works becomes very difficult if you can't measure what's being diverted through the pipelines. Another problem for our ditchriders is not knowing whether they have a sufficient volume of water in a pipeline to prevent short-changing the farmers currently irrigating."

The Seaflow IP series of flow meters are insertion type meters which use a small rotor with jewel bearings to determine the rate of flow in a pipe. Inside the pipe, the rotor spins in the flow stream at a specific depth set according to the specifications. As it spins, a small magnet in each rotor blade passes a Hall effect sensor buried inside the meter body. This solid-state device is sensitive to magnetic fields, and switches every time a magnet passes. The result is a series of square-waves which can be converted by the remote electronics into rate readout and other types of information. Seaflow reports that the meter has an accuracy of ± 1% of full range. The IP meter and remote recorder can be installed in any size pipe from 50 mm to 1200 mm and costs $1645.00.



Seaflow IP Series flow meter attached to remote recorder.



Steve Topping holds Seaflow meter that needs only 12-volt marine battery to power it.

Quite often says Topping, "One of the problems with metering at remote sites is the cost of bringing in grid power. The Seaflow meter is powered by a standard 12-volt marine deep-cycle battery and needs no other power source. The power draw is so little that a fully-charged battery will run the meter and recorder for the entire irrigation season."

Installing the meter through a 50-mm ball valve allows the meter to be installed or removed from the pipeline while still under pressure (hot tapped). "Our ditchriders can remove the meter to check and clean it while the pipe is in operation. Seaflow has a handy rotor repair kit for less than $100.00 but to date we haven't had to use ours," states Topping.

"Our meters are housed in a pipe well to protect them from the elements and vandalism. The recorder and the 12-volt battery are attached by brackets near the top of the well so they can be easily read and removed," states Topping.

In conclusion says Topping, "Our ditchriders are very happy with the meter and are requesting that we put them on all pipelines. They seem to be a valuable tool for them to manage their individual pipeline systems and to assist in balancing water requirements in the Main Canal."

For more information please contact Steve Topping, P. Eng., District Engineer, Bow River Irrigation District, Box 140, Vauxhall, Alberta, Canada T0K 2K0. Telephone (403) 654-2111. ■

INFRARED PHOTOGRAPHY PROVIDES VALUABLE RESOURCE MANAGEMENT TOOL

The Irrigation Act requires each Irrigation District to maintain maps and plans of the acres on their assessment rolls classified "to be irrigated."

Keeping accurate records of the location of the 353,000 irrigable acres within the St. Mary River Irrigation District (SMRID) has proven to be a challenge. This is due to the ever-changing trends in irrigation methods, the addition of new acres and changes due to ditch relocations or eliminations because of rehabilitation, says Derick Jaffray, land administrator for the district.

To provide better irrigation assessment information and an update of the 1979 true color stereo photos for engineering purposes, the district had the first infrared photos flown in 1987. Photos taken with infrared film detect infrared light which is reflected by spongy mesophyll tissues. Therefore, the lusher the growth the greater the reflection. A field of summerfallow would show no reflected infrared and would appear blue-green, dryland crops reflecting less spongy mesophyll tissues appear light orange, but due to abundant moisture irrigated crops appear bright red.

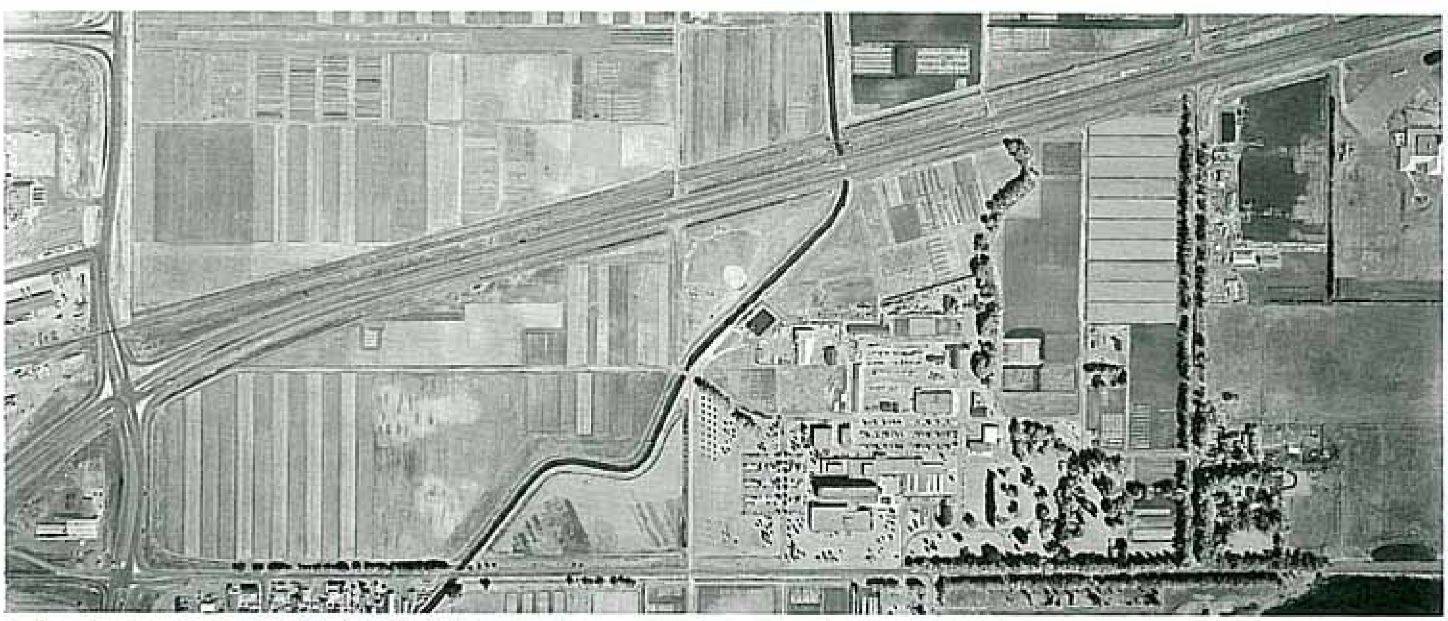
The advantages of the infrared photos over the true color photos were immediately obvious in labor savings. By scaling from the photos, irrigated areas could be accurately identified and compared to the district's classification records eliminating the need for costly and time-consuming field checks. Since sets of photos are kept at both district offices, Lethbridge and Bow Island, staff and water users find it convenient to have on hand visual information to handle inquiries such as canal and farmstead locations, seepage and salinity areas, roads, drainage areas, assessment and subdivision inquiries, all without leaving the office.

Realizing the value of this information, the Board has requested that the district be reflown every five years to provide an update and a historical base of information. New flights were scheduled for 1993, however the wet spring and summer were not conducive to indicating irrigation patterns since many farmers didn't irrigate crops and irrigated and non-irrigated areas were indistinguishable. New photos were taken in July of 1994 at the height of the irrigation season and have provided great results.

The first set of photos had been shot at a scale of 1:10,000 then photographically enlarged to 1:7500. "SMRID chose not to have the 1994 photos enlarged due to loss of clarity and minor scale distortion as a result of the enlargement process," states Jaffray.

The air photos also serve another purpose. They provide invaluable assistance in the preparation of preliminary engineering reports for the Irrigation Rehabilitation and Expansion Program (IREP). The photos provide a ready source of information and thus require less time in the field to assess various proposals. "Field work will always be required, however the air photos allow some options to be investigated with less field work and thus a cost savings to the IREP program and water users," concludes Jaffray.

For more information please contact Derick Jaffray, St. Mary River Irrigation District, Box 278, Lethbridge, Alberta, Canada T1J 3Y7. Telephone (403) 328-4401. ■



Darkened areas would appear bright red if this was in color.

CONDITION EVALUATION OF REHABILITATED PROJECTS

12 Districts Completed — One to Go

In 1990, at the request of Irrigation Council, the planning staff of the irrigation branch, Alberta Agriculture, Food and Rural Development started to collect field data to evaluate the present condition of all rehabilitated projects built since 1969, under the Irrigation Rehabilitation and Expansion program.

Since 1969, the Alberta Government and the 13 irrigation districts have invested in excess of 471 million dollars under the Cost Sharing program for the rehabilitation of their existing water delivery systems in southern Alberta.

Since 1990, final reports have been completed and presented for 11 irrigation districts (Aetna, Leavitt, Mountain View, Ross Creek, Magrath, United, Taber, Raymond, Lethbridge Northern, Western and St. Mary River). The field work for Bow River Irrigation District (BRID) has also been completed and the final report is expected to be completed by January 1995 for submission to Irrigation Council and the management of BRID. The field work for Eastern Irrigation District is scheduled to start this fall and will be completed in the fall of 1995.

This has been a huge task says project leader, Zafar Iqbal, P. Eng. "We visually must inspect every project and this can only be done when the water is out of the system in early spring and late fall. During the winter most canals drift full of snow and it's impossible to inspect them. This leaves us very short windows to complete our inspections," states Iqbal. To ensure consistency and continuity of the evaluation throughout the districts, Allan Herbig, P. Eng., section head, has had Zafar Iqbal, P. Eng. and Brian Taylor, technologist do all the field inspections, data compilation and report preparation.

The present condition of the rehabilitated projects within the above-mentioned districts is rated as "fair" to "very good" with a few isolated problems. Some of the problems typical to each district are firstly, a never-ending problem of erosion, siltation and vegetative growth in canals and around irrigation structures; secondly, poor or no vehicle access; thirdly, the trampling of canal systems by livestock; and fourthly, exposed polyethylene liner. We found that in some cases, better access along canals in some districts would alert district personnel to potential problems developing within their systems.

Arrow points to bank erosion caused by cattle trampling as they come to drink.

For more information please contact Zafar Iqbal, P. Eng. or Brian Taylor, Planning Technologist, both of the Irrigation Branch, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. Telephone (403) 381-5173. ■

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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