the
WATER HAULER'S BULLETIN

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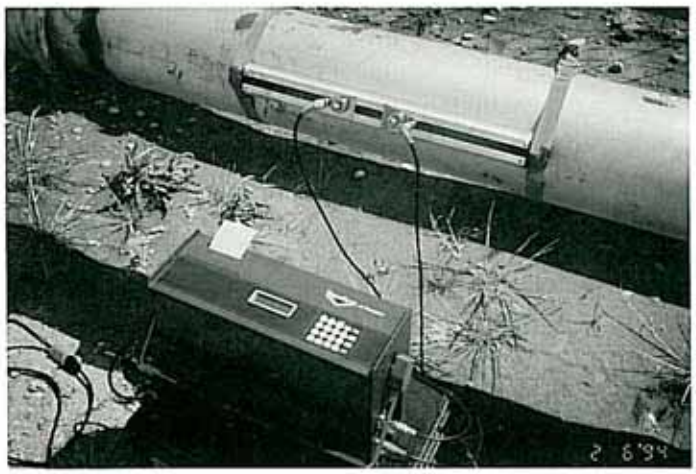
UTILITIES SUPPORT IRRIGATION SYSTEM EVALUATION PROGRAM

The irrigation branch of Alberta Agriculture, Food and Rural Development has been conducting system evaluations for 13 years," says Gord Cook, P. Eng., irrigation specialist. Over 500 farm pumping units and irrigation systems have been tested since the program was first implemented. Now, thanks to the contributions of both Canadian Western Natural Gas and TransAlta Utilities, the testing work within these system evaluations is becoming much easier to do and the opportunities for carrying out a variety of testing applications has significantly increased.

One of the major measurements taken during a system evaluation is the flow from the pump through the system. In the past, flow measurement was made using a Collins Flow Gauge. This instrument required small holes to be drilled in a system supply pipeline for installation. "In 1994, we began using the portable ultrasonic flow meter purchased for us by the two utility companies," says Cook. This meter clamps directly to the outside of pipelines and will make it easier to conduct system evaluations. No holes in pipelines have to be drilled and the systems do not have



Ultrasonic flow meter is easily clamped onto a pipeline (no drilling required).

to be shut down to install the meter. Its flexibility will enable more flow readings to be taken at various operating conditions and locations within an irrigation system.

A system evaluation has many components.

In addition to measuring system flow, accurate pressure gauges are installed on the suction and discharge of the pump as well as at critical points on the irrigation system to verify operating pressures. Individual sprinkler operating pressures are checked with a pitot tube. The energy consumption of the power unit is measured. For internal combustion engines, the pump speed is measured with a strobe light. Once all data is gathered, the overall pumping unit efficiency is calculated. All of the data collected is compiled in a short report and any problems or recommendations for improvement are identified. Irrigation specialists then use this information to make more detailed recommendations in consultation with the owner of the irrigation system.

Canadian Western Natural Gas and TransAlta Utilities both recognized the value of the System Evaluation Program and consequently have very generously made this contribution to the enhancement of the program. Cook says, "One of the greatest benefits of the new equipment is the ease in which it can be used to measure, monitor and record pipeline flows over time, whether the pipeline is downstream of a pumping unit or used in some other application such as a gravity flow line." Because of the "on-board computer" within the meter system, varying flows can be automatically recorded to determine increasing, diminishing, maximum, minimum and average flows.

A report summarizing the activities of the system evaluation program, from 1981 through 1993, has been compiled and is available. Sections of the report detail program activity, test procedures and interpretation of test results. Anyone interested in obtaining a copy of the report may contact the Irrigation Branch, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7 or Gord Cook, Irrigation Specialist, Box 640, Taber, Alberta T0K 2G0 or telephone (403) 223-7908. ■

MANAGING FERTILIZER AND PESTICIDES TO REDUCE INPUT COSTS AND PROTECT WATER QUALITY

Farmers can adopt many practices that will reduce or prevent the transport of pesticides and nutrients into surface water and groundwater. Scientists with Alberta Agriculture, Food and Rural Development (AAFRD) are currently developing, testing and refining these practices for Alberta conditions. However, enough information is currently available to allow farmers to take a pro-active stance to protect water quality now. In some cases, these practices can reduce input costs, while also preserving surface water and groundwater supplies for humans, wildlife and aquatic organisms. Some of these protective measures are summarized below.

1. Minimizing Leaching, Runoff and Soil Erosion

Farm chemicals can be leached to groundwater as water percolates down through the soil. Surface runoff can transport chemicals into surface water. Methods to reduce movement via leaching or runoff include continuous cropping, perennial forage, and irrigation scheduling. Methods which distribute water more slowly and evenly reduce leaching and runoff by allowing plants to use the water more efficiently. Such methods include the frequent application of small amounts of water, and snow trapping with alternate stubble heights.

Many farm chemicals, such as phosphorus and certain pesticides, become strongly attached to soil particles, and can move to surface water during soil erosion. Reduced tillage and other methods to reduce soil erosion will reduce contamination of water by sediment.

Surface water can be partially protected from runoff by using grassed filter strips. In areas where cattle graze, surface water bodies can be protected by fencing or providing alternate water sources. Pesticides, liquid and solid manure should not be applied within 30, 10 and 5 m of a water body, respectively.

2. Reducing Nitrate Leaching

Nitrate from commercial fertilizer and manure dissolves easily in water, so it is susceptible to leaching to ground-

Proper application equipment minimizes chemical leaching and runoff.

water. Ross McKenzie, a soil fertility specialist with the soil and crop management branch, suggests one of the most important ways to protect groundwater is to test the soil for nitrogen levels to determine optimum nitrogen fertilizer or manure application rates. Application rates should be based on crop requirements and realistic yield expectations. Including legumes in a crop rotation will reduce the need for fertilizer. Nitrogen release from legumes should be included in soil testing calculations and fertilizer recommendations.

Ideally, fertilizer and manure should be applied near the time of peak crop demand. When fertilizer is applied in the fall, waiting until just before the soil is frozen will reduce nitrate loss. Manure should not be applied to snow, frozen ground, or excessively wet or dry soils. Fertigation (fertilizing through an irrigation system) allows split applications which can reduce nitrate loss.

3. Reducing Pesticide Leaching and Runoff

"Pesticides" refer to herbicides, insecticides, fungicides, nematicides, etc. Pesticides applied directly to plants are less susceptible to leaching than pesticides applied to soil. Organic matter in soils ties up pesticides, thus reducing the amount of leaching. Other methods to protect water from pesticides are summarized below.

Pesticides exhibit a wide range in solubility. Joan Rodvang, a groundwater specialist with the land evaluation and reclamation branch, says that soluble pesticides dissolve easily in water and are more susceptible to transport by leaching or runoff. The solubility of a pesticide can be obtained in the Blue Book ("Crop Protection with Chemicals," released by AAFRD, Agdex #606-1) under "Movement in soil." In many cases a pesticide listed as "readily leached from the soil" can be replaced with one listed as "little or no movement in soil." The potential for pesticide transport decreases significantly as the time interval between application and rain or irrigation increases.

Denise Maurice, a weed specialist with the soil and crop management branch, says careful sprayer calibration can significantly reduce the amount of pesticide used. The calibration should be checked frequently during the season, especially if dry flowable formulations are being used. Steps for proper calibration include: i) checking the flow rate delivered by each nozzle. Nozzle output shouldn't differ by more than 5 to 10%; ii) Operating nozzles within the correct pressure range; iii) After spraying a known number of acres, checking the liquid level in the tank to make sure your application rate is correct; iv) Cleaning the three main screens daily, and cleaning each nozzle screen.

Spray drift can be minimized by using higher water volumes, shrouds, and spraying only on calm days. When filling the sprayer tank, be sure to prevent back-siphoning. Try to avoid handling pesticides near a water well or surface water. Cleaning out sprayers should be done over thick plant cover, to reduce the potential for leaching and runoff.

Before applying a pesticide, calculate the economic threshold for application (the cost of crop loss versus the cost to control the pest population). More information on economic thresholds can be obtained from the Green Book ("Practical Crop Protection," AAFRD, Agdex #606-3). Checking fields often will help to prevent unnecessary spraying, and ensure weeds are treated at the appropriate time.

Some farmers maintain that by examining soil type, calibrating correctly, selecting the right nozzle and checking fields often, they can cut herbicide application rates by as much as 30 to 50%.

Insect infestations can be spot-treated in many cases. Insect resistant crop varieties are sometimes an option. Beneficial insects (predators and parasites) can be conserved by minimizing insecticide application. Beneficial insects can also be encouraged by maintaining their habitat (crop residues, woodlot, windbreaks, grassy ditch banks and waterways) and increasing crop diversity.

A video on environmentally sustainable pesticide and fertilizer management is planned for release this fall. For more information please contact Joan Rodvang of the Land Evaluation and Reclamation Branch (381-5883, Lethbridge), Ross McKenzie (381-5126, Lethbridge) or Denise Maurice (427-2530, Edmonton), both from the Soil and Crop Management Branch. ■

LONG-TERM DATALOGGER OPERATION

Life Expectancy

Alberta Agriculture, Food and Rural Development, irrigation branch has been using Lakewood Systems Electronic Dataloggers since 1983. Our first eight loggers, says Brian Cook, electronics technologist with the irrigation branch, were purchased in 1984. Two of these units are still operating reliably today, ten years later.

In 1988, second generation dataloggers became available and were purchased. With improved manufacturing practices, improved components and improved circuitry, we predict that these new units will have a useful life of at least ten years, says Cook.

In 1990, third generation loggers were purchased. These units are smaller with smaller 9-volt batteries that are easier to change. These new loggers have lower battery drain, more options and accessories. With all our upgrades the manufacturer has maintained compatibility with our older units.

Three factors that affect the useful life and reliability of dataloggers are:

1. Obsolescence — almost all computer-related electronic products built ten years ago can be considered obsolete as new improved models have been developed. However, if a ten-year-old piece of electronic equipment is still operating reliably, can do the job required and is supported with spare parts, it may be cost effective to continue using it, states Cook.
2. Age — as electronic equipment gets older, it becomes more unreliable. This is due to physical damage, static damage and aging of components.
3. Batteries — to keep battery-operated equipment operating reliably, a schedule of regular battery replacement must be set up and followed. We found, says Cook, that it was necessary to replace batteries almost twice as often as recommended by the manufacturer (every three years instead of every five).

Maintenance

It soon became apparent to Cook that to keep units operating reliably, it was necessary to start an annual maintenance program. Our maintenance program consists of:

Technologist Brian Cook makes check on datalogger operation.

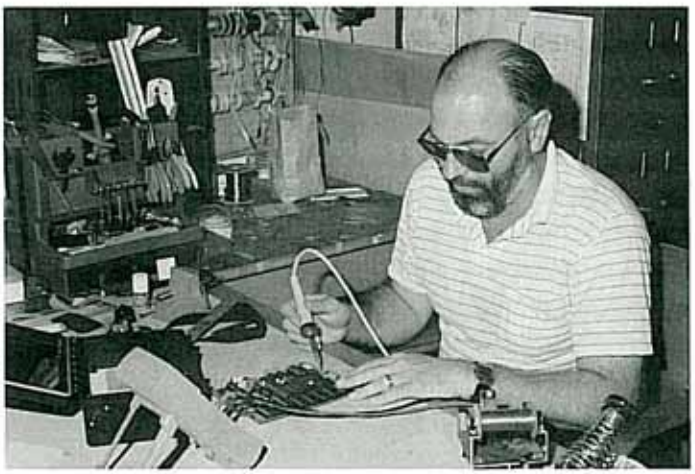
1. Keeping a complete record of each unit's performance, noting: time and type of use, upgrades to hardware and software, failures, repairs and battery replacement.
2. Annual inspection and cleaning — repair or replacement of any damaged defective parts.
3. Annual calibration of probes — replacing any that are not performing to specifications.
4. Battery testing — if rechargeable batteries are used, a regular schedule of testing, charging and field replacement of low batteries must be followed. Any batteries found incapable of holding a charge must be discarded. Non-rechargeable batteries must be replaced on a regular basis.

Yearly maintenance costs per datalogger have been:

— $10 to $30 for batteries.

— Up to $20 for replacement parts.

— Usually less than $20 for replacement probes (however, some probes can cost hundreds of dollars).



Yearly maintenance check being performed by Brian Cook.

Training

Well-trained and dedicated staff are essential to any program using dataloggers. Four areas of staff training are:

1. Setup — field staff installing dataloggers and probes must understand how each probe operates, and how to install, wire and calibrate it.
2. Electronics — most loggers require some hookup wiring, battery changes and electronic trouble-shooting. Simple or user-friendly systems may require only 15 minutes instruction. Complicated stations with several different styles of probes may require the services of an electronics technologist.
3. Datalogger programming — all staff using loggers must be able to monitor the logger's operation, spot malfunctions and be able to retrieve data. At least one member of the crew must be able to program the dataloggers. Training can take from a few hours to several weeks, depending upon the type of logger used and the computer literacy of the crew member.
4. Data processing — data collected by loggers must be processed into a usable form, such as tables or graphs. This processing can be done using the logger's own software or other database programs and spreadsheets. The training and programming skills required will depend upon the results needed.

Installation

After dataloggers have been purchased, there are several additional costs that may be necessary before dataloggers are operational:

1. Laptop computer or terminal — required for most loggers.
2. Weatherproof cases — many loggers do not have weatherproof cases and some means must be found to protect them.
3. Probes, weirs, etc. — depending upon what is to be measured, some support structure will be required for almost all probes.
4. Batteries — some loggers do not come with batteries or additional batteries are needed to run some probes.

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) 381-5878. ■

LOW COST WATER VALVE PREVENTS BROKEN AIR VALVES

Operating pipelines late in the irrigation season can be expensive if air release valves aren't protected from sudden frosts. At a cost of approximately $300 each, air valves are not cheap. The Eastern Irrigation District's (EID) operations staff began experimenting with a cheap gate water valve that allows water to dribble out of the air release valve. "As the cold water dribbles out it is replaced by warmer water from the buried pipeline. This slow water exchange keeps the valve from freezing," says Kevin Tebo, divisional superintendent of the EID.

The EID researched various methods of protection. They decided against using thermally activated valves ("TAV's") because of their cost. "Insulated steel canisters or thermo blankets aren't cheap either. What we settled on was a $3.00 gate valve available at any hardware store," says Tebo.

"Installing the valve is easy" states Tebo. One simply removes the drain plug at the bottom of the air valve and threads in a 90-degree union with the gate valve. The gate valve remains closed throughout most of the season. Then, when autumn colors begin to appear and evening temperatures drop below freezing, a ditchrider must open the valve to allow just a dribble of water through. "Since most of our turnouts and valves are in concrete wells, this constant dribble of water doesn't wet the surrounding area. A wet area might cause a slight problem if our air release valves were out in the open," concludes Tebo.

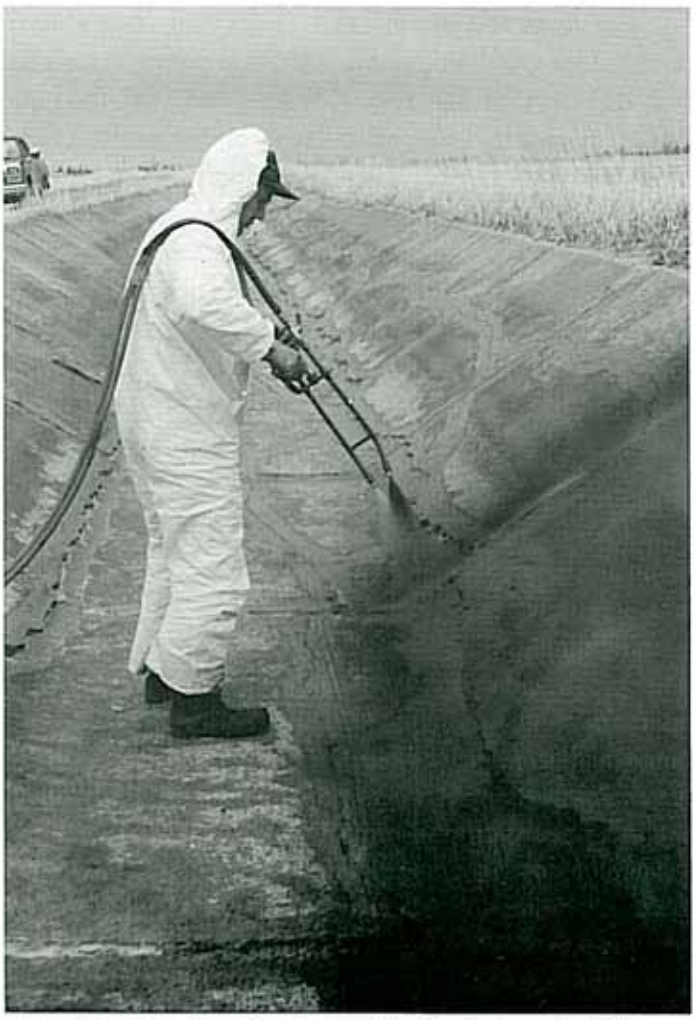
Arrow points to installed water valve.

For more information, please contact Kevin Tebo, Divisional Superintendent, Eastern Irrigation District, P. O. Bag 8, 550 Industrial Road, Brooks, Alberta, Canada T1R 1B2. Telephone (403) 362-1400. ■

NEW CRACK SEALER TESTED FOR CONCRETE LINING

How to repair cracked and broken-up concrete slip-form lining is a regular spring headache for many district managers and maintenance staff. Badly heaved and broken sections are removed and replaced with various surrogate materials. Small cracks are often injected with various foam products. The St. Mary River Irrigation District (SMRID) recently tested a new product on the Canadian market called Liquid Boot for sealing small to medium cracks.

Liquid Boot is a two component cold-spray-applied waterproofing material that sets up in seconds to a seamless monolithic membrane. The material has been used in the United States over the past decade for lining ponds and tanks, and as an effective methane gas barrier. Liquid Boot has an elongation factor of up to 1,300% with a 90% dimensional recovery, making this product very multi-purpose says Monte Flexhaug, SMRID operations superintendent.



Liquid Boot being sprayed on test reach of the badly cracked Cameron Lateral.

"The severely cracked and heaved Cameron Lateral north of Coaldale, Alberta was chosen as the test site. Most of the existing cracks had previously been repaired by injecting polyurethane foam into them. In order for Liquid Boot to adhere to the concrete, the surface must first be cleaned, and cleaning can be very costly," says Flexhaug.

The district divided the test reach into three sections.

In section #1, the old foam repairs were totally removed and the cracks heavily sand-blasted. In section #2 the foam was allowed to remain in the cracks and the sides slightly sand-blasted. Section number #3 was only broomed clean and the old foam repairs were allowed to remain says Flexhaug. L.B. Canada Inc., the authorized Canadian distributor, sprayed the compound on at a thickness of 2 mm.

The repairs will be monitored by Monte Flexhaug, Operations Superintendent, St. Mary River Irrigation District, 1210 - 36 Street North, Lethbridge, Alberta, Canada T1J 3Y7 [telephone (403) 328-4401]; and Svat Jonas, P. Eng., Irrigation Branch, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta T1J 4C7 [telephone (403) 381-5870]. ■

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NEW ALBERTA PESTICIDE REGULATIONS

The new pesticide regulations refer to four sets of procedures that are designed to address specific aspects of pesticide use, says Robert Burland of the pesticide management branch. The procedures have the same force as regulations, but were set apart to allow for easier amendment through a consultation process that will include government, industry and pesticide users. Two of the procedures pertain to irrigation districts:

a) **Procedures for Pesticide Applicators** describe how to obtain practical experience for certification, supervision requirements, pesticide mixing and loading requirements, insurance requirements, and rinsate disposal.

In addition to passing an exam says Burland, candidates for an applicator certificate must complete an experience checklist signed by the holder of a certificate. The experience checklist replaces the former requirement for one year's practical experience applying pesticides.

If either the exam or the experience requirements cannot be met by a candidate for a certificate, the candidate may apply for a conditional certificate (formerly an interim licence). The conditional certificate is contingent on the applicant obtaining the missing qualification within two years.

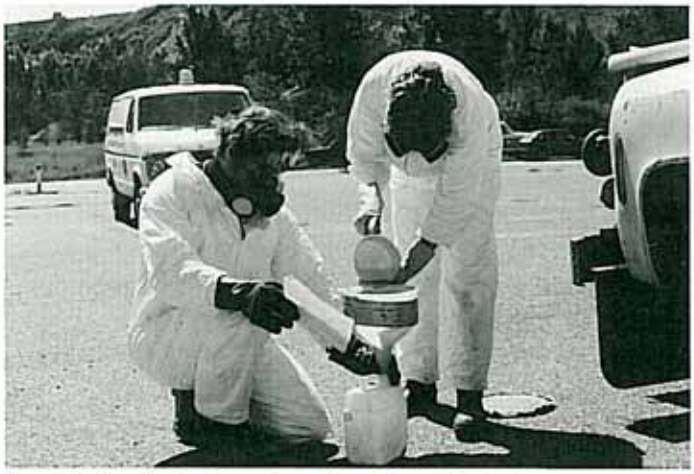
A certified applicator can supervise any number of noncertified assistants if the certified applicator is physically present throughout the operation. However, there can only be a maximum of six assistants supervised if once-daily supervision is employed at each pesticide or calibration change.

A conditional applicator can supervise a maximum of two assistants if the conditional applicator is physically present throughout the operation.

A certified applicator must be physically present during the application of any Schedule 1 pesticide (includes acrolein) or any non-selective residual herbicide (i.e. diuron, bromacil, atrazine, etc.).

No mixing or loading of pesticide solutions can take place within 30 metres of an open body of water unless a closed system (i.e. an injection system) or backpacks with secondary containment are used.

Pesticide rinsate must be used in the spraying operation as mix water. It must be sprayed over the treated area (according to label directions), or be disposed of in a manner acceptable to the director.



A certified applicator supervises the mixing of Schedule 1 pesticides.

Washing spray equipment must be done over the spray site, at a facility approved for such an activity by the local authority, or at other sites identified in a Service Approval.

Other aspects of pesticide application specified in the procedures include training requirements for assistants, emergency response equipment requirements for mixing and loading sites, and descriptions of the various forms and letters that are required for obtaining certification.

b) **Procedures for Pesticide Storage** identify requirements for pesticide storage for Pesticide Vendor Approval holders and Pesticide Service Approval holders. Aspects of pesticide storage that are covered include:

- pesticide containment in the case of a spill by the use of either non-cumbustible curbs, pans, trays or grading
- site security, including signs, locked entrances, and fencing
- emergency response plans to spills and fires
- compliance with Alberta's safety codes
- good housekeeping

This discussion has touched on some of the major pesticide regulation changes in Alberta relevant to pesticide use by irrigation districts, concludes Burland. The public is invited to obtain copies of the Environmental Protection and Enhancement Act and the two pesticide regulations from Public Services, Main Floor, McDougall Centre, 455 - 6 Street S.W., Calgary, Alberta, Canada T2P 4E8. Telephone (403) 297-6215.

Copies of the regulatory procedures and additional information can be obtained from Robert Burland of the Pesticide Management Branch, Rm. 2:45, 200 - 5 Avenue S., Lethbridge, Alberta, Canada T1J 4C7, Telephone (403) 381-5511. ■

SERVICES COST MONEY

On April 1, 1994 the irrigation branch of AAFRD initiated a Fee For Services on four of the programs offered by the branch. The programs involved are all on-farm activities which the department has been providing as a service for many years.

The fees were established to cover some of the costs of providing the service and also, to get the client to take an active roll in the program offered. In the past many projects were requested and not constructed, or the data collected and recommendations made were never used.

It is the Department's intent to continue providing these services to our clients and to form a partnership in the long-term viability of the industry.

The four programs which fall under the fee schedule are:

- Alberta Irrigation Management Program
- On-Farm Irrigation System Evaluation Program
- Water License Application Support
- Surface and Sub-Surface Drainage Design

A general description of each of the programs for which fees will be charged is outlined as follows:

1) **Alberta Irrigation Management (AIM) Program** — This is our on-farm water management training program. Clients who sign up for this program will learn how to accurately determine available soil moisture, system application rates, crop water use, soil moisture holding capacity and timing of irrigation applications. A detailed farm water management plan will be developed along with a comprehensive final report.

2) **Surface & Sub-Surface Drainage Projects** — As time permits the branch will continue to do the investigations, detailed designs and construction supervision of these types of projects. These projects will be divided into two phases. The first phase will be investigation and the second will be design. The reason for the two phases is that after doing the investigation, the project may not be continued.

3) **System Evaluation** — This is a spin-off of the old Pump Testing Program. Clients who request a system evaluation will have their pumping system evaluated for flow output, performance characteristics and overall system efficiency. Recommendations will be made on how to make the system operate more efficiently and a summary report will be written outlining how these changes should be made.

4) **Water License Application Support** — The irrigation branch will continue to be involved in the project development, system layout, data collection and Agricultural Feasibility Report writing for clients wishing to get a license to irrigate lands that are outside the boundaries of the organized irrigation districts. The fee does not include the cost for land classification or water sampling. A Level II Land Irrigability Classification is required on all projects.

For more information, please contact Wally Chinn or Roger Hohm, Irrigation Development Section, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta, Canada T1J 4C7. Telephone (403) 381-5864. ■

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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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