

## New Robotic Crawler to Assist With Future Dam Inspections

By Karen Goff

The State Water Commission's Dam Safety Program is responsible for conducting dam safety inspections throughout the state. As part of a thorough dam inspection, it is important to inspect the inside of dam outlet pipes to look for deterioration that could impact the safety of the dam. However, there are numerous dams in the state that have outlet pipes that are either too small in diameter or too hazardous for a person to safely enter to conduct an inspection. As the dams in the state age, many of these pipes are known to be nearing the end of their design life, making it even more important to determine their condition and prioritize repair needs.

To address this issue, the State Water Commission recently purchased a remote pipe inspection system called the Rovver® Robotic Crawler, for the Dam Safety Program. The robotic crawler system will allow dam safety personnel to inspect the inside of small diameter dam outlet pipes without having to physically enter the pipes, greatly increasing safety and efficiency of inspections.

The system consists of a color pan-and-tilt camera mounted on a remote control crawler. A separate control unit allows the operator to remotely drive the crawler and control



An obstruction is identified by the robotic crawler in the upstream outlet pipe at Nygren Dam.

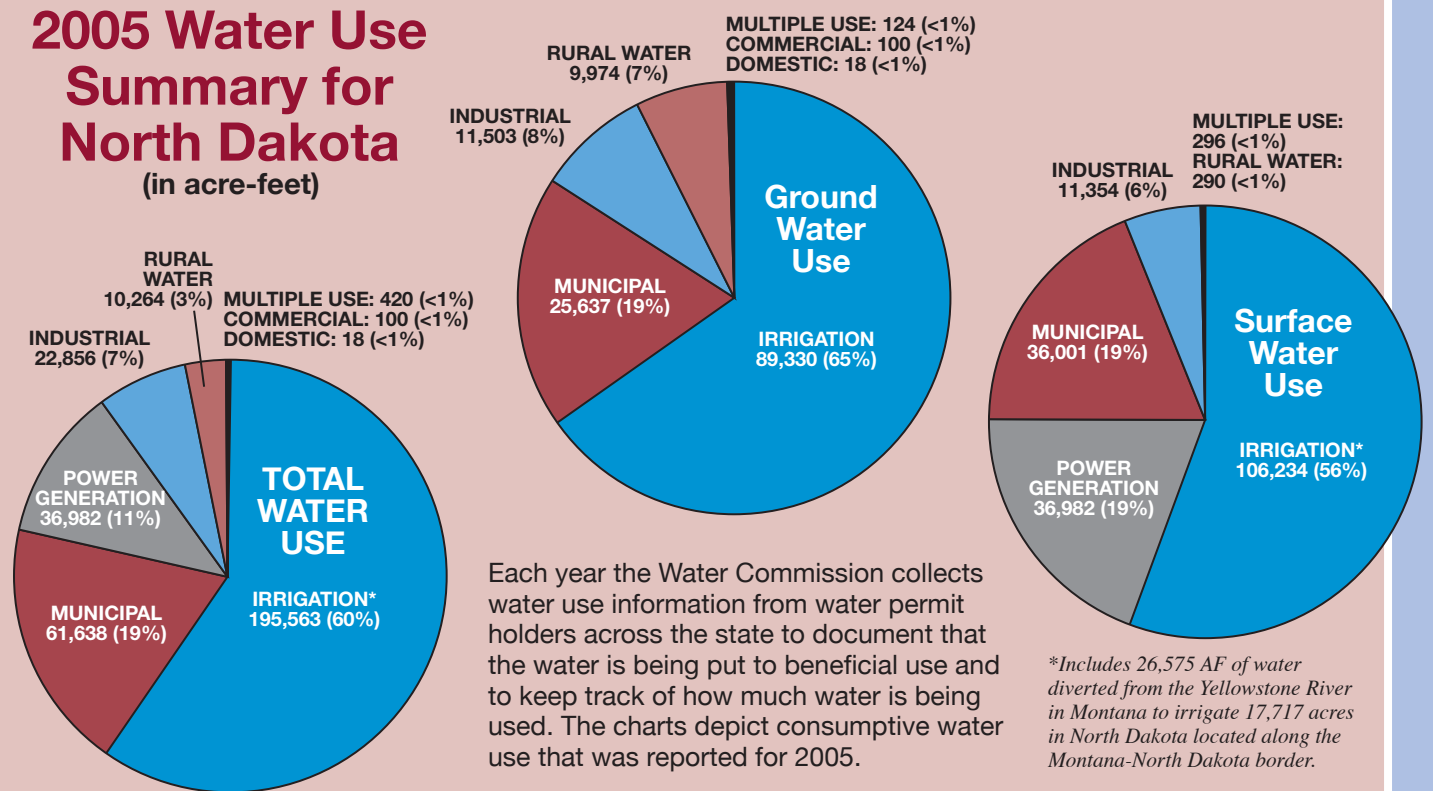
Water Commission staff prepares the robotic crawler for a test inspection.

the camera functions. Video from the camera is fed back through a cable to the control unit where it can be viewed on a monitor and recorded.

The system can optimally inspect pipes ranging from 6 to 36 inches in diameter. And, the entire system is portable enough that the equipment can easily be stored or loaded into a pickup or SUV when needed.

The Water Commission's new Rovver® Robotic Crawler was purchased from Everest VIT/GE Inspection Technologies, Inc. using funds from a National Dam Safety Program grant administered by the Federal Emergency Management Agency.

## 2005 Water Use Summary for North Dakota (in acre-feet)



Each year the Water Commission collects water use information from water permit holders across the state to document that the water is being put to beneficial use and to keep track of how much water is being used. The charts depict consumptive water use that was reported for 2005.

\*Includes 26,575 AF of water diverted from the Yellowstone River in Montana to irrigate 17,717 acres in North Dakota located along the Montana-North Dakota border.

## SE Releases Draft Sovereign Land Plan For Public Comment

In mid September, State Engineer Dale Frink, released a Draft North Dakota Sovereign Land Management Plan for public review and comment. Sovereign land is another name for North Dakota's public lands in and around the state's major rivers and lakes. State law defines sovereign land as "those areas, including beds and islands, lying within the ordinary high water mark of navigable lakes and streams."

"North Dakota's sovereign lands are some of the state's most valuable and heavily used public resources," Frink says. "For that reason, we feel it's important that North Dakota's citizens have a chance to weigh in on how these lands should be managed before the plan is finalized."

The plan includes 21 recommendations and corresponding action strategies that are aimed at improving

management of the state's sovereign lands. Some of the management recommendations pertain to cultural and historic resources, water quality, motor vehicle use, littering, noxious weeds, hunting, boating, and camping.

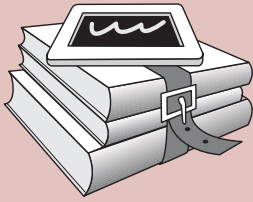
To facilitate public involvement in the planning process and to encourage public comment on the proposed management changes, a series of five open house public meetings were held in Williston, Minot, Bismarck, Fargo, and Valley City. The meetings were held from Sept. 27 through Oct. 4.

The Draft North Dakota Sovereign Land Management Plan can be downloaded from the Water Commission and Office of the State Engineer's website at [www.swc.nd.gov](http://www.swc.nd.gov). Printed copies of the plan can be requested by contacting the Office of the State Engineer at (701)-328-4989, or via e-mail at [NDSLMP@nd.gov](mailto:NDSLMP@nd.gov). Written comments are due by Oct. 30, and can be submitted via the previously mentioned e-mail, or mailed to the Office of the State Engineer, Attn. Sovereign Land Planning, 900 E Boulevard Avenue, Department 770, Bismarck, ND 58505-0850.



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# THE WATER PRIMER

## Water Equivalents Reference Table

### Volume Conversions

UNIT	CUBIC INCHES	CUBIC FEET	GALLONS	ACRE-FEET	MILLION GALS
1 cubic inch	1	.000579	.00433	.00000001329	.000000004329
1 cubic foot	1728	1	7.48	.00002296	.00000748
1 U.S. gallon	231	.134	1	.000003069	.000001
1 acre-foot*	75,270,000	43,560	326,000	1	.3260
1 million gals	231,000,000	133,800	1,000,000	3.0684	1

\*An acre-foot covers the area of one acre one foot deep.

### Rate of Flow Conversions

UNIT	CUBIC FEET PER SECOND	CUBIC FEET PER DAY	ACRE-FEET PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	MILLION GALS PER DAY
1 cubic foot/sec	1	86,400	1.984	448.8	646,000	.646
1 cubic foot/day	.0000116	1	.000023	.00519	7.48	.00000748
1 acre-foot/day	.5042	43,560	1	226.28	325,900	.3258
1 gal/minute	.00223	192.5	.00442	1	1440	.00144
1 gal/day	.00000155	.1337	.00000307	.000694	1	.000001
1 million gal/day	1.55	133,700	3.07	694	1,000,000	1

For example, water flowing at the steady rate of 1 cubic foot per second (cfs) is equivalent to: 86,400 cubic feet per day; 1.98 acre-feet per day; 449 gallons per minute; or 646,000 gallons of water per day.

### Weight Conversions

1 gallon.....	equals.....	8.3 pounds
1 cubic foot.....	equals.....	62.4 pounds
1 acre-foot .....	equals.....	2.7 million pounds or 1,359 tons

The weight of one inch of rain over 1 acre of land would tip the scale at about 226,512 pounds or 113 tons. An inch of rain over the entire United States is equivalent to about 47.7 cubic miles of water and would weigh about 220 billion tons.

### Metric Units

1 liter.....	equals .....	1,000 milliliters.....	equals.....	0.001 cubic meters
1 liter per second flow .....	equals .....	86.4 cubic meters per day		
1 liter of pure water .....	weighs.....	1 kilogram		
1 milliliter of water .....	weighs.....	1 gram		

The following equivalencies will allow you to convert from metric units to U.S. units:  
1 liter equals 0.264 gallons or 0.0353 cubic feet and 1 kilogram equals 2.2 pounds.