

DATA COLLECTION MODERNIZATION IN NORTH DAKOTA

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North Dakota State Water Commission/ Office of the State Engineer

DATABASE

- Internal IT department developed water use 4D database in late 1980s
- Expanded to include
 - Water chemistry
 - Water levels
 - Precipitation (Observer network)
 - Hydraulic structures (Dams/Drains/Sovereign Lands permits)
 - Water supply
 - Survey
 - Weather modification/cloud seeding data
 - Etc...

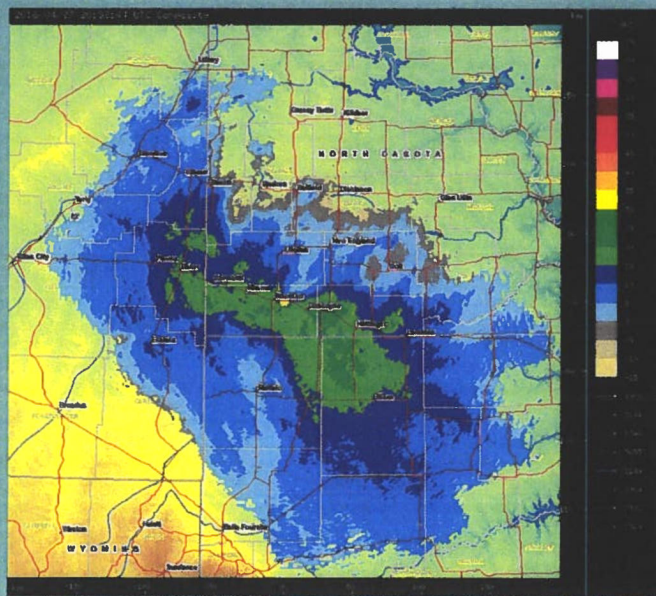


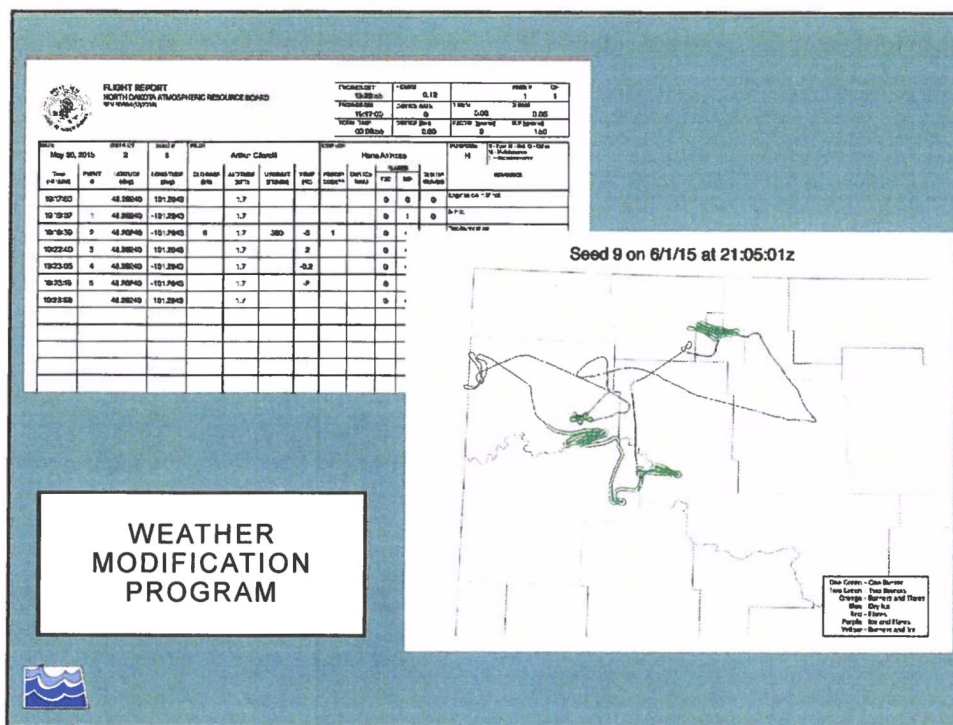
WEATHER MODIFICATION PROGRAM

- Developed in late 1970s for hail suppression
- Atmospheric Resources Board oversees
- Involves about 10 to 15 interns annually



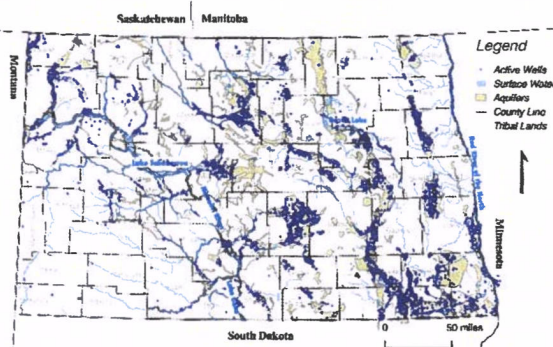
WEATHER MODIFICATION PROGRAM





WATER LEVEL MONITORING

- Approximately 4,000 wells currently monitored by hand monthly
 - 73 Global level loggers
 - 20 Onset level loggers
 - 5 in-house loggers

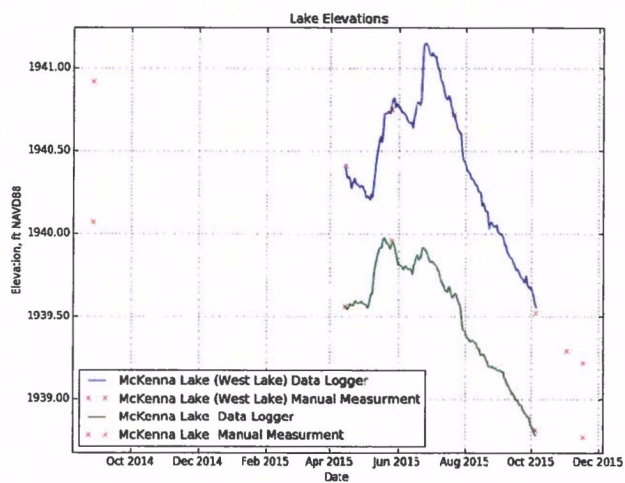


WATER LEVEL MONITORING

- Onset level loggers used for surface water elevation monitoring
- \$300 per logger or \$650 per site (non-vented)
- Currently monitoring about 10 closed basin lakes and 1 stream



WATER LEVEL MONITORING



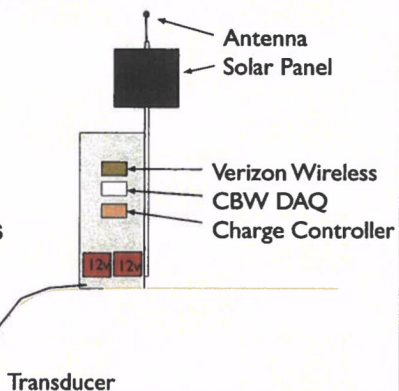
WATER LEVEL MONITORING

- Currently have constructed 5 real-time monitoring stations in-house
 - Current cost ~\$1,500 per site
 - Monitors pressure, other sensors can be added
 - Verizon Wireless network
 - Control By Web interface
 - Sampling interval can be adjusted

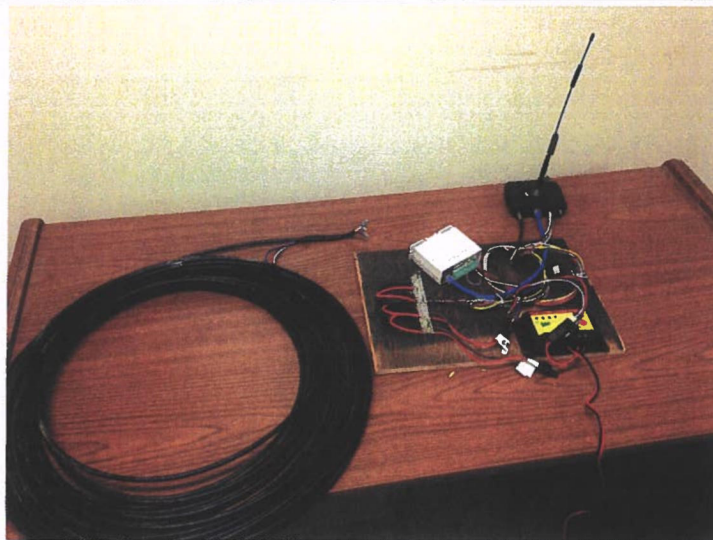


WATER LEVEL MONITORING

- Components
 - Pressure transducer (vented system)
 - Control By Web data acquisition device
 - Verizon Wireless MiFi
 - Solar power system
 - 50 watt panel
 - Charge controller
 - 12 v gel cell or marine batteries
 - External signal antenna

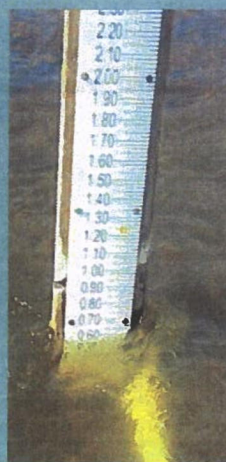


WATER LEVEL MONITORING



Staff Gage

Recorder Shack

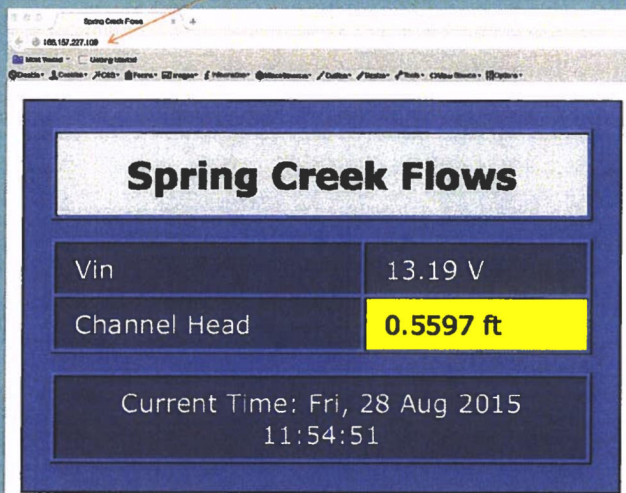


Staff Gage reads 0.68 ft
at 8/27/2015 11:15
Transducer = 0.575 ft

WATER LEVEL MONITORING

WATER LEVEL MONITORING

IP address to access Control By Web



Battery Voltage

Ft of water above transducer

Current Time Stamp

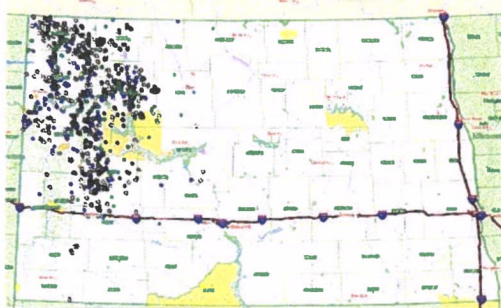


AQUIFER TEST



OIL-FIELD WATER USE MONITORING

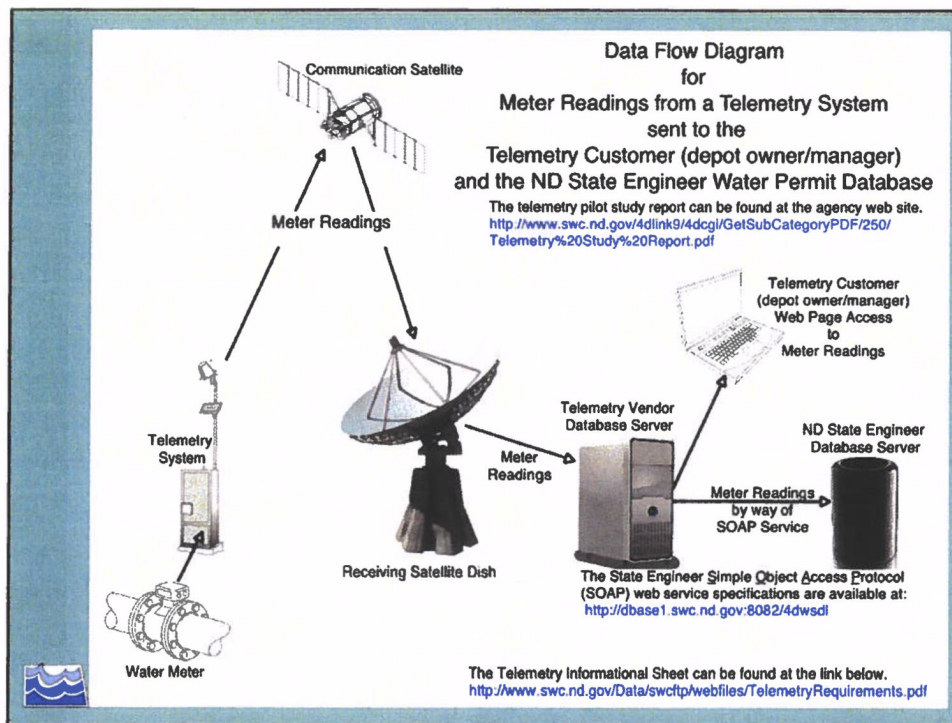
- Bakken oil boom resulted in rapid increase in industrial use (water depots) in western North Dakota
- Telemetry pilot test completed in 2011 by legislative request
- Requires water permit holders that provide water for oil field use to use water meters that automatically upload daily to the SWC database



OIL-FIELD WATER USE MONITORING

- System cost varies from \$1,000 to \$40,000 (multiple sites)
 - At \$0.02/gal \$10,000 = 1.5 acre-ft of water sales
- “Push” system using Simple Object Access Protocol (SOAP)
- Not a replacement for field inspections
- State does not assume responsibility for permit violations





NDSWC SOAP Service Specifications

The North Dakota State Water Commission has developed the following SOAP service for purposes of reporting daily meter readings to comply with remote meter reporting requirements for specified water permits with telemetry projects.

This service is currently a draft specification and may be modified or refined prior to official implementation.

The SOAP service includes the utility to file the meter readings for each depot station. In order to post meter readings, the user will be required to obtain a correct username and password, and the relevant station ID information from the SWC.

The Web Service specifications can be accessed at <http://dbase1.swc.nd.gov:8082/4dwsdl>

xml_Post_Meter_Reading

Input Parameters

Parameter	Data Type	Description
StationID	Integer	Index number assigned to the station.
Username	Text	*
Password	Text	*
ReadingDate	Date	*
ReadingTime	Time	*
MeterReading	Text	*

* Contact the ND State Water Commission for user credentials.

Output Parameters

Parameter	Data Type	Description
Posted	Boolean	Returns True if meter reading was properly posted.
DatePosted	Date	Date Reading was posted
TimePosted	Time	Time Reading was posted
ReadingID	Integer	Record Index assigned to meter reading

SOAP Fault

The service will return a SOAP Fault in the event of one of the following conditions:

Station ID Does Not Exist	SOAP FAULT: Error - Station ID could not be found!
Remote Access Not Defined	SOAP FAULT: Error - Depot Credentials have not been defined!
Incorrect Credentials	SOAP FAULT: Error - Incorrect Username and Password!
Duplicate Meter Reading	SOAP FAULT: Error - Duplicate Meter Reading Sent!

OIL-FIELD WATER USE MONITORING

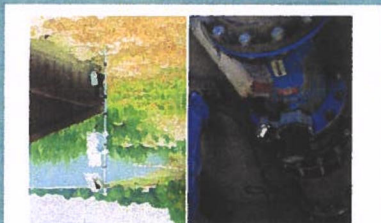


Figure 3. Installation of MacCrometer Technology at the Tarrant Water Depot owned by State Machine, (LEFT) Photo courtesy of MacCrometer Meter: (RIGHT) Desktop installation of telemetry system

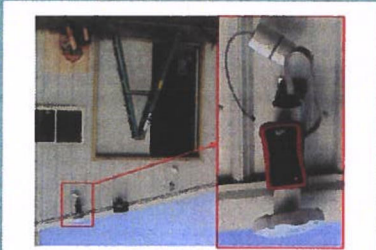


Figure 4. Installation of TWT Technology at the Shafter Water Depot owned by Jett Shafter. External view of the telemetry system, with the hand held calibration system.



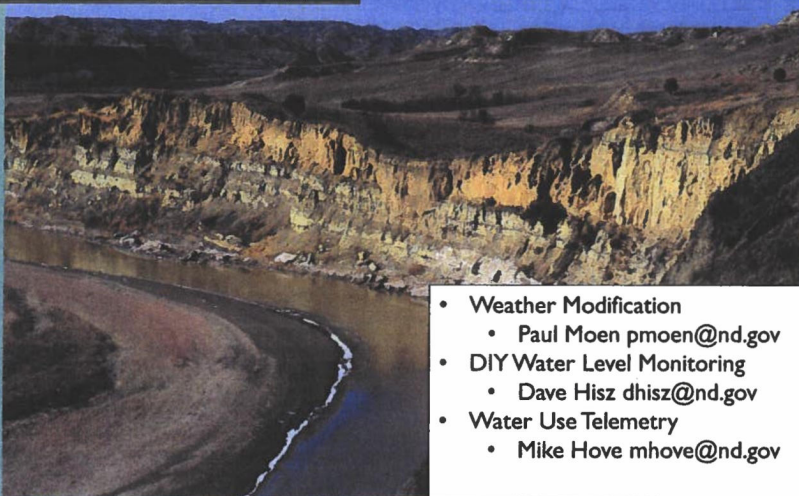
Figure 1. Installation of On-Site Computer HOBIO Data Logger at the Dodge Depot operated by SWWA



Figure 2. Installation of MacCrometer Technology at Timber Creek Depot operated by Mike Amick

Depot ID	Vendor	Depot Address	Status	Station ID	Location	Meter	Model	Units	Date	Reading	Elapsed Days
323	MacCrometer - Monitor	0.0	●	435	1440971C	MacCrometer	ME-100-1700	Barrels	5/2/16	32287	0
362	IoT	0.0	●	427	1591001S	MacCrometer	ME-100-1700	Barrels	4/30/16	98316.00	2
361	MacCrometer	0.0	●	592	15210013B	MacCrometer, MacCrometer	ME-4	Barrels	5/2/16	224130	0
361	MacCrometer	100.0	●	618	15210013B	MacCrometer, MacCrometer	ME-100	Barrels	5/2/16	817258	0
356	Preferred Controls	0.0	●	388	15410013CB			Barrels	4/25/16	9196280	7
327	IoT - Agr-Industries	0.0	●	321	152090120B	MacCrometer	PC-100-01-K	Barrels	5/2/16	384661.00	0
319	IoT	0.0	●	424	154090120B	MacCrometer	PC-100-03-K	Barrels	5/2/16	1595923.00	0
313	MacCrometer	0.0	●	913	15309135C	Seals	CHOD Meter	Galons	5/2/16	3291605	0
311	Preferred Controls	0.0	●	643	15409013D	Seals	WMD 04-00-135	Galons	5/2/16	26847750	0
291	MacCrometer/Halter	0.0	●	432	1450953AN	MacCrometer	ME-110	Barrels	5/2/16	15616	0
289	IoT	0.0	●	1251	14509530AD	Seals	Accu Meter	Galons	5/2/16	0.00	1
289	IoT	0.0	●	1252	14509530AA	Seals	Accu Meter	Galons	5/2/16	0.00	0
288	IoT Station #10015	0.0	●	639	14809064CD9	Seals	Accu Meter	Galons	5/1/16	0.00	1
285	IoT	0.0	●	287	15910013AA2	ABB Motor Meter	FEV 125, VA CMC	Barrels	5/1/16	1375548.00	1
285	IoT	0.0	●	754	15910013AA1	ABB Motor Meter	FEV 125, VA CMC	Barrels	5/1/16	1064543.00	1

THANK YOU



- Weather Modification
 - Paul Moen pmoen@nd.gov
- DIY Water Level Monitoring
 - Dave Hisz dhisz@nd.gov
- Water Use Telemetry
 - Mike Hove mhove@nd.gov

