Palouse Basin Aquifer Committee
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January 15, 2009 Meeting Minutes

Moscow UI Facilities Services Center, Jack's Creek Meeting Room

Attendance

X	UI: Michael Holthaus, Water Systems Manager	X	WSU: Mike Leonas, Project Manager, Capital Planning & Dev.
X	UI: Joe Kline, Director, Utilities and Engineering	X	WSU: Rob Corcoran, Asst Dir, Arch, Engr & Const Services
X	Moscow: Tom Scallorn, Water Dept Superintendent	X	Pullman: Mark Workman (Chair), Director of Public Works
X	Moscow: Walter Steed, City Council Member		Pullman: Art Garro, Maintenance & Operations Superintendent
X	Moscow: Les MacDonald, Director of Public Works	X	Pullman: Barney Waldrop, City Council Member
X	Latah County: Paul Kimmell (Vice-Chair), County Representative	X	Whitman County: Mark Storey, Director of Public Works
X	Latah County: Tom Stroschein, County Commissioner		Whitman County: Michael Largent, County Commissioner
X	Colfax: Carl Thompson, City Administrator		Colfax: Andy Rogers, Public Works Supervisor

Visitors and Others

Bob Haynes, IDWR; Mandie MacDonald, Landau Associates; Joe Foote, CH2M Hill; Wally Hickerson, CH2M Hill; Michael Yount, Patrick O'Neill; Scotty Cornelius, self; David Hall, PWCN; Steve Robischon, PBAC

Call to Order

Mark Workman, PBAC Chair, called the meeting to order at 2:02 PM.

1) Approval of the November 20, 2008 Meeting Minutes

The draft November minutes were modified to include a note regarding the cancellation of the December meeting (due to inclement weather) and approved by consensus.

Item not on Agenda

Robischon announced that Whitman County Commissioner Michael Largent has been appointed to serve as a Whitman County PBAC representative, replacing Commissioner Jerry Finch.

2) Presentations – None Scheduled

3) Unfinished Business -

Pullman/WSU Wastewater Reclamation Project –
Workman reported the Pullman City Council conducted a joint meeting with District 9 legislators in which Senator Mark Schoesler strongly recommended that the effluent reuse project be submitted as an economic stimulus project to both state and federal agencies. In order to make the project "shovel-ready", some of the recently awarded DOE grant funding will be applied toward bringing the previous pre-design information up to date. Corcoran and Leonas added that the governor's supplemental capital funding request does not include direct state funding of the project but instead allows WSU to finance the project through university funding sources. Robischon displayed a copy of a letter from Governor Gregoire thanking PBAC and the CAG for their support for including the project in the proposed capital funding request.

New/Continuing PBAC Projects
The group discussed whether to fund new research projects, and if so, which projects should receive priority. There was consensus among the group that the topic be assigned to the executive committee for preliminary work and returned to the entire group for consideration at a future meeting. Robischon was directed to produce a list of potential projects, as well as a draft RFP for a staged/de-scoped Framework project. In addition, Robischon and Workman will attempt to meet with Mimi Wainwright to discuss potential joint PBAC/DOE funding of projects. Robischon handed out copies of project proposals for the long-term aquifer test project proposed at the November PBAC meeting as well as the continuation of WoW systems dynamics modeling project. Storey noted that in the future the CAG will likely be recommending that PBAC provide funding support to a public information campaign project. The group also passed a motion directing Robischon to purchase (using funds from the research budget) event loggers to be installed on entity pumping wells to record pump on/off events.

4) New Business –

Moscow Well 10 Transfer Application
Robischon displayed the transfer document for a proposed Moscow Well 10 transfer involving the addition of a new point of diversion to the water right for Well 9. IDWR requested comments by January 16. The group discussed the details of the transfer, and as it did not involve any expansion to the Moscow 9 water right, decided not to oppose the transfer. Robischon was directed to document the decision in a letter to IDWR.

5) PBAC Projects Progress Report – Not Discussed

6) Citizens Advisory Group Report

Storey reported the CAG discussed: continuing their support for the wastewater reclamation project, recommending that PBAC fund a public information campaign project, and inviting Steed to the February CAG meeting to discuss the proposed changes to Idaho law regarding use of water outside the state.

7) Budget Report

Robischon displayed budget information through the end of December, indicating a healthy surplus. All entities have paid their FY09 assessments.

8) Other Reports and Announcements –

2008 Pumping Summary
Robischon displayed preliminary information for 2008, indicating a reduction in pumping of nearly 4% from 2007 (14% from 1992 levels). Robischon was directed to verify the numbers and prepare a press release to disseminate the information.

Hawkins Stateline Project
Robischon reported the data loggers at the DOE and IDWR monitoring wells were unable to detect the occurrence of a pump test at the Hawkins site.

Other
Robischon displayed a newspaper article regarding Governor Otter's cut of $12 million from the Idaho Comprehensive Aquifer Management Project. The impact of the cut will likely be that studies planned for the Palouse will be delayed or cancelled.

9) Next Meeting –

The next meeting is scheduled for February 19 in Pullman.

10) Adjournment -

The meeting was adjourned at 3:48 PM.

Submitted for review and approved at the February 19, 2009 PBAC meeting.

Steve Robischon, Executive Manager

Project Scope of Work – Long-Term Grande Ronde Aquifer Stress Testing To Delineate Annualized Effective Aquifer System Storativity and Water Level Responses in the Palouse Basin

Executive Summary:

Hydrogeologic investigations of the ground water resource systems in the Moscow-Pullman area over the past few decades often have led to conflicting conceptual hydrogeologic models and hypotheses to explain inconsistencies between geologic interpretations and hydrogeologic data collected over that period. Long-term, Grande Ronde, water level data collected in Moscow, Pullman and Palouse indicate that annually variable, water level declines on the order of about 0.5 to 1.5 feet per year occur within this general triangular shaped area of the Palouse Basin depending on the volume of ground water pumped from the Grande Ronde aquifer system each year. However, the actual areal extent (i.e., aquifer size and volume) of the interconnected aquifer system affected by the water level declines is unknown. This leads to a high degree of uncertainty and significant misconceptions about the true, basin water balance relative to the rates of natural recharge and natural discharge, and the total amount of ground water stored within the basin that is accessible by wells for long-term domestic, municipal and/or industrial water supplies. Spatially limited sampling for ground water C-14 age determinations suggests that variable areal recharge to the Grande Ronde aquifer system occurs under essentially steady-state (i.e., non-changing and independent of annual precipitation) conditions. C-14 data suggest natural recharge travel times on the order of approximately 4000 to 6000 years from land surface to the top of the Grande Ronde Formation, and proportionally longer travel times from the land surface to the primary Grande Ronde producing zones in Moscow, Pullman, Colfax and Palouse (Douglas, et al., 2007). Mass balance estimates ($Inflow = Outflow \pm \Delta S$), where ΔS is change in ground water storage (reflected as ground water level declines), based on ground water C-14 age dates appear to be inconsistent with mass balance estimates based on water level drawdown measured during several controlled aquifer tests conducted over time periods of days to weeks. Mathematically, the total annual volume of ground water pumped V from the interconnected Grande Ronde aquifer system must be equal to the storativity S (dimensionless volume of water released from storage) of the aquifer system **times** the total area A that experiences the water level decline **times** the annual water level decline Δh as:

$$V = SA\Delta h$$

Answers to questions about the relationships between short-term and long-term derived aquifer test values for transmissivity T and storativity S are critical for all accurate water level projections, and accurate answers are required to ensure a long-term, quality water supply for the Palouse Basin. Delineation of the magnitude of aquifer system S based on basin-wide aquifer system responses to accurately measured basin-wide hydraulic stresses, on an annual time frame, is crucial for accurate prediction of future water level changes associated with pumping and/or implemented aquifer system enhancement measures. Without accurate answers for the magnitude of aquifer system S, it is not possible to develop effective ground water management strategies (other than by trial-and-error) that will result in a basin-wide mass balance between recharge and discharge (i.e., stabilized ground water levels). The importance of accurate characterization of aquifer system S cannot be overstated. Aquifer system S is a crucial aquifer coefficient for understanding where and how in situ ground water is stored in the basin, and for identification of optimal target zones for efficient and effective aquifer system enhancement. In addition, all ground water flow models (predictive tools), such as the Palouse Basin Participatory Model or numerical models such as the Spokane Valley – Rathdrum Prairie Aquifer model, require accurate estimates for aquifer system S to provide useful products. Current estimates of aquifer system S for the Grande Ronde aquifer system vary by more than a factor of 100 when different conceptual models of basin size (volume), based primarily on C-14 age date estimates of natural recharge and natural discharge (i.e., travel time calculations), are compared with the results of several relatively short-term aquifer tests.

The present need is to conduct a strictly monitored, long-term (≥ one year), basin-wide, aquifer test in the Grande Ronde aquifer system to delineate the full system response to total, annual pumping withdrawals. The methodology for this multiple-well/variable pumping rate aquifer testing has been under development for the past several years in the Palouse Basin (McVay, 2007; Fiedler, 2008; Bennett, 2008, Osiensky, 2007). It now is feasible to treat total annual, spatially distributed, basin-wide Grande Ronde and/or Wanapum pumping as long-term, pumping rates for aquifer test analyses to calculate long-term average values of aquifer system transmissivity T and storativity S, as well as 1) provide crucial details on the long-term vertical hydraulic connections between shallow and deep Grande Ronde basalt aquifers, and 2) provide more accurate data to estimate of the "total volume" of aquifer system affected by total annual withdrawals. Application of this aquifer testing methodology as proposed herein provides for maximum utilization of the data derived annually from the PBAC ground water monitoring network (data logger data), and will yield 1) detailed information on long-term (annual) average values for aquifer system T and S, and 2) detailed information about specific aquifer system responses to temporal, pumping variations. This information yields additional benefits of the investigation for Moscow, Pullman, Palouse, Colfax, UI and WSU by providing data needed to evaluate the effectiveness of water conservation measures implemented during the year, and to predict the spatial effects of potential future aquifer system enhancement measures; however, complete analysis for 2) is beyond the scope of the investigation proposed herein. The proposed multiple pumping-well/variable pumping rate aquifer test would incorporate all available pumping records and water level records for the pumping centers of Moscow, Pullman, Palouse and Colfax, plus the two universities, to ascertain the basin-wide aquifer system S for correlation with annual water level declines measured throughout the PBAC Grande Ronde ground water monitoring network, and for correlation with estimates of aquifer system S derived from short-term aquifer tests. This proposed aquifer testing project is designed specifically to provide PBAC with detailed information and answers about the water storage properties of the interconnected Grande Ronde aquifer system within the Palouse Basin. In turn, this information will improve understanding of the relationships of $Inflow = Outflow \pm \Delta S$ so a water balance can be achieved in a timely manner through conservation efforts combined with aquifer system enhancement and/or development of alternate water supplies.

Project Scope of Work – Long-Term Grande Ronde Aquifer Stress Testing To Delineate Annualized Effective Aquifer System Storativity and Water Level Responses in the Palouse Basin

The aquifer testing project proposed herein would be designed as a two-year M.S. Hydrology thesis project in the Department of Geological Sciences at the University of Idaho. Planning and coordination efforts for collection of water level data, pumping rates, pumping on/off schedules, etc. would begin immediately, and the actual aquifer test would begin as soon as all coordination efforts are completed. All pumping entities would be requested to pump normally as needed; however, accurate pumping on/off rate schedules would be requested from Moscow, Pullman, Colfax, Palouse, UI and WSU for the duration of the investigation. In addition, requests will be made to make collection of these data standard operating procedure (SOP) for use in future analyses. Because accurate information on pump on/off times is critical to the aquifer test analyses proposed herein, each major well in the basin will be equipped with a motor on/off data logger such as the HOBO® U9 Motor On/Off Data Logger manufactured by Onset Computer Corporation (see below). These units record power usage on/off cycles by sensing the AC magnetic field generated by the pump motor. Continuous and redundant recording of pump activity is crucial for success of the aquifer testing methodology being proposed herein because the level of detail being proposed for this investigation is unprecedented for the Palouse Basin. The Motor On/Off Data Loggers are self-contained, battery operated, and do not require any wiring or electrical modifications to the pumps.

Project Name:

Long-Term Grande Ronde Aquifer Stress Testing to Delineate Annualized Effective Aquifer System Storativity and Water Level Responses in the Palouse Basin

Period of Performance:

Begin August 25, 2009 and run through May 13, 2011. Project start date is contingent upon securing the services of a qualified graduate student investigator.

Project Description and Objectives:

This project is designed with two purposes:

Purpose 1 of this project will be to continue the maintenance and expansion of the Grande Ronde ground water monitoring network and database. Monitoring will be modified, as needed, to meet the specific needs for the long-term aquifer stress test. However, the general monitoring network and database will be maintained for the period of the investigation.

Purpose 2 of this project will be to design and conduct a long-term Grande Ronde aquifer stress test ($\geq$ one year) to evaluate the long-term aquifer system storativity relative to annual water level fluctuations due to total annual, Grande Ronde, pumping withdrawals.

It is well known that annual water level declines in the Grande Ronde aquifer system have varied between about 0.5 and 1.5 feet per year since first development of the Grande Ronde aquifer system. Most short-term (hours to weeks) Grande Ronde aquifer tests completed in the Moscow-Pullman-Palouse area have yielded estimates of aquifer system storativity between about 0.001 and 0.00001. However, no controlled, long-term aquifer tests on an annual time frame have ever been completed in the Palouse Basin to evaluate the spatial distribution of annual water level declines relative to strictly monitored annual pumping.

The general objective of this project is to modify the existing Grande Ronde ground water monitoring network to allow detailed monitoring of annual water level drawdown and recovery in relation to detailed pumping records in time and space (daily records of all Moscow, Pullman, Palouse and Colfax pumping). This project will be coordinated in collaboration and cooperation with the cities of Moscow, Pullman, Palouse and Colfax, and with the University of Idaho and Washington State University to allow the compilation of detailed, daily pumping records for analysis of the Grande Ronde ground water level data in unprecedented detail. The effects of an entire year of pumping stresses on the Grande Ronde aquifer system will be analyzed as a long-term aquifer test to delineate the annualized effective storativity of the aquifer system.

Short-term aquifer tests in the Palouse Basin historically have been conducted in an organized, well-planned manner to evaluate well-to-well hydraulic connections, and to estimate the aquifer coefficients transmissivity and storativity. However, these aquifer tests often were of limited duration because maximum pumping and recovery periods were controlled by local water demands. This project will evaluate the total hydraulic effects of the combined annual Grande Ronde pumping withdrawals of all the major pumping entities within the Palouse Basin. Daily Grande Ronde withdrawals from all the major pumping entities will be analyzed as a single, long-term aquifer test by invoking the method of superposition. The method of superposition allows for the summation of all hydraulic effects of on/off pumping periods to be analyzed as a single, comprehensive data set that incorporates variable pumping rates and times over a long time period (annual or greater).

List of specific objectives:

1. Maintain and modify the existing Grande Ronde Formation monitoring network, download water level data as required, reset dataloggers to record on a consistent time frame needed to monitor annualized pumping effects within the Grande Ronde aquifer system as a whole.
2. Develop a water level monitoring database for the period of investigation for analysis of the annualized effects of total Grande Ronde pumping within the Palouse Basin.

3. Design and conduct a basin-wide, long-term aquifer stress test to evaluate hydraulic responses to annualized pumping in all wells in the Grande Ronde monitoring network. Collect, synthesize, analyze and interpret the long-term aquifer test data to evaluate the annualized effective aquifer system storativity for the Grande Ronde Aquifer System.
4. Compose/complete a ground water monitoring/aquifer testing report as an MS thesis in Hydrology that addresses issues, documents observed field data, and compiles findings of results and interpretations.

Project Deliverables:

- The final report for the project will be presented as an MS thesis in Hydrology at the University of Idaho. An electronic copy of the thesis will be provided in Adobe.pdf format and made available for download from the PBAC web page if desired.
- A ground water monitoring database for the period of investigation will be provided to PBAC on CD/DVD.
- Semiannual progress updates (presentations) will be presented at PBAC meetings. Electronic files containing a project specific, 2-page progress report clearly stating the goals and accomplishments for that period, and digital file(s) of presentation graphics, will be submitted to PBAC prior to the presentation.
- Monthly 1-page progress reports will be submitted via email to PBAC on or before the second Thursday of each month.

Project Budget:

Project Title: Long-Term Grande Ronde Aquifer Stress Testing to Delineate Annualized Effective Aquifer System Storativity and Water Level Responses in the Palouse Basin

Cost Category	PBAC	Non-PBAC	Total
1. Salaries and Wages James L. Osiensky (PI) Grad Student (8-25-09 to 5-13-11)[1]	 --- $31,158	 UI	 --- $31,158
2. Fringe Benefits (1%, 9% for sum. 2010)	$672	---	$672
3. Supplies (data storage, thesis prep/printing)[2]	$1,200	---	$1,200
4. Equipment[3]	$1700	---	$1700
5. Services or Consultants	---	---	---
6. Travel (local and to regional meeting)	$2,500	---	$2,500
7. Other direct costs (fees and insurance)[4]	$16,510	---	$16,510
8. Total direct costs	$53,740	---	$53,740
9a. Indirect costs on PBAC share[5]	---	---	---
9b. Indirect costs on non-PBAC share	---	---	---
10. Total estimated costs [1] $692.4 per pay period x 45 pay periods. [2] Does not include miscellaneous expenses such as ropes, pipes, clamps, brackets, cables, etc. for data logger maintenance or any other unforeseen contingencies. [3] No costs associated with water level data logger replacements are included. Approximate costs for motor on/off data loggers needed to conduct the aquifer testing are included. [4] Estimated from current rates. [5] Does not include negotiated indirect costs.	$53,740 Motor on/off data loggers are approximately $73 per well. One copy of the software, USB cables, batteries, etc. are extra at about $200 total)	---	$53,740

Project Budget Explanation:

Salary and Fringe:

The project budget includes salary and fringe for one graduate student for the period August 25, 2009 to May 13, 2011. The salary requested is for 20 hours per week over the entire project. This includes 20 hours per week for summer 2010.

Supplies:

Costs associated with portable data storage, thesis preparation, printing and binding are included in the budget. No costs for contingencies are included in the budget. It is assumed that replacement of items that suffer normal wear and tear will be covered by a PBAC maintenance budget rather than this specific aquifer testing project.

Equipment:

It is not possible to itemize potential costs associated with data logger replacements as part of the PBAC ground water monitoring network. Therefore, no costs have been added to the budget for these replacements. However, reliable and stable water level data loggers are required to meet the objectives of this investigation. It is assumed that replacement of items such as data loggers that fail due to normal wear and tear will be covered by a PBAC maintenance budget rather than this specific aquifer testing project.

An estimate for Motor On/Off data loggers currently is $73 per data logger per pumping well. Ideally, one Motor On/Off data logger would be purchased for each major pumping well in the basin. These include all university and city primary wells plus potential backup wells that might be pumped during the period of the investigation. The total number of Motor On/Off data loggers needed might change between now and initiation of the project; however, it is anticipated that at least 20 loggers will be needed at a cost of about $1500. In addition, one copy of the data logger interface software will be needed at a cost of about $100. Miscellaneous cables and connectors for the loggers will total about $100. So the total estimated cost to equip all the major pumping wells in the basin with Motor On/Off data loggers is about $1700. The information collected by the Motor On/Off data loggers should be considered redundant to the data collected by each well operator. However, very accurate on/off times are needed each day because of the unprecedented detail of the aquifer test analyses being proposed in this investigation. Redundancy is required to avoid potential loss of data that are critical to meet the objectives of the investigation.

Travel:

Travel is budgeted specifically for local mileage to and from all wells to set and download water level data loggers and motor on/off data loggers for the period August 25, 2009 to May 13, 2011. In addition, travel funds are included to attend one regional professional meeting to present the results of the aquifer testing project. All unused travel funds will be returned to PBAC.

Other Direct Costs (fees and insurance):
Graduate student fees and insurance are estimated from current (Dec 2008) rates of $2606 and $694.25 per semester, respectively. Increases of 10% each year were assumed for the budget period of this investigation.

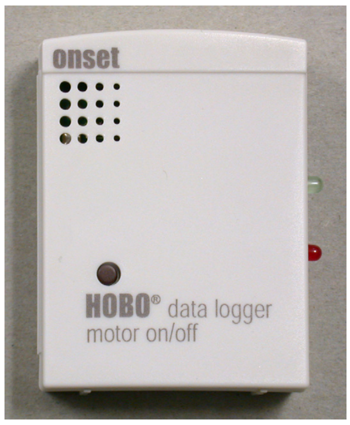
Indirect Costs:
Negotiated indirect costs (overhead) are not included in the budget because these are not known at this time.

HOBO® U9 Motor On/Off Data Logger
(Part # U9-004)

Inside this package:

- HOBO U9 Motor On/Off Data Logger
- Mounting kit with magnet, hook and loop tape, 3/8" double-sided tape.

Doc #9622-A, MAN-U9-004
Onset Computer Corporation



Thank you for purchasing a HOBO data logger. With proper care, it will give you years of accurate and reliable measurements.

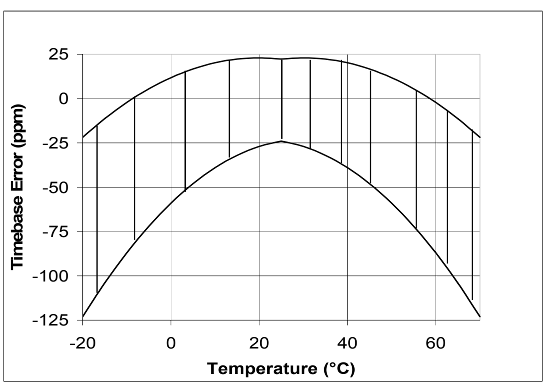
The HOBO U9 Motor On/Off Data Logger has 64K of memory and can record up to 43,000 state changes. The state channel monitors motor on and off conditions by sensing an AC magnetic field.

The logger uses a direct USB interface for launching and data readout by a computer.

A HOBOware™ software starter kit is required for logger operation. Visit www.onsetcomp.com for details.

Specifications

AC field threshold	750mGauss at 60Hz
Time accuracy	Approximately ± 1 minute per month at 25°C (77°F); see Plot A
Operating temperature	Logging: -20° to 70°C (-4° to 158°F) Launch/readout: 0° to 50°C (32° to 122°F), per USB specification
Humidity range	0 to 95% RH, non-condensing
Battery life	1 year typical use
Memory	64K bytes (up to 43,000 state changes); see "Storage capacity" on the next page
Weight	29 g (1.0 oz)
Dimensions	45 x 60 x 20 mm (1.8 x 2.38 x 0.77 inches)
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

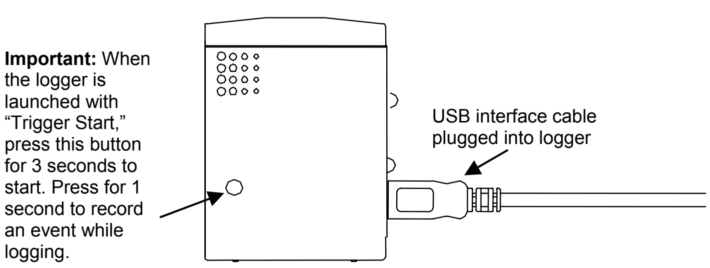


Plot A

Connecting the logger

The U-Series logger requires an Onset-supplied USB interface cable to connect to the computer. If possible, avoid connecting at temperatures below 0°C (32°F) or above 50°C (122°F).

1. Plug the large end of the USB interface cable into a USB port on the computer.
2. Plug the small end of the USB interface cable into the side of the logger, as shown in the following diagram.
3. Load and use logger software to operate the logger (see software manual).



If the logger has never been connected to the computer before, it may take a few seconds for the new hardware to be detected.

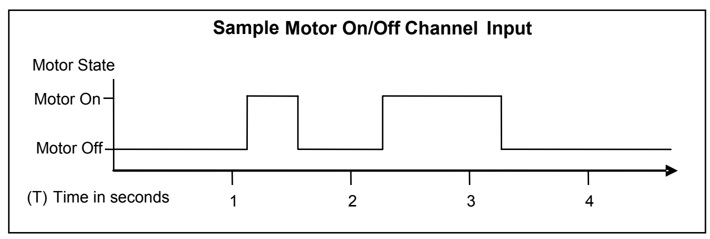
You can read out the logger while it continues to log, stop it manually with the software, or let it record data until the memory is full.

Refer to the software user's guide for complete details on launching, reading out, and viewing data from the logger.

Important: If you configure the logger to start with a trigger start, be sure to press and hold down the button on the front of the logger for at least three seconds when you want to begin logging data. When you release the button, the light on the side of the logger will flash rapidly to indicate that logging has begun.

State logging

The logger checks the state value every second. It is unaware of any changes that happen between checks. Accordingly, if the motor activity shown in Plot B below is applied, the logger does not see the momentary motor-on-to-off transition that happens between T1 and T2 because the motor is off at both times. However, the motor state changes from T2 to T3, and from T3 to T4, are recorded as one motor-on state that begins at T3 and ends at T4.



Plot B

Using the AC field sensor

Your logger contains a coil, which is used to monitor motor on and off conditions. It does this by sensing the magnetic field created when an AC motor turns on. The sensitivity threshold is 750mGauss @60Hz. The coil is located just below the pushbutton and should be as close to the field as possible. Magnetic field intensities fall off rapidly with increasing distance from their source. This means the logger must be mounted very close to (ideally, directly on) the field source. If you cannot mount the logger directly on a motor with heat fins or shielding, mounting the logger to one phase or "leg" of power going to the motor may be an alternative if the field in the "leg" is large enough.

Test deployment

Before deploying your HOBO U9 Motor On/Off logger for an extended period, we recommend running a test deployment to ensure that the logger is reliably recording when your device turns on and off. Reposition the logger and repeat the test deployment if needed.

Logging the battery voltage

In addition to state readings, the logger can record battery readings at regular intervals. If you enable the internal battery channel for logging, battery measurements should be made at long intervals (one hour or greater) to minimize memory usage.

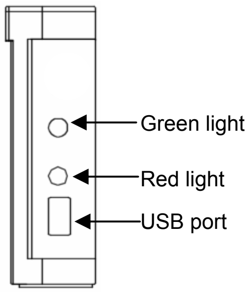
Internal events

Events are independent occurrences triggered by logger activity. Examples of events recorded asynchronously during deployment include: when the logger is connected to the host, when the battery is low, end of a datafile once the logger is stopped, and button pushes.

Press the button on the front of the logger for one second to record an event. Both a "button down" and a "button up" event will be recorded. This is useful if you want to mark the datafile at a particular point.

Logger operation

Lights (LEDs) on the side of the logger confirm logger operation.



The following table explains when the logger blinks during logger operation:

When:	The lights:
The logger is logging battery channel faster than four seconds	Blinks at the battery logging interval • Red LED blinks if motor is not detected • Green LED blinks if motor is detected*
The logger is logging battery channel at four seconds or slower, or is logging only state changes	Blinks every four seconds • Red LED blinks if motor is not detected • Green LED blinks if motor is detected*
The logger is awaiting a start because it was launched in Start At Interval, Delayed Start, or Trigger Start mode	Red LED blinks once every eight seconds until launch begins
The button on the logger is being pushed for a Trigger Start launch or manual event	Red LED blinks once every second while pressing the button and then (trigger start only) flashes rapidly once you release the button. The light then reverts to a blinking pattern based on the logging interval

*Faint red LED blinks can be seen when motor is detected. This is a normal condition; the logger is checking its battery voltage.

Storage Capacity

The logger's storage capacity depends on the interval between state changes. The longer the interval between a state change, the more memory is needed to store the data. The following table shows how memory capacity is affected by various intervals between state changes, assuming the battery channel is disabled.

Average interval between state changes	Approximate total points
1 sec. – 15 sec.	43,439
16 sec. – 4.25 min.	32,512
4.24 min – 68.25 min.	26,009

Protecting the logger

The logger can be permanently damaged by corrosion if it gets wet. Protect it from condensation. If it gets wet, remove the battery immediately and dry the circuit board with a hair dryer before reinstalling the battery. Do not let the board get too hot. You should be able to comfortably hold the board in your hand while drying.

Note! Static electricity may cause the logger to stop logging. To avoid electrostatic discharge, transport the logger in an anti-static bag, and ground yourself by touching an unpainted metal surface before handling the logger. For more information about electrostatic discharge, visit our website at http://www.onsetcomp.com/support/support.html.

Mounting

There are three ways to mount the logger using the materials in the mounting kit included with the logger.

- Use the hook-and-loop tape to affix the logger to a surface.
- Attach the magnet and then place the logger on a flat magnetic surface.
- Use the double-sided tape to affix the logger to a surface.

Battery

The logger requires one 3-Volt CR-2032 lithium battery. Expected battery life varies based on the temperature and the frequency at which the logger is recording data (the logging interval and the rate of state changes). A new battery typically lasts one year. Deployments in extremely cold or hot temperatures or logging intervals faster than one minute may significantly reduce battery life.

To replace the battery:

1. Disconnect the logger from the computer.
2. Open the case by unsnapping the side cover.
3. Lift the circuit board and carefully push the battery out with a small blunt instrument, or pull it out with your fingernail.
4. Insert a new battery, positive side facing up.
5. Carefully realign the logger in the case and re-close it.

⚠ **WARNING:** Do not cut open, incinerate, heat above 85°C (185°F), or recharge the lithium battery. The battery may explode if the logger is exposed to extreme heat or conditions that could damage or destroy the battery case. Do not dispose of the logger or battery in fire. Do not expose the contents of the battery to water. Dispose of the battery according to local regulations for lithium batteries.

Service and Support

HOBO products are easy to use and reliable. In the unlikely event that you have a problem with this instrument, contact the company where you bought the logger: Onset or an Onset Authorized Dealer. Before calling, you can evaluate and often solve the problem if you write down the events that led to the problem (are you doing anything differently?) and if you visit the Technical Support section of the Onset web site at www.onsetcomp.com/support.html. When contacting Onset, ask for technical support and be prepared to provide the product number and serial number for the logger and software version in question. Also completely describe the problem or question. The more information you provide, the faster and more accurately we will be able to respond.

Onset Computer Corporation
470 MacArthur Blvd., Bourne, MA 02532
Mailing: PO Box 3450, Pocasset, MA 02559-3450
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Repair Policy

Products that are returned after the warranty period or are damaged by the customer as specified in the warranty provisions can be returned to Onset with a valid RMA number for evaluation.

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Data-back™ Service. HOBO data loggers store data in nonvolatile EEPROM memory. Onset will, if possible, recover your data.

Tune Up Service. Onset will examine and retest any HOBO data logger.

Part #: MAN-U9-004, Doc #: 9622-A, Patent # 6,826,664

Participatory Water Visioning Tool for the Palouse Basin

A Palouse Basin Aquifer Committee and UI Waters of the West Collaboration
Proposal Date: December 9, 2008

Introduction

The management of natural resources is becoming increasingly complex. Agencies who manage resources have come to realize the value of public input into the decision-making processes and encourage participation in a variety of forums, which attempt to both educate and gather public sentiments. Due to the complexity of explaining often highly scientific information and juggling a plethora of social values, agencies and communities are exploring the use of participatory modeling processes using system dynamics.

The University of Idaho Waters of the West, the Palouse Basin Aquifer Committee and its Citizen Advisory Group have participated in a pilot project to explore the use of participatory modeling to assist with water resource management decisions. The model building process has been a collaborative effort that includes hydrologists from WSU and UI, facility operators from Pullman, WSU, Moscow and UI, representatives from Washington Department of Ecology, Idaho Department of Water Resources, Latah County, Palouse Conservation District, and local citizens.

Building the Palouse Basin model has followed an iterative process that includes workshops and model building between workshops. Modelers build simulations of their understanding of stakeholder concerns expressed during the group meetings. They then return to the group with a simulation model to be vetted by the group. The model continues to be developed with the input and commentary described at each meeting. The process encourages members of the groups to explore individual mental models of water issues on the Palouse. It has promoted discussion of scientific uncertainty, and individual perceptions of availability and conservation. The iterative nature of the process promotes a shared vision of "the problem and potential solutions" through discussion and model development.

The pilot project, which began with its first workshop in March of 2008, had an additional four workshops and many individual consultations. As a process product the group presented the results of their participatory process at the 2008 Palouse Basin Water Summit in October. The presentation included model simulation results of various combinations of "what if" scenarios focusing on growth and conservation. At present the model combines groundwater supply parameters, issues surrounding demand and potential policy considerations for both conservation and "new water". It includes parameters such as aquifer storativity, recharge, pumping history, projected demand and potential conservation by Pullman, WSU, Moscow and UI, current and potential use of reclaimed water, a hypothetical reservoir, and the potential contributions of individual conservation measures such as low flow toilets or reduced lawn watering.

Throughout the process participants discussed where this project was leading the group and what could happen after the pilot project. There is interest in taking this process to "the next step". The following is a proposal for a Participatory Water Visioning Tool that is designed to both refine and expand the pilot model and to include additional participants in the modeling process.

Although maintaining the "pilot" perspective may be an asset at this point we recommend a more committed name, thus the "Participatory Water Visioning Tool for the Palouse Basin". The next layer of participants are not familiar with this kind of process and may need time to assess the usefulness of participatory modeling and its potential for developing a decision support tool. That said, the more "committed" name might serve as an incentive for involvement. We have no doubt the group will revisit how or in what fashion this model should be developed and used. It should be emphasized that participatory model building embraces different personal values and provides the opportunity for those values to be explained to others. Models allow us to agree or disagree. And finally decision support tools are just that, they support, they do not make decisions.

Participatory Water Visioning Tool for the Palouse Basin
Timeline for Calendar year 2009

Bi-monthly Workshops between January and September plus individual or working group meetings in between workshops (3 hours per workshop).

October 2009 Water Summit presentation

October –December write up results and plan for 2010

Process specifics need to be decided by the group. See next section Model Refinement and Expansion for suggestions of potential paths.

Participatory Water Visioning Tool for the Palouse Basin
Process products for Calendar year 2009

Model refinement:
Continue to work with hydrogeologists to refine hydrologic parameters and improve consensus on such parameters.

Model expansion:
The current version of the model is weak with respect to costs of alternative sources of water, costs of conservation and the economics of growth and growth management. In

order to facilitate discussion and improve this segment of the model we propose that the group should be expanded to include those who make economic and growth management decisions in the Palouse Basin. Their expertise is needed and their buy-in is crucial if this process is to lead to more holistic and cooperative water management.

Potential paths to facilitate refinement and expansion:
To help facilitate discussion about the next steps the following is offered as a point of departure for discussion.

1. Hydro-geologic expert workshop(s) to further develop and refine physical side of model. Invitees may include: Dr. James Osiensky (UI), Dr. Kent Keller (WSU), Dr. John Bush (UI Emeritus), Dr. Jerry Fairley (UI), Dr. Fritz Fiedler (UI), Dr. Jan Boll (UI), Dr. Allyson Beall (WSU, Waters of the West), Guy Gregory (WA DOE), Michael McVay (ID IDWR) and Steve Robischon (PBAC).

2. Expansion of conservation options: In addition to further utilizing the pumper's conservation plans, we could have mini workshops at night with the CAG to help further develop this sector of the model. Previous CAG participation was limited by the timing of the meetings. A representative could then attend the regular workshops.

3. The WRIA is close to setting instream flows and limitations on unmetered wells. Should they be invited to the process at this point? Again as with the CAG mini workshops to accommodate their schedule may increase participation.

4. Invite elected officials to the workshops. If they are unsure of attending we could hold individual meetings with elected officials to elicit their thoughts on development and economics. Invitations to the workshops would again be extended. Including elected officials will give them an opportunity to explore their own visions of water resources as well as the visions of others in a neutral venue. It also provides the opportunity for them to explore the options of cooperative water management throughout the process of designing a model.

Presentation: 2009 Palouse Basin Water Summit:
This collaboratively designed presentation will describe the changes to the model over the course of 2009 and insights into the process as seen through the eyes of the participants.

Participatory Water Visioning Tool for the Palouse Basin process participants:
The original group of participants should be included due to their working relationships and familiarity with both the process and the model. We recommend "layering" in elected officials from Moscow, Pullman and Latah and Whitman counties as well as encouraging more participation from the CAG and potentially including the WRIA. Adding in community members from each of these entities will help maintain the transparency of the process and provide expertise with growth, development, design,

economics and conservation measures. In all, this would expand the original group of 18-20 people (see below) to a potential of 30-40 people. The larger group could be split into working groups who could meet with the modelers in between workshops to address model details in depth.

Pilot participants:
Waters of the West: Allyson Beall, Jan Boll, Barb Cosens, and Fritz Fiedler.

Community members: Ree Brannon, CAG; Rob Corcoran, PBAC WSU Exe. Dir. Facility Operation; Kevin Gardes, City of Pullman; Guy Gregory, WA Dept of Ecology; David Hall, PWCN; Suzanne Hamada, Palouse Conservation District; Helen Harrington, IDWR; Paul Kimmell, PBAC Latah County; Joe Kline, PBAC UI Dir. Utilities and Engineering Services; Mike McVay, IDWR; Cheryl Morgan, Pullam Citizen; Ken Neely, IDWR; Steve Robischon, PBAC; Tom Scallorn, PBAC Moscow Water Dept Superintendant; Julie Titone, CAG; and Mark Workman, PBAC city of Pullman.

Hydrologic advisors: Jerry Fairley, UI; Kent Keller, WSU; Jim Osiensky, UI; and Steve Robischon, PBAC.

Participatory Water Visioning Tool for the Palouse Basin
Budget for Calendar year 2009:

40k for Allyson Beall. To be split between WoW and PBAC. Waters of the West 20k, PBAC 20k. Details to be determined.