HAPPY NEW YEAR!!

THE WATER HAULER'S BULLETIN

OFFICE COPY
PROJECT PLANNING
IRRIGATION DIVISION

VOLUME 2, JANUARY 1981

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EXTENDED LIFE FOR ASPHALT DIPPED CORRUGATED METAL PIPE

A recent check by Project Planning Branch staff on a stockpile of used asphalt coated corrugated metal pipes at SMRID's yard in Grassy Lake revealed some interesting information. These pipes, of various sizes, were installed in the original development of irrigation in the years 1952-53, and were recently removed from areas where ditch rehabilitation has taken place. Upon removal, the pipes looked virtually as good as new. The asphalt coatings were intact and showed little wear. What could be seen of the galvanized pipe under the coating was in excellent condition - even the couplers and bolts showed very little corrosion. Prolonged exposure to sunlight and drying winds in the stockpile has now caused some of the asphalt coating to crack and chip off. A check on a soils map shows the area from where the culverts were removed (Yellow Lake Tract) to have soils at a normal Ph level.

SMRID personnel say they are re-using these pipes in their maintenance program and expect them to have as long a service life as new uncoated pipe. Regular galvanized culverts removed from the same general area have shown considerable corrosion after the same or shorter time frame.

This is not a salespitch for asphalt coated pipe. It is simply an observation made for interests sake. The Project Planning Branch will be continuing its investigation into corrugated metal pipe.

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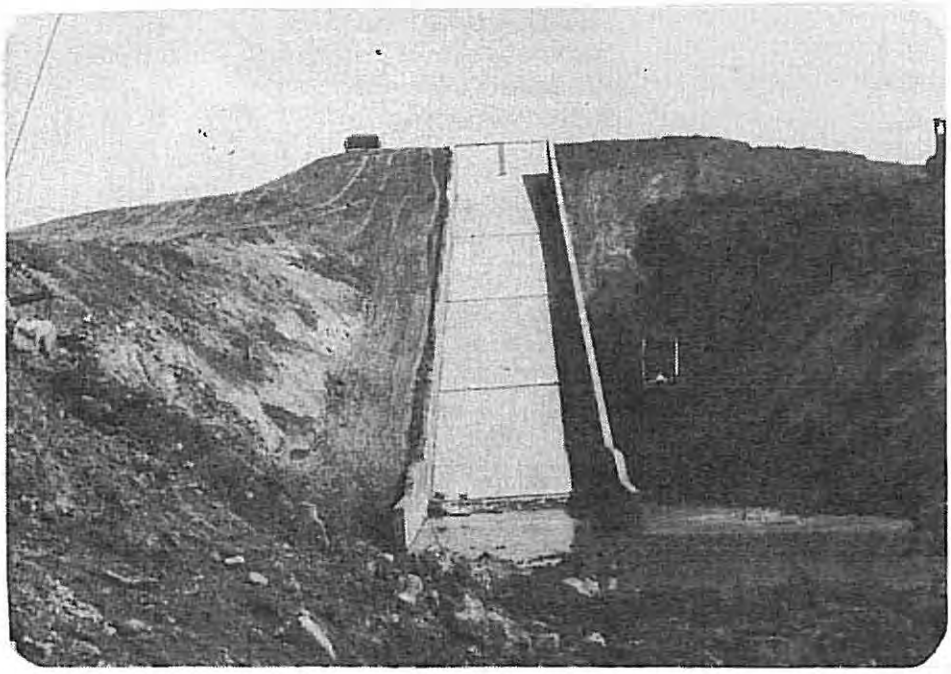
CONTROL EROSION AND WEEDS BY HYDROSEEDING CONSTRUCTION SITES

Barren soil left on construction sites invites erosion. One of the best ways of remedying this condition is the rapid re-establishment of grass cover to protect these areas. Hydraulic seeding and mulching is one successful way of treating the problem, where wind, runoff water and steep slopes make other seeding methods difficult or unsuccessful.

Hydraulic seeding and fertilizing is done in one operation. Seed, fertilizer and water are incorporated in one tank and kept under constant mixing by agitators inside the tank. Thus, when this mixture comes out of the nozzle and sprays on to the slopes, it is evenly applied on the seedbed. After the application of seed and fertilizer, a second operation of applying mulch over the seedbed is required. Combining these two operations to reduce costs is becoming more popular and is nearly as successful.

The mulch that is used to cover the seedbed dissipates the effect of heavy raindrops and allows the soil to absorb more moisture, thus holding the moisture longer, helping greatly to increase the rapid growth of grass cover. Also the mulch helps insulate the seedbed, making a more uniform temperature favorable to grass growth. Nature takes over in a very short time and the once barren areas are covered with a lush green growth. The roots bring erosion to a halt.



During construction on irrigation projects, large areas are often disturbed and the vegetative cover is removed. Without regrassing, erosion damage can result. This is not only unsightly, but can cause failure of the new structure if left unchecked.

Organic mulches are often an agricultural crop residue or industrial product. The price usually reflects transport and handling costs more than any intrinsic value of the product. Most organic mulches require additional nitrogen to compensate for the tie up of nitrogen in the decomposition process. Effectiveness is roughly related to the size and the shape of the mulch particles. Long narrow particles are superior to finely ground products. Some commonly used organic mulches are: cereal straw, hay, wild grass hay, wood fibres, chopped paper wastes, and seed screenings. Mulches applied hydraulically must have a particle size small enough for ready pumping through half inch nozzles, and must not be too buoyant to remain in suspension with moderate agitation.

The most important quality of a hydromulching material is that it must adhere to the soil even on steep slopes and hold the seed in place during heavy rainfall impact and high winds. Of the previously mentioned mulch materials, virgin wood fibres of aspen and alder offer the best all round protection. Straw tends to move more easily with water or wind because of its relative smoothness. Straw also contains weed and cereal seeds which could germinate and choke out grass seedlings. Seeds present in wild grass hay could be beneficial to re-establishing natural vegetation, if the hay is cut at the right stage of ripeness. Paper wastes and seed screenings are inferior and tend to wash from slopes with the first raindrops. Commercially prepared grass/straw by-product mulches can be very effective if they contain properly sized particles and have been heat treated to prevent germination of inherent weed seeds.

Commercial fibres are usually dyed with a fugitive green dye which lasts only a few hours or days. This visual aid assists in obtaining an even distribution on the slope.

Rates of hydromulch vary from 500 lb. to 3000 lb. per acre. A minimum of 1000 lb. per acre is necessary to hold seed on a slope.

In Southern Alberta, where strong winds prevail, a tackifier ("glue") should be used to hold hydromulch fibres in place and retard erosion. Manufacturer's recommendations must be followed when using any tackifier as adverse reactions may occur between it and the mulch material or the fertilizer if incompatible products are combined. Some commercial tackifiers promote germination and hold moisture after absorbing it, so their importance should not be underestimated, especially when seeding on slopes.

There is a hazard to the seed in using highly effective mulches or additives. These products or combinations may retain enough moisture to allow germination when the moisture in the soil is too low to permit establishment. Planting as near as practical to a date when adequate moisture is expected may avoid this problem. Most people in the business in Southern Alberta recommend late fall seeding so that germination occurs in the spring when adequate moisture and sunshine is available.

Areas that have been hydroseeded must be protected from vehicles and animals until the grass is well established. If the protective mulch crust is broken, it becomes vulnerable to wind and water damage and displacement of seeds.

A rough, open seedbed surface is necessary for good grass establishment; a smooth crusted surface will never yield desirable results. A practical approach on steep slopes is the use of benches, serrations, or simply rough grading. The rough effect can often be achieved by simply eliminating the final grading operation. Special pitting equipment is available for nearly-level sites.

"Track walking" (walking a cat on a slope to create cleat marks perpendicular to the slope) is widespread and very effective.

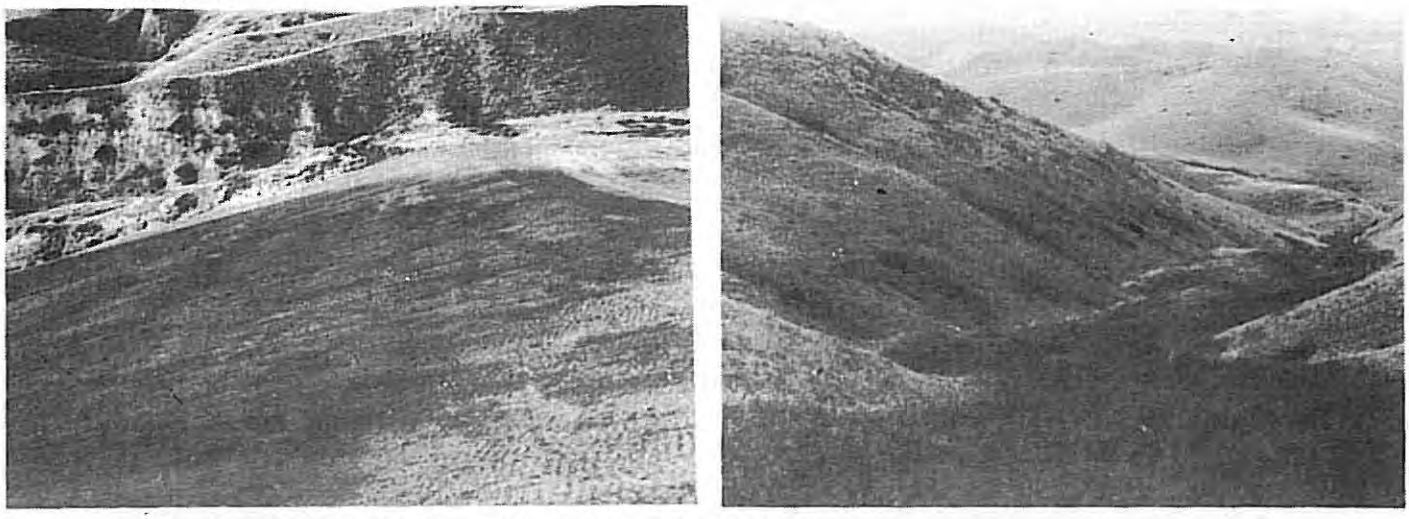
Choice of a seed mixture should be based on the site conditions, whether they be wet or dry, sloping or flat, north or south facing, type of soil, etc. A seed specialist can be of tremendous help in recommending the proper mix. As an example, the City of Lethbridge uses the following mix on steeply sloping dryland sites:

60% Fairway crested wheat grass
20% creeping red fescue
10% Lemtal annual rye grass
10% Kentucky blue grass

This mixture is applied at the rate of 200 lb. per acre along with 250 lb. per acre of 16-20-0 fertilizer, mulch at the rate of 1200 lb. per acre, and a tackifier at the rate of 20 lb. per acre.

Costs vary greatly depending on site accessibility, surface preparation required, distance to water source and materials used. The City of Lethbridge is presently paying in the range of $1500 to $1800 per acre for the above mentioned hydroseeded grass mixture, surface preparation included. The results are very encouraging, as can be seen in the accompanying photographs.

Rehabilitation work in the Irrigation Districts has left a large number of barren construction sites throughout Southern Alberta resulting in serious erosion and weed control problems. Regrassing of those areas can check both of these problems, as well as improving their aesthetic appearance. Hydroseeding may be the answer to rapidly re-establishing an attractive, protective vegetative cover around new irrigation structures and along newly relocated ditches.



Two hydroseeded sites in the City of Lethbridge. The one on the left is at the landfill site and picture was taken 3 months after seeding. The one on the right shows growth after 7 months over a storm sewer outfall line.

Ref: "Weeds, Trees and Turf", August 1980, October 1979
Spra-Mac Landscaping, Vancouver
City of Lethbridge, Community Services, Parks & Recreation, Ron Pederson
UGG Seed Division, Lethbridge, Neville Downs
Southern Hydroseeding, Lethbridge
Perma Green Landscaping, Lethbridge

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SEALANT TEST PLOT ESTABLISHED NEAR BARNWELL IN FALL 1980

The Applied Research Unit, Project Planning Branch, Irrigation Division, in cooperation with the Taber Irrigation District has established a test plot on concrete lined Lateral 1 just west of Barnwell to scientifically evaluate the durability and economics of eight different types of crack sealants. By subjecting all the sealants to virtually identical field conditions, an accurate assessment of performance can be obtained. Signs are posted to indicate the product and supplier. The project is financed jointly by TID, Alberta Agriculture, and the suppliers. The following products are being evaluated: chopped fiberglass, roofing tar, asphaltic cement, Crafco Overflex MS, Vibrapair grout, polyurethane foam, butyl rubber and Versa Kote.

Mr. Svat Jonas, P. Eng., Applied Research Unit Head, is in charge of the project and will be issuing interim reports.

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LEAK TEST ON POLYURETHANE FOAM

The Project Planning Branch recently conducted an in house test on polyurethane foam samples to determine if water passes through the product when it is used as a crack sealant on concrete lined irrigation ditches. The test showed that, due to the cellular characteristic of the foam, a small amount of water was absorbed, but no measurable quantity passed completely through it when subjected to approximately one foot of head for a three week period.

As mentioned in the Fall 1980 issue of the Water Hauler's Bulletin, the polyurethane foam appears to be a fairly economical and effective crack sealant for concrete lined ditches. It is one of the materials being studied in a test plot in the Taber Irrigation District (see above article).

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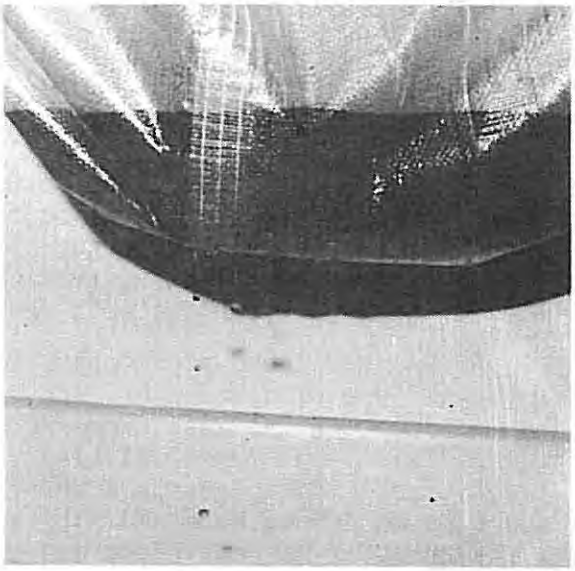
LEAKY SEAMS ON DUPONT FABRENE TM



Several districts have recently been installing Dupont Fabrene TM as a buried membrane canal liner. The material is a very tough cross-woven polyethylene sheet produced in five foot widths. The material itself is water tight. However, when it is made up for a canal liner, the five foot widths are stitched together with a simple one inch overlap seam to produce the necessary overall width. These stitched seams are not water tight; as a matter of fact, a considerable amount of water passes through them as can be seen in the accompanying photograph. Use of a membrane liner that is not water tight seems to be defeating the purpose of lining in the first place. The manufacturer has been contacted and comments that they are able to produce a fold-lock stitched seam which should be watertight. Upon testing, we found this seam also leaks, but at a rate only 1/24th that of the straight lap seam. Further testing will be done by the Branch on membranes used as liners and cutoff curtains.

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POTENTIAL FOR HYDROELECTRIC DEVELOPMENT ON IRRIGATION CANALS

By: Len Ring, P. Eng., Irrigation Systems Engineer

The possibility of generating hydroelectric power from drop structures in existing southern Alberta irrigation canals has been discussed a fair bit, but the discussions usually have occurred over coffee break or just casually and very little of a formal nature has been done. I first became interested over three years ago and felt that the potential for development may be in areas where sprinkler irrigation is being practised near drop structures and the power generated could be used to run electric motors driving the sprinkler pumps. Being deeply involved with design of sprinkler irrigation systems for on-farm use prompted me to consider this possibility first but as information was received from various manufacturers and Calgary Power it became evident that the more practical potential would be for electrical generation tied into existing electric grids.

There are a significant number of firms who manufacture electrical generating equipment and some manufacture prefabricated generating plants which can be installed as a unit once the structure has been constructed to the specifications required. It is interesting to note that Canadian companies play a very major roll in this industry.

Another common misconception is that only large structures with a great deal of vertical drop would have potential for hydroelectric development. Actually there are many generating plants which can operate in drops of as little as 2 metres. Also, during irrigation rehabilitation, when drop structures are being replaced consideration could be given to, for example, installing one 9 metre drop structure rather than three 3 metre drop structures. If this were done the potential for hydroelectric development appears even more feasible. An example of where this type of development could be investigated is familar to me again because I often drive by the area. Here I am referring to the series of drop structures just west of Raymond. There are similar situations in other areas as well.

Another aspect which must be investigated in detail is the actual flows in the irrigation canals. Table 1 shows a number of arbitrarily chosen drop structures which presently exist in Alberta as well as the design flow rate of the canal at that point. The maximum theoretical output of a generating station, if it were located there, is also shown for each drop structure. However, since the canals do not carry their design capacity for all of the irrigation season it is necessary to look at the long term records for what flows have actually occurred in the canals as well as give some prediction what the future flows will be throughout the summer months.

As was mentioned previously, Calgary Power has expressed some interest in this type of development and in the last year the Alberta Irrigation Projects Association has also expressed interest. In addition, many Irrigation Districts and municipalities in the United States have installed small hydroelectric plants. However, in Alberta the government agencies, notably Alberta Agriculture and Alberta Environment, have been slow to move in this area and I suspect there are many and varied reasons. However, I believe that now the time is right for a study of some sort to be conducted. Calgary Power would be interested in studying the potential but the historical stream flows must be known to determine how many kilowatt-hours could be produced and then, by comparing the cost per kilowatt-hour of that power to the cost of conventional power generation, the feasibility can be assessed.

TABLE 1: Examples of Potential for Hydroelectric Development on Alberta Irrigation Canals (Using prefabricated lohead generating systems)

DESCRIPTION	DESIGN FLOW (cfs)	DROP (ft)	POSSIBLE MAXIMUM CAPACITY			COMBINED DROPS		
			# of units		capacity of each	FLOW (cfs)	DROP (ft)	MAX. CAPACITY
A) Drop at railway bridge near Magrath outlet	3200	9.2	3	@	700 kW			
B) Taylor Coulee Chute	3000	117.2			25000 kW*			
C) Raymond Chute	2900	92.4			19000 kW*			
D) Drops West of Raymond:								
Drop # 5	2585	16.0	2	@	1500 kW			
Drop # 6	2585	16.0	2	@	1500 kW	2585	48.0	2 @ 4600 kW
Drop # 7	2585	16.0	2	@	1500 kW			
Drop # 8	2585	16.0	2	@	1500 kW			
Drop # 9	2585	10.2	2	@	1000 kW	2585	36.4	2 @ 3400 kW
Drop #10	2585	10.2	2	@	1000 kW			
E) Chin Chute	1283	112.2			14000 kW*			
F) Canal to Grassy Lake Reservoir								
Drop	405	15	1	@	400 kW	405	30	1 @ 800 kW
Drop	405	15	1	@	400 kW			
Chute	405	34.5	1	@	900 kW			
G) Chute to Murray Res.	199	27.6	1	@	360 kW			

* The vertical drop at these sites exceeds the range for the prefabricated generating plants studied. Their potential has been estimated assuming an 85% overall generating efficiency. All other capacities are taken from the manufacturers' literature for units presently available.

Tremendous energy like this can be harnessed to provide electricity to power sprinkler pumps in Irrigation Districts.

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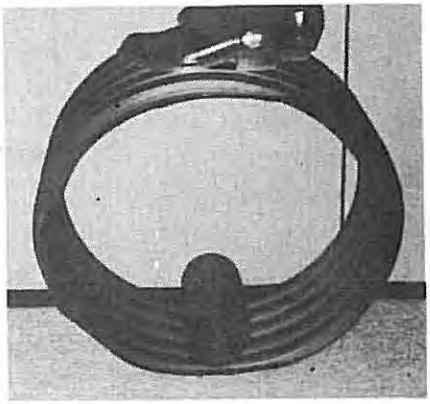
LOCAL BUSINESS MANUFACTURING PLASTIC CULVERTS

It has been said that everything is going to be plastic by and by. The Toyo Corporation of Japan has developed a process for manufacturing Spiral Corrugated Polyethylene Pipe which can be used in virtually any application that presently employs corrugated steel pipe. Big 'O' Drain Tile Co. Ltd. of Taber has the patent rights for Canada on this product, and began manufacturing in mid October 1980.

Testing of the flow and loading characteristics of the pipe is being carried out by the manufacturer and the results are expected to be very similar to corrugated steel pipe. Also being tested are several different types of couplers and inhibitors to protect exposed pipe from ultra violet light deterioration.

Ready for market in early 1981 will be four sizes, all with 4 mm wall thickness: 15", 18", 21" and 24". A non-pressure, spin-on coupler will be available. Any length can be produced. The 24" pipe weighs 14 kg per lineal metre or about half the weight of steel. Abrasion resistance of the polyethylene is five times that of steel, and expected life is in excess of 50 years. The price is competitive with 16 ga. corrugated steel pipe. Within a year, Big 'O' expects to have available an internal smooth-wall corrugated polyethylene pipe with a low pressure rating and leakproof pressure couplings. Virtually any fittings, tees, wys, crosses, etc. will be available on a "custom made" basis.



New plastic culvert and its Little Brother - 4" drain tile.

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FARM WATER METERING DEVICES

During the summer of 1980 a field evaluation was carried out by the Farm Irrigation Services Branch on two different metering devices suitable for on-farm use.

The 12" deflection meter tested was originally developed by FAO in 1970. It consists of a 12" x 12" metal box, 4' long with a pivoted rod hung in the water flow (Figure 1). The top end of the rod has a pointer which indicates flow on a calibrated scale. The one tested was built by a local irrigation dealer. For field testing it was mounted in the side of an earthen farm delivery size ditch.

Results from one summer's testing are very encouraging. The deflection reading responded well to the range of flows tested up to 2.75 cfs. Greatest accuracy ±6% average was obtained for flows between 0.5 and 2.75 cfs. The meter operates with a low head loss and appears to be relatively self cleaning of trash.

The second measuring device tested was a broadcrested weir with a 30" throat width (Figure 2). Various standard sizes of these weirs were developed by John Replogle of the USDA in Phoenix, Arizona. This structure was constructed by our staff out of two 4' x 8' sheets of 3/4" plywood. The apparent features of this flume are: (1) inexpensive and easily constructed, (2) has a large flow range, (3) non-plugging, (4) low head loss, and (5) very good stage discharge relationship. Our testing indicated an accuracy of ±6% in the entire flow range up to 2.75 cfs.

Both of these metering devices appear to have potential for measurement of flow rates most commonly experienced with farm size deliveries in Alberta.

For more detailed information contact Larry Spiess of the Farm Irrigation Services Branch in Lethbridge.

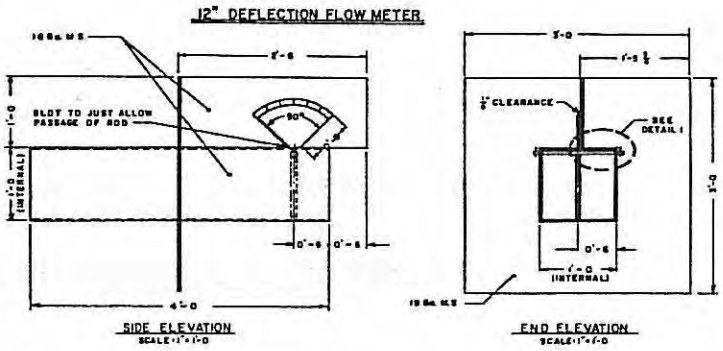

Figure 1

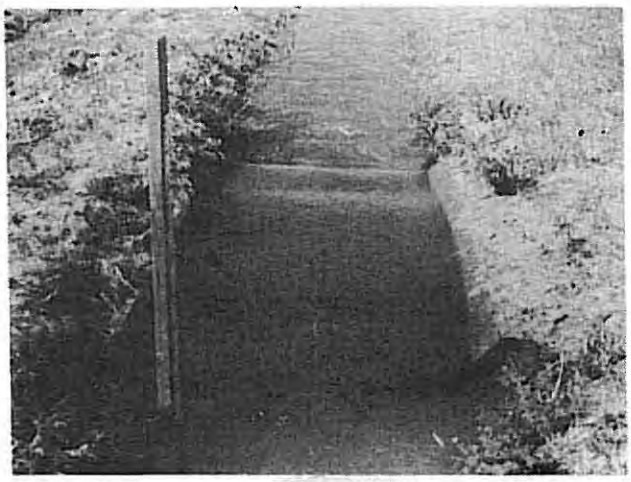

Figure 2

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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 Roger Knibbs at 329-5164, Lethbridge.

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