



UTILITY OPERATOR

NEWSLETTER

WINTER 2002 - NUMBER ONE

PREPARING TO SEE THE LIGHT

Canmore Water Plant UV Upgrade

by Barry Vallance, P.Eng., Associated Engineering

The Town of Canmore Pump House No. 2 is an in-line water filtration plant with a capacity of 10.5 ML/d. Source water is mountain run-off, which is captured in the Rundle fore bay - part of the TransAlta hydro facility located above the Town. Organics levels are low, and disinfection byproducts are not an issue.

Poly-aluminum chloride is used to chemically condition the water prior to filtration through four (4) rapid gravity, dual-media sand/anthracite filters. Pre-chlorination provides both primary and secondary disinfection. Treated water is discharged into a small clearwell, from which high lift vertical turbine pumps draw to feed the Town distribution system.

Recent plant upgrades include filter-to-waste and improved controls to lessen on/off cycling. These improvements have increased plant production and the ability to meet turbidity goals. With these improvements in place, EPCOR Water Services, who operates the Canmore Pump House No. 2 facility for the Town, turned their attention to the plant disinfection system. The current Alberta Environment (AENV) Guidelines stipulate minimum reduction levels for Giardia cysts and viruses; shown in Table 1.



CANMORE PUMP HOUSE NO. 2 WATER TREATMENT FACILITY

TABLE 1

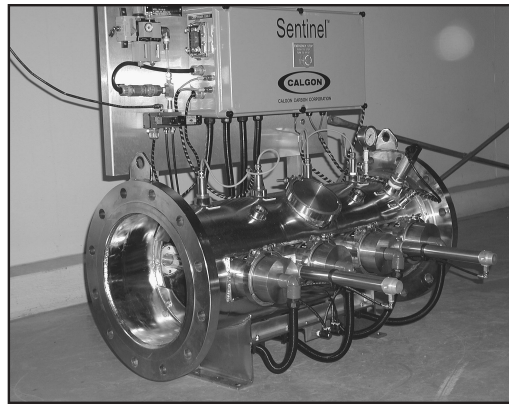
AENV Guidelines for Disinfection (excerpt)		
	Viruses	Giardia cysts
Total Reduction Required	4-log	3-log(1)
Removal Credit(2)	1-log	2-log
Inactivation Required by Disinfection	3-log	1-log

1. Giardia cysts < 1 per 100 L in source water
2. Provided filtered water meets AENV turbidity guideline
Applies to Direct Filtration

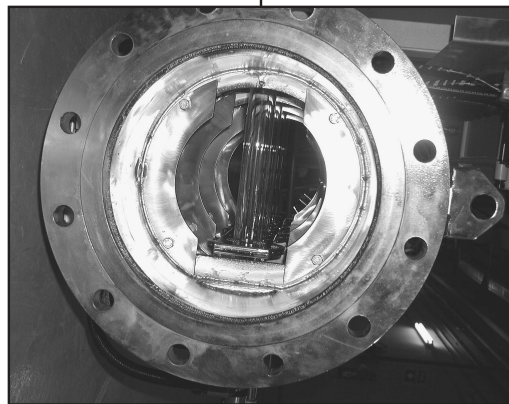
Table 1 also shows the removal credit that a well-operated in-line filtration plant would receive provided it meets AENV turbidity guidelines.

The required inactivation by disinfection is 3-log for viruses and 1-log for Giardia. The chlorine contact time through the filters and clearwell provided by the pre-chlorination system was only just able to achieve the required level of virus inactivation. It was not able to achieve a 1-log Giardia inactivation. The options reviewed for achieving the Giardia inactivation goal included improved chlorine contact time, and alternative disinfection technology. The small clearwell provides little chlorine contact time despite being reasonably well baffled. Improved chlorine contact time could have been provided by moving the chlorine dose point to the intake end of the raw water supply line. This was discounted because of potential obstacles with land acquisition and operating a remote chlorination facility. A bigger clearwell, to increase chlorine contact time, was ruled out because of site constraints.

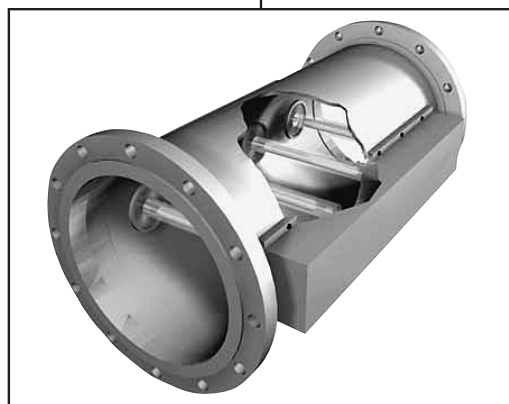
The Operator, EPCOR Water Services, decided ultraviolet (UV) disinfection would be a good option, as it could be accommodated on the site, and from recent discussions with AENV they were confident it would be granted the required 1-log Giardia inactivation credit. Indeed the AENV approval was forthcoming, and the project moved into design. AENV approval was conditional however. Water had to meet the AENV turbidity guidelines prior to the UV process. To avoid the potential for turbidity particles shielding pathogens from the UV light dictates that UV has to be a post-filtration process. A second condition was the retention of the existing chemical (chlorine) disinfection process. The rationale here is two-fold: UV should be an additional disinfection process, not a substitute; and having two disinfection systems is consistent with the multiple-barrier approach preferred in the industry. In addition to these fundamental conditions, there were facility and equipment design considerations to be met.



UV REACTOR WITH 4 LAMP SELF-CLEANING ASSEMBLY AND CONTROL PANEL BEHIND



END VIEW OF UV REACTOR SHOWING LAMP ASSEMBLY



CUT AWAY OF A UV REACTOR SHOWING LAMP ASSEMBLY

EQUIPMENT DESIGN

UV works by irradiating pathogens to render them incapable of replicating. UV does not kill pathogens and, unlike chlorine does not leave a measurable residual in irradiated water. The true test of its effectiveness is to perform infectivity tests on mice using the treated water. The time needed to perform this test makes it unsuitable as a process control parameter for plant operations. Currently there is no immediately measurable means of confirming UV has, in fact, effectively irradiated a pathogen. Instead of measuring UV effect, UV performance is monitored. The inference here is that provided the UV system is performing as it should, it will be achieving the desired effect. The performance parameters are UV irradiance, power draw, lamp operation and flow rate. If all of these lie within the UV reactor design limits, the system can be considered to be performing satisfactorily.

FACILITY DESIGN

Some of the more important installation considerations for the Canmore design were:

- redundancy and isolation
- power supply and
- hydraulics

These factors need consideration in any UV system design. The last, hydraulics, becomes very critical when retrofitting UV into an existing plant.

Redundancy and isolation are critical to a successful design. A UV reactor may fail for a number of reasons: poor transmissivity, lamp failure, loss of power, failure of controls, or flow rates out of range.

Transmissivity is a measure of the water's ability to transmit UV light. It is an inverse function of UV absorbance, which is a measure of how much UV light is absorbed by the organics in the water. An increase in organics will reduce UV transmissivity, resulting in reduced effective UV dose. A UV system is designed to tolerate the worst UV

transmissivity conditions. However, this may not account for unexpected conditions that produce abnormally low transmissivity levels.

Typically, each reactor will include at least one spare lamp, so that even if a lamp fails, the remaining lamps will provide the required dose. An alarm will advise the operator to replace the failed lamp as soon as it is convenient to do so. Meanwhile, the unit can continue to operate.

A more serious failure would be a fall off in the UV dose to a critical level. This could result from deteriorating water quality (increased turbidity, colour or organics), fouling of lamp tubes, fouling of the irradiance monitor, long term lamp aging, or a controls related reduction in power to UV lamps. The alarm generated by a low UV dose should shut down and isolate the faulty reactor. This is critical to avoid inadequately disinfected water leaving the plant.

As UV has to be downstream of the filters, this makes it, in most cases, the last process in the treatment train before discharge to the clearwell. Unless a plant has the ability to recycle or otherwise purge its clearwell, it becomes important to ensure poorly disinfected water does not enter and contaminate the clearwell. With chemical disinfection, clearwell contents can be held up and given an “extra dose” of chlorine to bring it up to spec. With UV, this does not work. To avoid clearwell contamination, the Canmore UV system is equipped with a fast-closing, fail-safe isolation valve downstream of the reactors, before the clearwell. The fail-safe feature ensures this valve closes even during loss of power.

When a UV reactor fails and is shut down, a stand-by unit must be brought on-line before plant production can be restored to its previous level. The Canmore UV system incorporates two (2) 100% capacity reactors, for hydraulic reasons that are discussed later. When the duty reactor fails, the plant is effectively shut down until the stand-by unit is up and running.

It can take up to five minutes for a UV lamp to achieve full output after start-up. During this warm-up period, it is necessary to run water through the reactor to prevent overheating. This can be achieved by flushing with finished water or running plant water through the unit. In either case, the water has to be wasted until the unit is ready to go on-line. This is monitored by the system controller, which signals when the unit is ready to go on-line. This signal will initiate opening of the clearwell isolation valve, and a return to normal operation. The Canmore design includes a UV-to-waste line, which operates in much the same way as a filter-to-waste line. It dumps into the backwash waste holding tank, via an air gap to eliminate the potential cross-connection risk.

The Canmore plant has a gas-driven electric generator capable of supporting the entire facility. It is called upon frequently, as utility power interruptions average about one per month. A check confirmed that the generator had sufficient spare capacity to accommodate the additional load from the UV system and associated controls. The frequent power interruptions were, however, a concern. UV lamps will power down even with a brief power blip or brown-out. Once a lamp is powered down, it must go through a cool-down period of several minutes before it can be re-started. Although the plant generator can restore power in considerably less than a minute, the UV system will not be operational for several minutes. The Canmore UV system design switches to the stand-by UV reactor following a power interruption. The stand-by unit can be energized as soon as the plant power is restored. The duty unit goes through its cool-down period, and becomes the stand-by unit.

The last, but not least important facility design consideration is hydraulics. As previously mentioned, the ideal UV position in the process train is downstream of the filters. The cost and operational complexity of pumping filtered water through the UV system suggests this should be avoided if practicable. The key here is to find sufficient spare head in the hydraulic profile between the filters and clearwell to permit gravity flow through the UV reactors. This requires looking at filter operations and clearwell operating levels to determine what and where spare head is available.

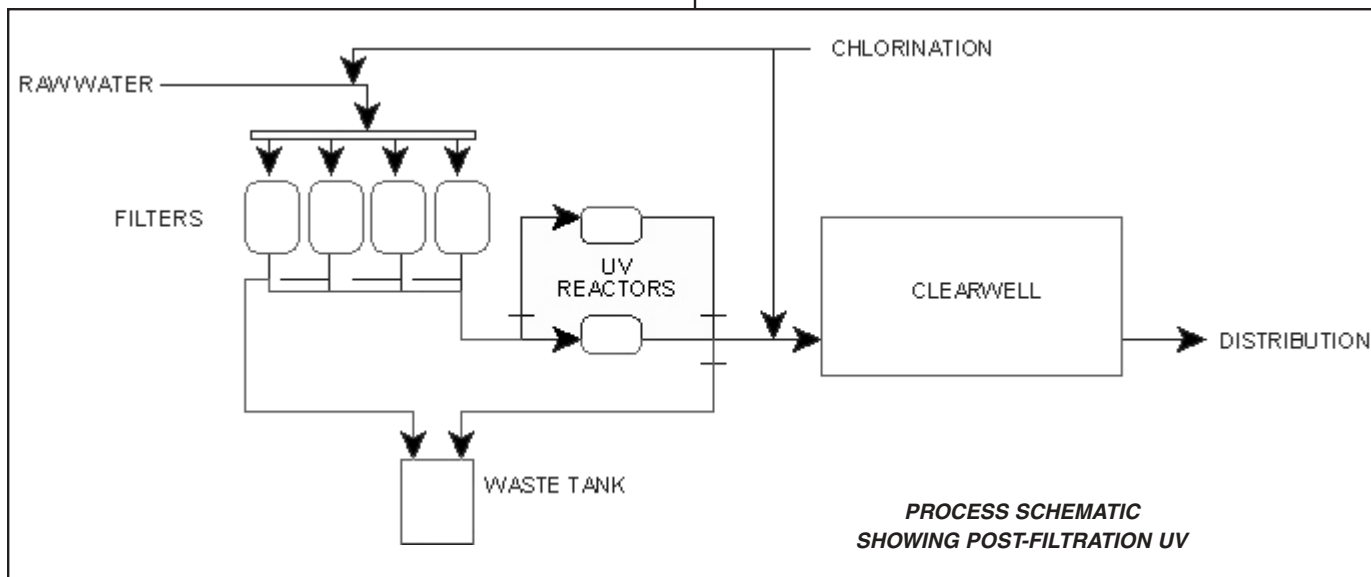
A UV reactor and its associated piping and valves may impose a head loss of 0.5 to 2.0m, depending on the type of reactor and the piping layout. If the spare head is less than that required, then it is necessary to either find more available driving head, reduce the required driving head, or maybe both. If these initiatives still leave a shortfall in available head, then the required head must be looked at. For a given flow rate, the bigger the system, the smaller the head losses. It may be practicable to reduce head losses by using a larger UV reactor and piping system than would be needed based purely on the UV dose requirement.

This was the case for the Canmore plant. The initial reactor selection, based on capacity, was three (3) 300mm Calgon Sentinel units; two duty and one stand-by. The available driving head would have limited this arrangement to about 8.6 ML/d, which was unacceptable to the Operator. The final design uses two (2) 600mm Calgon Sentinel reactors, each capable of handling the full 10.5 ML/d design capacity, while limiting the head losses to acceptable levels.

Summary

The burgeoning interest in UV as a solution to protozoa reduction will compel many utilities to look at this technology for their plant. This article has attempted to outline some of the important design issues that must be addressed. There are of course others which are not discussed here, such as flow control, water UV transmissivity, on-site reactor validation, and constructability issues, which all need careful consideration.

The Canmore UV system is currently under construction and is scheduled to be on-line later this summer. It will be one of the first UV systems in Alberta aimed at addressing the AENV guidelines for Giardia reduction. As such, it is sure to attract attention in Western Canada, and provide the groundwork for others who wish to "see the light".



ELECTRONIC REPORTING OF DRINKING WATER QUALITY MONITORING INFORMATION

Alberta Environment has given priority to the goal of assuring the public as to the safety of their drinking water supply. In addition, one of the strategic directions for Alberta Environment is the use of the Internet for information exchange.

The Internet information exchange initiative will minimize and may eventually eliminate the manual effort involved in paper based reporting, and will enable us to provide public access to drinking water quality information and accountability for ensuring that the water treatment facilities meet drinking water quality performance standards.

You will probably have a number of questions and concerns about this initiative. **Departmental staff will be attending the Annual Operators' Conference in Banff, March 12-15, 2002, in order to make two presentations about this initiative.** The first presentation will be an overview of the changes coming and the second presentation will be a demonstration giving a detailed look at the proposed web forms, their functionality and website layout. We encourage you to attend these presentations, and raise any questions or concerns with the staff that will be attending.

A letter to all operators of treated drinking water supplies, approved under the Environmental Protection & Enhancement Act, will be mailed out in early March describing the project.

PERSONAL PROFILE

DAVID GERVAIS

M.D. of Smoky River #130



Dave was born and raised in Falher, Alberta approximately 410 km northwest of Edmonton. After completing school, he worked for two years for the Alberta Wheat Pool as a grain buyer. In November of 1976 Dave was successful in obtaining a position as Utilities Officer for the M.D. of Smoky River. He quickly discovered that Utility Officers have many and varied responsibilities. In addition to operating three small water treatment facilities, his duties included helping initiate and form the East Peace Gas Co-op as well as being the liaison between the gas co-op and it's customers. Dave's job responsibilities have changed considerably over the years. In 1986, water and sewer facilities were installed in two of the M.D. hamlets (Guy and Jean Coté). In 1994 the pressure filter treatment facilities in both Guy and Jean Coté were changed to conventional package plants. These operations were further streamlined when the Municipal District of Smoky River #130 decided to purchase potable water from the Town of Falher via a pipeline.

Dave's current duties include the operation of the municipal water and wastewater systems, three Class II D landfills, Road Foreman, Development Officer and Fire Guardian. Dave is currently certified by Alberta Environment at Level II Water Treatment, Level I Water Distribution, Wastewater Collection, Wastewater Treatment and Landfill IID. He has also been a member of the Alberta Water and Wastewater Operators Association and the Western Canada Water and Wastewater Association for 17 years.

Dave says "I enjoy my work. It keeps me busy and there is always something that comes up to keep me on my toes". With the area he needs to cover and being on call much of the time, he certainly does not have time to get bored.



This year is quite a milestone for Dave and his family. He and his wife will celebrate their 25th wedding anniversary, 25 years with the Municipal District of Smoky River #130, Rural Utilities Safety Association and also the local fire department. Dave and his wife Lynn, have three children, Kim, Kelsie and Ken. Much of Dave's "spare" time is spent with Ken at hockey games all around the province and at local golf courses in the summer. David is also the proud grandfather of two grandsons, Braden and Darian.



The Gervais's enjoy spending time at the Five Star Golf Course on the Little Smoky River. Golfing, fishing, camping, what could be better than that?

After 25 years, Dave says that he enjoys working with the excellent and experienced staff of the Municipal District of Smoky River #130.



MESSAGE FROM THE AWWOA CHAIRMAN Gerard Hollman

Year just goes by too quickly. I would like to invite all operators who are able to attend the 27th Annual Operators Seminar in Banff March 12 - 15th. There is something for everyone at the Operators Seminar and I sincerely hope you can be there. The Ground Hog has given the green light for spring, which is nice. We all believe in his prediction, right?

On a sad note, a fellow Operator and Executive member Tom Dlugosz passed away on Jan 28/02 at the age of 36 years. He was the Town Of Peace River Facilities Supervisor. Tom will be greatly missed by everybody. God bless his soul. I would personally like to thank our Honorary Life Member Steve Blonsky for delivering flowers on behalf of the Association and attending the funeral in my absence, as I was in Edmonton having ear surgery. Thank you Steve.

Until Banff, safe driving and always keep a positive attitude. See you at the AWWOA Annual General Meeting, March 13.

Gerard

In Loving Memory *Thomas Kenneth Dlugosz* Born July 8, 1965 Deceased January 28, 2002 Age 36 Years

Tom has been a WCWWA & AWWOA Member for 14 years.

He was on his second term with the AWWOA Executive. He worked on the Annual Operators Seminar Guest Program, AWWOA Website and the Publicity and Promotions Committee.



Tom was working for the Town of Peace River as the Manager of the Water and Wastewater Treatment Plants.

He will be missed by all.

2002 SEIDEL AWARD

We are proud to announce that Gerald Samuel, P. Eng., Alberta Environment, has recently been awarded the Harris F. Seidel Award. The Harris F. Seidel Award is presented to an individual in recognition



**HARRIS F. SEIDEL PRESENTING
TO GERALD SAMUEL**

of outstanding contribution toward establishing or advancing certification programs. The criteria are that the individual shall have contributed through time and effort; innovative, and successful approaches; leadership; development of materials; or a combination of these. The contributions shall be regional or international in scope, and of lasting value in improved performance by more highly qualified personnel and laboratory facilities.

Gerald was instrumental, in 1975, in getting the Alberta Water and Wastewater Operators Association formed. He has been an advisor on their executive committee since. He has been chair of the Alberta Water and Wastewater Operators Certification Advisory Committee from when it was formed in 1979 until now.

Gerald was also instrumental in getting the Water/Wastewater Technician Program into the Northern Alberta Institute of Technology. He has been on their program advisory committee from the start. He has conducted training, presented papers and has been a speaker at numerous events for Association of Boards of Certification, the American Water Works Association and others in US and Canada.

Recently Gerald was asked by the Ontario Water Works Association (a Section of AWWA) to prepare a paper on operator certification and training for the Walkerton Inquiry following the e-coli outbreak in May 2000.

He has received numerous awards for his contributions to the water and wastewater field including the AWWOA Ron Bayne service award.

Congratulations, Gerald, on a well deserved, prestigious award.

COURSES OFFERED 2002

The following courses are being offered. If you wish to register for any of these courses please mail or fax your registration in with your payment to: (780) 427-5204. If you require more information please contact Del Morrison at (780) 427-8130. Please note: registrations are limited, so register early.

COURSE	LOCATION	DATES
Chlorination Workshop	Calgary	April 16 - 18, 2002
Level I Certification Preparation Course Part "A"	Edmonton	April 2 & 3, 2002
Level I Certification Preparation Course Part "B"	Edmonton	May 15 & 16, 2002
Small Water Systems Course	Red Deer	May 1, 2002
Small Wastewater Systems Course	Red Deer	May 2, 2002

2002 CERTIFICATION EXAM SCHEDULE

Anyone who is interested in writing operator certification exams may request application forms from:

Alberta Environment
 Approvals Support Branch
 Certification Section
 5th Floor, 9820 - 106 Street
 EDMONTON, AB, T5K 2J6
 Fax: (780) 427-5204

The **DEADLINE** for receipt of completed applications for examinations is listed below. Applications received after the deadlines, for any reason, **WILL NOT** be accepted. IT IS THE RESPONSIBILITY OF THE INDIVIDUAL WHO IS APPLYING FOR CERTIFICATION TO ENSURE THAT HIS/HER APPLICATION IS RECEIVED ON TIME. Completed applications and a copy of transcripts or diplomas/degrees as well as other RELEVANT information must be submitted.

Exam	Location	Application Deadline
May 28, 2002	Edmonton	April 10, 2002
May 28, 2002	St. Paul	April 10, 2002
May 29, 2002	Red Deer	April 10, 2002
May 29, 2002	Peace River	April 10, 2002
May 30, 2002	Medicine Hat	April 10, 2002
May 30, 2002	Grande Prairie	April 10, 2002
May 30, 2002	Lethbridge	April 10, 2002
May 31, 2002	Calgary	April 10, 2002
May 31, 2002	Fort McMurray	April 10, 2002

LEVEL II AND IV WATER TREATMENT CERTIFICATION PREPARATION COURSE You Asked For - Now You Got It!

DATE: May 13 - 17, 2002 (Possible November dates as well)

LOCATION: Ramada Inn (Formerly Edmonton Inn)
 11834 Kingsway Avenue, EDMONTON
 Phone: 1-800-661-7264

SPONSORS: The Alberta Water & Wastewater Operators Association & Alberta Environment

**APPLICANTS MUST PRE-REGISTER
 WE MUST HAVE A MINIMUM OF REGISTRATIONS BY
 APRIL 23rd OR THIS COURSE WILL BE CANCELLED.**

Training Credit: 3.0 Continuing Education Units (CEUs).
 For additional information check the AWWOA Website at www.awwoa.ab.ca or call (780) 427-8130.

WATER FOR PEOPLE UPDATE

This year, the AWWOA hopes to raise enough funds for the "Bolivia Machaj Marca Water & Health Training Project" which will benefit a school, orphanage and small community. We hope to raise \$4,800 (US) to help improve the lives of children in this region. Along with the Silent Auction, we plan to hold a pie throwing event and raise funds through the purchase of Water-for-People coffee mugs, T-shirts and pins.

Please note that we are always looking for volunteers to help out. If you are interested in volunteering or learning more about Water for People please feel free to contact Kathy Abramowski at (780) 427-7713.

We look forward to your on-going support and seeing you at the Annual Operators Seminar.

AWWOA BURSARY GENERAL REQUIREMENTS

1. Must be a "member in good standing" of the A.W.W.O.A.
2. Must be registered or hold confirmation of registration with Northern Alberta Institute of Technology Water and Wastewater Technician Program.
3. Must be a Municipal or Utility employee in the Water and Wastewater field or provide proof of employment within the last year.
4. Bursaries are a "one time only" award.
5. All applications are to be received by the Bursary Committee for approval or rejection. Selections must be approved by the A.W.W.O.A. Executive.
6. The program can be altered or discontinued with the approval of the A.W.W.O.A.
7. If the situation arises that the funding for the Bursary is not available, no bursaries would be awarded that year.

Full-time Student Applicant Bursary

1. A bursary of \$2000.00 will be awarded to an applicant meeting the General Bursary requirements.
2. Deadline for application is November 1st of each year.
3. Approval or rejection will be made by December 15th of each year by the A.W.W.O.A. Executive.
4. Bursary to be paid in two equal payments:
 - First payment to be made after confirmation of attendance at NAIT Campus and after the completion of the first term.
 - Second payment to be made after confirmation of attendance at NAIT Campus and after the completion of the second term.

**ALBERTA UTILITY OPERATOR
REGULATORY ASSURANCE DIVISION
APPROVALS SUPPORT BRANCH
ALBERTA ENVIRONMENT
5th Floor, 9820-106 Street
Edmonton, Alberta T5K 2J6**

Outreach Student Applicant Bursary

1. Bursaries of \$150.00 to be dispersed up to a maximum of five applicants meeting General Bursary requirements.
2. Deadline for applications is March 1st of each year of the September program.
3. Approval or rejection to be made by May 31st of each year by the A.W.W.O.A. Bursary Committee for the A.W.W.O.A. Executive.
4. Bursary to be paid in one payment after the confirmation of registration of the applicant with NAIT Westerra Campus.
5. Bursary is available to student applicants meeting general requirements only if the employer is unable or unwilling to assist with funding for educational purposes.

Applications must be made in writing by either the employer or the student applicant.

Applications should be sent to:

Alberta Water and Wastewater Operators Association
P.O. Box 34010, 196A Kingsway Mall P.O.
Edmonton, Alberta T5G 3G4

The Alberta Utility Operator is published three times a year by the Regulatory Assurance Division, Approvals Support Branch, Alberta Environment, as a means to exchange information for those involved in the operation of water and wastewater facilities. The contents do not necessarily reflect official opinion or policy and, unless otherwise stated, should not be construed as policy or regulations. **The Alberta Utility Operator** and Alberta Environment allow the Alberta Water and Wastewater Operators Association to publish noteworthy information in this newsletter, however, we cannot be held responsible for the accuracy of information submitted. Contributions, comments and criticisms are welcome.