

STATE OF IDAHO  
DEPARTMENT OF WATER RESOURCES (IDWR)

MINIMUM ACCEPTABLE STANDARDS FOR  
MEASUREMENT AND REPORTING OF  
SURFACE AND GROUND WATER DIVERSIONS

The source and means of diversion of water, whether surface or ground water, generally determines the measurement and reporting process. Surface water sources such as streams, springs and waste channels are normally diverted into open channels (ditches or canals), but closed conduits (pipes or culverts) are also used. Ground water is usually diverted into pipes (which may also discharge into open channels).

Measuring devices are required at or near the point of diversion from the public water source.

## SURFACE WATER DIVERSIONS

### I. Flow Measurement

The following discussion is applicable only to diversions from surface water sources. Measurement of a ground water diversion with an open channel measuring device must be pre-approved by the Department.

#### A. Standard Open Channel Measuring Devices

All open channel flow diversions should be measured using one of the following standard open channel flow measuring devices commonly used in Idaho:

- contracted rectangular weir
- suppressed rectangular weir
- Cipolletti weir
- 90 degree V-notch weir
- ramped broad crested weir (or ramped flume)
- Parshall flume
- trapezoidal flume
- submerged rectangular orifice
- constant head orifice

Construction and installation of these devices should follow published guidelines. References are available upon request.

#### B. Non-standard open channel devices: Rated Structures or Rated Sections

IDWR may authorize the use of non-standard devices and rated sections provided the device or section is rated or calibrated against a set of flow measurements using an acceptable open channel current meter or a standard portable measuring device. Further restrictions and requirements are available from the Department upon request.

#### C. Closed conduit measuring devices

Refer to the Ground Water measuring section for installation, accuracy, and calibration standards of closed conduit measuring devices.

## II. Reporting

All surface water measuring devices, rated structures and rated sections should be read and readings recorded at least once per week, and more frequently if necessary. IDWR will accept the assumption of constant flow rates between readings if flow rates are continuous and reasonable constant. Forms will be provided for recording dates, stage (or water levels) and flow rates.

Users with diversions located within water districts may report their diversions individually to IDWR or provide for the water district watermaster to report their diversions in acceptable annual water distribution reports. Ground water diversions are not normally included in a water district, and must be reported individually.

## **GROUND WATER DIVERSIONS**

Ground water diverters have the option of installing a flowmeter, or using power records to estimate water withdrawals. Information regarding the use of power records will follow this discussion of flowmeters.

### **I. Flow Measurement**

There are many flowmeters on the market, with costs ranging from several hundred dollars to several thousand dollars. In general, the higher priced meters are more accurate and require less maintenance. Most meters on the market have an acceptable accuracy rating for IDWR's guidelines. However, some types and designs are much more prone to maintenance problems. Moving parts tend to wear when sand or silt is present, and moss often plugs small orifices and slows moving parts. No single flowmeter is best for every situation. We recommend that you visit with qualified dealers and discuss your needs with them.

#### **A. Minimum Standards**

The following are minimum standards for closed conduit flowmeters:

- Minimum manufacturers' design accuracy of +/- 2 percent of reading
- Installed accuracy of at least +/- 10 percent of reading
- Meter must be calibrated with an independent, secondary measuring device when installed, and at least once every four years thereafter
- Must read instantaneous flow or be capable of flow rate calculation
- Must record total volume
- Non-volatile memory (power outage does not zero volume reading)
- Sufficient digits to assure "roll-over" to zero does not occur within 2 years
- Volume reading cannot be "reset" to zero
- Installed to manufacturers' specifications

Meter manufacturers typically specify that a meter must be located in a section of straight pipe at least 10 pipe diameters downstream and 5 pipe diameters upstream of any valves, bends, contractions, or other interferences which will distort the flow pattern. However, some types of meters will produce acceptable results when installed in shorter sections of straight pipe. For example, at least one electro-magnetic flowmeter provides excellent measurement accuracy with only 5 lengths of straight pipe upstream from the meter.

Each manufacturer should provide the installation specifications for its meters. These **specifications must be adhered to** in order to achieve the accuracy required for the water measurement program. Again, we stress the importance of visiting with a qualified dealer and discussing your specific needs with them.

## B. Types of Measuring Devices

Types	Pipe Sizes	Maintenance Required	Relative Purchase Price
Differential Head <ul style="list-style-type: none"> <li>• Orifice</li> <li>• Venturi</li> <li>• Annubar</li> </ul>	small to large	Low to high. Sand wears on sharp edges, and particles can plug small orifices and tubes.	low to medium
Force Velocity <ul style="list-style-type: none"> <li>• Turbine</li> <li>• Propeller</li> <li>• Impeller</li> </ul>	small to large	Typically moderate to high. Often problematic when exposed to sand or moss. Some cannot measure low velocities	low to medium
Ultrasonic	small to large	Low. Typically non-invasive with no moving parts to wear	high
Vortex	small to medium (about 12 to 14 inch maximum pipe diameter)	Low. Few or no moving parts to wear.	high
Electro-Magnetic	small to medium (about 12 to 14 inch maximum pipe diameter)	Low. No moving parts. Can provide good results with shorter lengths of straight pipe.	high

## II. Power Records

An alternative to installing flowmeters is the use of power records and other information to estimate the annual diversion from a pump. This method, which we call the Power Consumption Coefficient (PCC) method, utilizes information obtained from the pumping plant while running at or near full capacity. Two parameters are measured while the pump is operating: flow rate and input power. With this information, one can calculate the number of kilowatt-hours required to pump one acre foot of water. This number is unique to each well and pumping plant due to the physical attributes of the system.

To determine the rate of flow, a portable measuring device, such as an ultrasonic non-invasive meter or a differential head device, can be used. Simultaneous with the flow measurement, power is measured using the utility's kilowatt-hour meter. A qualified individual with the necessary equipment will be required to perform these measurements.

With the power consumption coefficient, an annual volume of water pumped can be calculated from the total annual kilowatt-hours of energy consumed by the pumping plant. The total power usage for each pumping plant will be supplied to the Department by electric utilities.

Some complex systems cannot use this method due to the potential for large errors. See the discussion on page 5 to see if this method can be used.

Because systems wear and water levels change, it is necessary to occasionally verify the flow to power ratio. Therefore, the power consumption coefficient must be re-calibrated at least once every four years.

### III. Reporting

For irrigation, all ground water measuring devices should be read and readings recorded prior to the first diversion of the season (around April 1), at least once per month during the irrigation season, and at the end of the irrigation season. Non-irrigation users should begin measuring within 56 days of receiving measurement information.

When power records are used to estimate the diversion, it may be necessary to keep a daily record of pump operation. This will usually only be necessary when the pump's flow rate changes significantly due to operational or other changes. For example, operation of multiple pivots, using fewer lines, booster pumps, throttling, etc. will usually cause dramatic changes in the flow.

All records of measurements and readings shall be submitted to the Department after the last diversion of the irrigation season, and no later than January 15<sup>th</sup> of the following year.

### Can power records be used to estimate my diversion?

**Only irrigation water users may use power records** to estimate their diversion because the utilities will only provide consumption information for irrigation uses. If you are not an irrigation user, but want to use power records, you must propose a method of reporting your power consumption data.

Owners of **surface water diversions** must have a flow measuring device in most cases. The alternate method of estimating water withdrawals with power records cannot be used unless you pump from a public water source and can show the Department that it will yield reliable results (case by case determination).

Owners of **ground water diversions** can either install a totalizing flowmeter or ask the Department to use power records to estimate withdrawals. If the pump discharges to an open channel, an open channel measuring device can be employed to measure the water diverted if the device and a method of tracking hours of operation are pre-approved by the Department. Flow meters which register only instantaneous flow rate are not acceptable unless the water user can demonstrate a reliable method of tracking the number of hours the pump operates through the season (the flow measuring device must then be read and flow rate recorded at least once per week).

Estimating total water diversion from power records requires the derivation of a relationship between power demand and flow. Flow rate and power demand must be measured simultaneously to determine the number of kilowatt hours needed to pump an acre foot of water. This relationship, called a power consumption coefficient, is applied to the year end power records to determine the total acre feet diverted.

The total water diverted can be accurately estimated if the system configuration or operation is not complex. Unfortunately, power records will not always yield acceptable results, and it will be necessary to install a flowmeter. **Flowmeters must be installed** if any of the following conditions exist:

- The well flows (artesian) so that water can be diverted when the pump is off.
- The energy consumption meter that records power used by the pump also records power used by other devices not integral to the irrigation system. For example, if the meter also records power used by a home, shop, cellar, etc., a flowmeter must be installed because power used by the pump cannot be isolated from the other devices. However, if the meter also records power used by center pivots, booster pumps, or other devices which operate when the main pump operates, the alternate method may be acceptable.
- The energy consumption meter records the power used by more than one well pump. If a deep well pump which discharges to an open pond or ditch and a relift pump are both connected to the same electrical meter, the discharge from the well pump can be measured, and a time clock can be installed to record the total number of hours of pump operation which can be multiplied by the flow rate to determine the total volume of water diverted.
- The energy supplied to the pump cannot be accurately and reliably measured. For example, most diesel and propane driven pumps do not have provisions to measure the fuel used by the engine. These will be reviewed one case-by-case basis.
- The flow rate from the pump varies significantly due to changes in demand or operation. For example, pumps that discharge into a pressurized system some times and then open discharge at other times, or pumps that supply multiple pivots, would likely have flow rates that changed drastically. These changes would alter the flow to power ratio, causing inaccurate estimates of diversions. The alternate method of estimating water withdrawals with power records may only be used if the water user can propose an acceptable method of tracking these changes in operation.
- Changing water levels cause the flow to vary more than 25% (or pressures to vary more than 15%) over the irrigation season.

STATE OF IDAHO  
DEPARTMENT OF WATER RESOURCES  
WATER MEASUREMENT ANNUAL REPORT

REPORTING YEAR \_\_\_\_\_

**POWER CONSUMPTION METHOD OF ESTIMATING DIVERSIONS**

ATTENTION: Year end data must be submitted to Idaho Department of Water Resources 1301 N. Orchard, Boise ID 83706, on or before **December 15** of the reporting year..

**A separate reporting form must be submitted for each diversion.**

Name:	_____
Water Source:	_____
Water Right No:	_____
Legal Description:	T _____ R _____ Sec. _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/>
Site Tag No:	_____
Diversion Name:	_____

**SECTION I Water Right Holder/Operator information**

*(If there are multiple water right holders on a common ditch or conveyance system, please designate the contact person below)*

**Current Water Right Owner**

Please check for address correction !

Name \_\_\_\_\_

Phone \_\_\_\_\_

Last, First, MI

Address \_\_\_\_\_

Fax \_\_\_\_\_

City \_\_\_\_\_

Mobile \_\_\_\_\_

State & Zip \_\_\_\_\_

e-mail \_\_\_\_\_

**Operator or Contact Person (if different from owner)**

Name \_\_\_\_\_

Phone \_\_\_\_\_

Last, First, MI

Address \_\_\_\_\_

Fax \_\_\_\_\_

City \_\_\_\_\_

Mobile \_\_\_\_\_

State & Zip \_\_\_\_\_

e-mail \_\_\_\_\_

**Original Owner (if sold within last year)**

Name \_\_\_\_\_

Phone \_\_\_\_\_

Last, First, MI

Address \_\_\_\_\_

Fax \_\_\_\_\_

City \_\_\_\_\_

State & Zip \_\_\_\_\_

**SECTION II Pump Discharge Pressure Information**

Pump discharge pressure readings: (enter date)

March ( ) \_\_\_\_\_ April ( ) \_\_\_\_\_ May ( ) \_\_\_\_\_ June ( ) \_\_\_\_\_  
 July ( ) \_\_\_\_\_ August ( ) \_\_\_\_\_ September ( ) \_\_\_\_\_ October ( ) \_\_\_\_\_

**SECTION III Utility Information (REQUIRED)**

Electric Utility \_\_\_\_\_ Customer Account No. \_\_\_\_\_

Power Pole or Service No. \_\_\_\_\_ IDWR Site ID Tag no. \_\_\_\_\_

Electric meter Serial No. \_\_\_\_\_ (Beginning of season)

Electric meter Serial No. \_\_\_\_\_ (End of season, if different)

Meter Manufacturer \_\_\_\_\_

**SECTION IV Crop information and method of irrigation** for land being served by this pump. List each type of crop, the number of acres grown, and the number of acres irrigated with each type of irrigation system.

<u>Crop</u>	<u>Acres</u>	<u>Method of irrigation</u>	
		<u>Sprinkler</u> (pressure)	<u>Surface</u> (gravity)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
	Total acres	_____	_____

Show the numbers of acres which is irrigated cropland but was **NOT** irrigated this year.

\_\_\_\_\_

Reason for idled acres \_\_\_\_\_

**SECTION V Modifications made during reporting year and other comments**

Please describe in the space below any major modifications made to the diversion works or piping system during the past reporting year which would affect system capacity or accuracy of the flow measurements. Attach drawings, sketches, photographs, notes or design information if needed.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SECTION VI Certification**

I hereby certify that the above reported information is correct to the best of my knowledge and that I recognize that willful submittal of false or inaccurate data is a violation of law subject to the penalty provisions of Sections 42-311, 42-350 and 42-351, Idaho Code.

\_\_\_\_\_  
Signature Title Date

Note: Each reporting form shall be accompanied by a report processing fee in the amount of **twenty-five dollars (\$25) per diversion** made payable to the Idaho Department of Water Resources (Section 42-701(6), Idaho Code). Report fee is not required if no water was diverted during the reporting year.

For Department Use Only

Received by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
Fee amount submitted \_\_\_\_\_ Correct? yes \_\_\_\_\_ no \_\_\_\_\_  
Receipted by \_\_\_\_\_ Receipt No. \_\_\_\_\_  
Reviewed by \_\_\_\_\_ Date \_\_\_\_\_  
Data entry by \_\_\_\_\_ Date \_\_\_\_\_



STATE OF IDAHO  
DEPARTMENT OF WATER RESOURCES  
WATER MEASUREMENT ANNUAL REPORT

**REPORTING YEAR** \_\_\_\_\_

**MEASURING DEVICE METHOD FOR TOTALIZING FLOW METERS**

ATTENTION: Year end data must be submitted to Idaho Department of Water Resources, 1301 N. Orchard St. Boise ID 83706, on or before **January 15** immediately following the reporting year.

**A separate reporting form must be submitted for each diversion.**

Name:	_____
Water Source:	_____
Water Right No:	_____
Legal Description:	T _____ R _____ Sec. _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/>
Site Tag No:	_____
Diversion Name:	_____

**SECTION I Water Right Holder/Operator information**

*(If there are multiple water right holders on a common ditch or conveyance system, please designate the contact person below)*

**Current Water Right Owner**

Please check for address correction !

Name _____ Last, First, MI	Phone _____
Address _____	Fax _____
City _____	Mobile _____
State & Zip _____	e-mail _____

**Operator or Contact Person (if different from owner)**

Name _____ Last, First, MI	Phone _____
Address _____	Fax _____
City _____	Mobile _____
State & Zip _____	e-mail _____

**Original Owner (if sold within last year)**

Name _____ Last, First, MI	Phone _____
Address _____	Fax _____
City _____	State & Zip _____

**SECTION II Water Level Information** (Optional data if available)

**Depth to water.** Record the date, if the pump was on or off, or if other nearby pumps were on.

Static Water Level (pump off, water level stable): \_\_\_\_\_ ft Date \_\_\_\_\_

Dynamic Water Level (pump on): \_\_\_\_\_ ft Date \_\_\_\_\_

**SECTION III Rate of flow and volume diverted (REQUIRED DATA)**

Meter information:

Make \_\_\_\_\_ Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_

Does the meter totalizer measure in acre-feet or gallons? \_\_\_\_\_  
 (circle one) What is the multiplier? \_\_\_\_\_

Does the meter rate of flow indicator show gpm or cfs? \_\_\_\_\_  
 (circle one) What is the multiplier? \_\_\_\_\_

For meters without rate of flow indicators, check here **G** and see page 4 for meter information and rate measurement methods.

**Reading of the meter totalizer, flow rate and discharge pressure should be taken and recorded once each month on or near the same date. Please provide the *actual totalizer reading* and not the total volume since last reading.**

Date (date of reading)	Totalizer Reading	Flow Rate circle: cfs or gpm	Discharge Pressure
January ( )			
February ( )			
March ( )			
April ( )			
May ( )			
June ( )			
July ( )			
August ( )			
September ( )			
October ( )			
November ( )			
December ( )			

Does totalizer and flow readings above include meter multipliers? \_\_\_\_\_ Yes \_\_\_\_\_ No

**Total Acre-feet** \_\_\_\_\_ **OR Total Gallons** \_\_\_\_\_  
 (there are 325,850 gallons per acre feet)

Calculations or Comments: (If a flowmeter was installed, calibrated, or replaced during **this reporting year**, please note the date.)

**SECTION IV**

**a. For Irrigation Uses:** Crop information and method of irrigation for land being served by this diversion. List each type of crop, the number of acres grown, and the number of acres irrigated under each type of irrigation system.

<u>Crop</u>	<u>Acres</u>	<u>Method of irrigation</u>	
		<u>Sprinkler</u> (pressure)	<u>Surface</u> (gravity)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Total acres	_____		

Number of acres irrigated cropland NOT irrigated this year: \_\_\_\_\_

Reason for idled acres \_\_\_\_\_

**b. For Non-Irrigation Uses (commercial, industrial, municipal):** describe type of use \_\_\_\_\_

**SECTION V Modifications made**

Describe in the space below any major modifications made to the diversion works or piping system which would affect system capacity or accuracy of the flow measurements during this reporting year. Attach drawings, sketches, photographs, notes or design information if needed.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**SECTION VI Certification**

I hereby certify that the above reported information is correct to the best of my knowledge and that I recognize that willful submittal of false or inaccurate data is a violation of law subject to the penalty provisions of Sections 42-311, 42-350 and 42-351, Idaho Code.

Signature \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

Each reporting form shall be accompanied by a report processing fee in the amount of **twenty-five dollars (\$25) per diversion** made payable to the Idaho Department of Water Resources (Section 42-701(6), Idaho Code). Report fee is not required if no water was diverted during reporting year.

For Department Use Only

Received by _____	Date _____	Time _____
Fee amount submitted _____	Correct? yes _____ no _____	
Receipted by _____	Receipt No. _____	
Reviewed by _____	Date _____	
Data entry by _____	Date _____	

## **COLORADO**

### **What Does the Water Administration Fee Program do?**

Historically, Water Right owners did not have to pay directly for water administration. The effect of the Water Administration Fee Program is to now assess certain Water Right owners a portion of the expense associated with that specific government service.

### **What are the fees for the Water Administration Program?**

The Water Administration Fee Program requires the Division of Water Resources to assess a fee to owners of certain Water Rights. Those fees are:

For Absolute Direct Flow Water Rights adjudicated for at least 1 cubic foot per second:

- \$10 per year for each water right adjudicated for agricultural irrigation, recharge, or stock water.
- \$250 per year for each water right adjudicated for uses other than agricultural irrigation, recharge, or stock water.

For Absolute Storage Water Rights adjudicated for at least 100 acre-feet:

- \$25 per year for each water right adjudicated for agricultural irrigation, recharge, or stock water.
- \$100 per year for each water right adjudicated for uses other than agricultural irrigation, recharge, or stock water.

### **Will I receive a bill for the Water Admin. Fee? If so, when? When must I pay?**

Owners of Water Rights subject to the Water Administration Fee will receive bills. The first bills will be sent in February 2004 to cover the Water Irrigation year ending October 31, 2003. The bills sent in November 2004 will cover the year ending October 31, 2004.

The Division has researched names and addresses of individuals, corporations, and municipalities that are identified as the owners Water Rights subject to this fee. Under the statute, only one fee is to be charged per Water Right. For mutual ditches where there is a fractional ownership of a water right of more than 1 cfs, the bill will generally be sent to a contact person for the ditch, who may ask fractional owners to pay their proportionate shares.

It is the owner's responsibility to pay the fee within 30 days of receipt. Payments not received within this time period will subject the Water Right owner to monthly interest charges and, after six months of non-payment, collection costs and attorney fees.

### **How will the money generated by the Water Administration Fee Program be used?**

The funds generated by the Water Administration fee will be used to maintain the water administration services discussed above.

Budget cuts over the past five years have decreased the actual workforce of the Division of Water Resources. The effect of budget cuts was most critical during the fiscal crisis of FY 02-03, which coincided with the worst drought in Colorado's history.

Cutbacks within water administration staff have unfortunately coincided with heightened demand for services. As Colorado has grown, competition for limited water supplies has increased. The ever-evolving complexity of distributing water to a greater variety and number of users requires more water administration. We recognize that the bill will help enable our Division to maintain our expected level of service during difficult budgetary times.

**What Other Services Does the Division of Water Resources provide?**

In addition to the administration of Water Rights, the Division of Water Resources measures and maintains records of stream flow, operates the state's dam safety program, and is the State agency for the permitting of wells. All of these functions are presented on the Division of Water Resources website <http://water.state.co.us/>.

Additional details discussing the Water Administration Fee Program can be obtained at <http://water.state.co.us/wateradminfees.asp>.