

GENERAL PERMIT
PRODUCED WATER

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER THE
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with Section 75-5-101 et seq., MCA, and ARM Title 17, Chapter 30, Subchapters 6, 7, 12, and 13, applicants with an authorization letter for this "Produced Water General Permit", are permitted to discharge wastewater resulting from oil/natural gas production wells to ephemeral drainages as impoundments for the purpose of the prescribed beneficial use. Discharges are not authorized to state surface waters other than ephemeral drainages. The discharge for the beneficial use shall be in accordance with effluent limitations, monitoring requirements, and other conditions set forth herein.

This permit shall become effective **May 1, 2010**.

A written authorization letter from the Department is required before an applicant is authorized to discharge under the Produced Water-General Permit.

This permit and the authorization to discharge shall expire at midnight, **April 30, 2015**.

FOR THE MONTANA DEPARTMENT
OF ENVIRONMENTAL QUALITY


Jenny Chambers, Chief
Water Protection Bureau

Issuance Date March 25, 2010

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I. APPLICABILITY AND COVERAGE

A. Area of Coverage

This Produced Water General Permit (PW-GP) applies to all areas of the State of Montana, except for Indian Lands and state waters in watersheds specified in ARM 17.30.670, namely, Rosebud Creek, Tongue River, Powder River, and Little Powder River watersheds.

B. Eligible Sources

This PW-GP is applicable to oil and gas production operations in standard industrial classification (SIC) 1311 that discharge “produced water” into the state waters in the aforementioned area. Specifically, this PW-GP authorizes the disposal of produced water into ephemeral drainages (the drainage courses of ephemeral streams) leading to holding ponds or impoundments, or directly discharge into holding ponds or impoundments for beneficial uses only.

C. Continuing Coverage of Existing Sources

The 2002 PW-GP authorizations will expire upon the effective date of the new PW-GP [ARM 17.30.1341(6)]. All the existing facilities with effective coverage under the 2002 General Permit are eligible for renewal coverage under the new PW-GP unless they are excluded in F. of this section. Eligible facilities seeking further coverage must submit the following:

- within 90 days after the effective date of this new permit, all eligible facilities with effective coverage under the 2002 General Permit shall submit DEQ Form PW-1, Produced Water Impoundment Capacity Self Evaluation (Attachment of this permit) with supporting materials.

Permittees who submit the above materials within the specified timeframe maintain coverage under the reissued permit unless notified by the Department that the coverage has been terminated. The Department will reissue an authorization to each qualified facility within 30 days after receiving a completed Form PW-1.

D. New dischargers seeking coverage under the new PW-GP

New dischargers seeking to obtain an authorization to discharge under the PW-GP must submit a complete application package at least 30 days prior to commencing operation, including:

- Application Forms (DEQ Form 1 and Form 2D); and
- Applicable Fees (includes both permit application fee and annual fee per outfall for the first year under the new PW-GP). and,
- DEQ Form PW-1 (see Part. II. C. and Attachment of this permit) and water quality analysis specified in Part II. C. of this PW-GP.

The Department will issue a letter of authorization (or denial) to the owner or operator of the PW-GP within 30 days after receiving a complete application package following ARM 17.30.1341(4). If denied, the applicant may apply for an individual permit or modify the discharge proposal (e.g. propose new locations of drainage ways with enough holding capacity). They must then re-apply for coverage under the PW-GP with all applicable fees.

E. Termination of Permit Coverage

The owner or operator of a facility covered under this PW-GP may request to terminate the coverage or to be excluded from coverage under this PW-GP.

To terminate the coverage, the permittee must submit a written notice to the Department indicating the produced water discharge activity will not be continued. This notice must be signed and certified appropriately and all applicable fees must be paid. Failure to submit a notice of termination shall result in accrual of annual fees until such notice is received by the Department.

The owner or operator of a facility can apply to be excluded from coverage under PW-GP by applying for and obtaining an individual MPDES permit pursuant to ARM Title 17, Chapter 30, Subchapter 13. If an individual MPDES permit is issued to the owner or operator of the facility, coverage under this PW-GP is terminated on the effective date of the individual MPDES permit.

F. Sources Excluded from Coverage

This PW-GP is issued to authorize the disposal of produced water into ephemeral drainages or holding ponds as impoundments for beneficial uses only. The following facilities may not qualify for coverage:

1. Produced Water from Coal Bed Natural Gas Operations

The national ELGs specified in 40 CFR Part 435, Subpart E were promulgated for traditional oil and gas production, but not for coal bed natural gas (CBNG) production. This PW-GP is issued only for traditional gas and oil operations. Therefore, CBNG produced water discharges do not qualify for coverage under this PW-GP.

2. Specific Produced Water from Oil and Gas Operations

As stated in 40 CFR Part 435, Subpart E: “the term ‘use in agricultural or wildlife propagation’ means that the produced water is of good enough quality to be used for wildlife or livestock watering or other agricultural uses and that the produced water is actually put to such use during the periods of discharge.”

A water quality chemical analysis of the produced water with required detection levels and recommended maximum concentration levels (See Part II C.) has been prescribed as a special requirement for new and renewal applications. The Department will conduct a review of the required chemical analysis of the produced water to confirm it meets the recommended levels.

In addition, since this PW-GP only authorizes produced water discharge that can be contained in ephemeral drainages as impoundments, discharge of produced water up to the amount that can not be held or impounded in an ephemeral drainage do not qualify for coverage under this PW-GP. The Department has developed a PW-1 Form for the permittee to conduct self evaluation on impoundment capacity of ephemeral drainages (See Part II. C.). Facilities do not qualify for coverage under the PW-GP shall apply for a MPDES individual permit.

3. Oil and Gas Produced Water in Powder, Rosebud, and Tongue River Basins

ARM 17.30.670 specifies the numeric standards for electrical conductivity (EC) and sodium adsorption ratio (SAR) for state waters in the Rosebud Creek, Tongue, Powder, and Little Powder River watersheds, which include all the ephemeral drainage ways. Because EC and SAR are parameters of concern (POC) for oil and gas produced water, produced water discharges to ephemeral drainages in these watersheds shall be subject to the numeric standards as described in ARM 17.30.670. This involves the evaluation of the natural condition in order to develop water quality-based effluent limits (WQBEL) pursuant to MCA 75-5-306(1). Therefore, discharges of oil and gas produced water into these waters shall be handled by MPDES individual permits because the PW-GP does not evaluate receiving water quality on a case-by-case basis.

II. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning immediately and lasting through the duration of the permit, the permittee is authorized to discharge from the outfall(s) as specified in the authorization letter. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

A. Final Wastewater Effluent Limitations

Effective immediately and lasting through the term of the permit, the quality of effluent discharged through the authorized outfalls shall, as a minimum, meet the limitations as set forth below:

1. Numeric Limitations

Table 1: Final Numeric Effluent Limitations		
Parameter	Concentration (mg/L) ⁽¹⁾	
	Average	Maximum
Total Dissolved Solids(TDS)	5,000	Not Applicable
Oil and Grease ⁽²⁾	Not applicable	10
⁽¹⁾ See the definitions in Part VI of the permit for explanation of terms.		
⁽²⁾ EPA Method 1664A, 40 CFR, Part 136, Table IB		

2. Other Limitations

There shall be no discharge of waste pollutants into state waters from any source (other than produced water) associated with production, field exploration, drilling, well completion, or well treatment (including but not limited to drilling muds, drilling cuttings, and produced sands).

No discharge is authorized by this PW-GP to state surface waters other than ephemeral drainages. All discharges must be to ephemeral drainages for the purpose of the beneficial use.

B. Self-Monitoring Requirements

The self monitoring in Table 2 is required of the permittee for each authorized outfall on a semiannual schedule. Samples shall be collected at least 5 months apart. Results shall be reported to the Department according to the procedures in Part III of the permit.

Table 2: Effluent Monitoring Requirements			
Parameter	Frequency	Type ⁽¹⁾	Detection level
Effluent Flow Rate ⁽²⁾ , gpm	Semiannual	Instantaneous	NA ⁽⁴⁾
Total Dissolved Solids (TDS), mg/L	Semiannual	Grab	10
Oil and Grease, mg/L ⁽³⁾	Semiannual	Grab	1
Sulfate, mg/L	Semiannual	Grab	10
Note: (1) See the definitions in Part VI of the permit. (2) If no discharge occurs during the reporting period, "no discharge" shall be recorded on the DMR report form. (3) EPA Method 1664A, 40 CFR, Part 136, Table IB (4) NA—Not applicable			

C. Special Conditions

1. Authorization Letter. A written authorization letter from the Department is required before an applicant is authorized to discharge under the PW-GP. The permit must be accompanied by a copy of this letter to be considered valid.
2. Prerequisites. The following two prerequisites must be met before an applicant can be authorized to discharge under the PW GP:
 - a. **Fill out Form PW-1 (Produced Water Impoundment Capacity Self Evaluation)**: Conduct an impoundment capacity self evaluation and submit DEQ Form PW-1 (Produced Water Impoundment Capacity Self Evaluation) to demonstrate that the volume of water need to be impounded is within the impoundment capacity for the proposed ephemeral drainages. In order to conduct the impoundment capacity self evaluation, the permittee must perform a water balance calculation including the annual volume of inflow (produced water), and outflow or loss (e.g. evaporation, seepage loss, and beneficial uses, etc) if there is any, with necessary supporting information (Attachments II and III).
 - b. **Water Quality Analysis**: submit a water quality analysis of the proposed discharge for the parameters specified in Table 3 and attach the results as a prerequisite to the application package. This requirement serves as the effluent characterization specifically for produced water beneficial use and the Department therefore waives the water quality analysis requirement in Section V of DEQ Form 2C pursuant to ARM 17.30.1322(7)(g)(i)(B).

The Department will use this water quality analysis to determine if the proposed discharges qualify for coverage under this PW-GP. 40 CFR Part 435, Subpart E specifies that produced water for beneficial use has to be “good enough quality to be used for wildlife or livestock watering or other agricultural uses.” Parameters in Table 3 are the POC identified for produced water beneficial uses in livestock and wildlife watering.

If any parameter in Table 3 is found to be present at level greater than the recommended maximum concentration, the Department may request additional samples for confirmation. If the resampling confirms the exceedance of the recommended maximum concentration levels, the application may be denied because the water is not suitable for livestock or wildlife consumption as per the maximum recommended concentrations.

3. Impoundment monitoring. The permittee must conduct a semiannual supplemental monitoring of the impounded water for EC, a reflection of TDS specified in Table 4. The monitoring must be conducted at least 5 months apart.

Table 3: Application Water Quality Analysis Requirements

Parameter	Type ⁽²⁾	Recommended Maximum Levels	Required Detection Level
Effluent Flow Rate, gpm	Instantaneous	NA ⁽³⁾	NA
Total Dissolved Solids (TDS), mg/L	Grab	5,000 ⁽⁴⁾	10
Total Suspended Solids (TSS), mg/L	Grab	NA	NA
Electric Conductivity, μ S/cm	Grab	11,000 ^(4,5)	5
pH, standard units	Grab	6.0 –9.0	0.1
Oil and Grease, mg/L	Grab	10 ⁽⁶⁾	1
Total Alkalinity, mg/L	Grab	NA	NA
Calcium, mg/L	Grab	NA	NA
Magnesium, total recoverable, mg/L	Grab	NA	NA
Sodium, mg/L	Grab	NA	NA
Sodium Adsorption Ratio	Calculated	NA	NA
Sulfate, mg/L	Grab	2500 ⁽⁷⁾	10
Nitrate as N, mg/L	Grab	100 ⁽⁴⁾	0.01 ⁽¹¹⁾
Nitrite as N, mg/L	Grab	10 ⁽⁴⁾	0.01 ⁽¹¹⁾
Arsenic, total recoverable, mg/L	Grab	0.5 ⁽⁸⁾	0.003 ⁽¹¹⁾
Boron, mg/L	Grab	5.0 ⁽⁸⁾	0.05 ⁽¹⁰⁾
Copper, total recoverable, mg/L	Grab	0.5 ^(4,8)	0.001 ⁽¹¹⁾
Fluoride, mg/L	Grab	3.0 ⁽⁸⁾	0.1 ⁽¹¹⁾
Lead, total recoverable, mg/L	Grab	0.1 ^(4,8)	0.0005 ⁽¹¹⁾
Selenium, total recoverable, mg/L	Grab	0.05 ⁽⁹⁾	0.001 ⁽¹¹⁾
Zinc, total recoverable, mg/L	Grab	25.0 ⁽⁸⁾	0.01 ⁽¹¹⁾

- (1) μ S/cm—microSiemens/cm.
- (2) See the definitions in Part VI of the permit.
- (3) NA-not applicable.
- (4) National Academy of Sciences, 1972
- (5) Ayers and Westcot, 1985.
- (6) ARM 17.30.637(1)(b).
- (7) Veenhuizen and Shurson, 1992.
- (8) Council for Agricultural Science and Technology, 1974
- (9) Looper and Waldner, 2002.
- (10) No RL available in DEQ-7, 1/100 of the recommended MCL is used.
- (11) DEQ-7 (February 2008).

Table 4: Impoundment Monitoring Requirements			
Parameter	Frequency	Type ⁽¹⁾	Detection level
Electrical Conductivity (EC), $\mu\text{S}/\text{cm}$	Semiannual	Instantaneous	5
Note: (1) See the definitions in Part VI of the permit.			

III. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling.

Samples taken in compliance with the monitoring requirements established under Part II shall be collected from the wastewater prior to discharging from the permittee's property. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures.

Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured.

C. Penalties for Tampering.

The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$25,000, or by imprisonment for not more than six months, or both.

D. Reporting of Monitoring Results.

Results of the self-monitoring shall be reported semiannually on the Discharge Monitoring Report form (EPA 3320-1) to the Department (see address below), postmarked no later than the 28th day of the month following the reporting period; the due date of the first semiannual report is July 28th and the second semiannual report is January 28th.

Montana Department of Environmental Quality
Water Protection Bureau
P.O. Box 200901
Helena, Montana 59620-0901

Phone: (406) 444-3080

E. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

F. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The time analyses was initiated;
5. The initials or name(s) of individual(s) who performed the analyses;
6. References and written procedures, when available, for the analytical techniques or methods used; and,
7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

G. Retention of Records.

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of sample, measurement, report or application. This period may be extended by request of the Department at any time.

H. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall report any noncompliance, which may endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division at (406) 444-3080.
2. The following occurrences of noncompliance shall be reported by telephone to the Water Quality Division at (406) 444-3080 by the first workday (8:00

A.M.- 4:30 P.M. Mountain Time) following the day the permittee became aware of the circumstances any unanticipated bypass which exceeds any effluent limitation in the permit (See Part IV.G., Bypass of Treatment Facilities.);

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:
 - a. A description of the noncompliance and its cause;
 - b. The period of noncompliance, including exact dates and times;
 - c. The estimated time noncompliance is expected to continue if it has not been corrected; and,
 - d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
4. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Quality Division, by phone, (406) 444-3080.
5. Reports shall be submitted to the addresses in Part III. D., Reporting of Monitoring Results.

I. Other Noncompliance Reporting.

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part III.D. are submitted. The reports shall contain the information listed in Part III. H.3.

J. Inspection and Entry

The permittee shall allow the head of the Department or the Regional Administrator, or authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,
4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

IV. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department advance notice of any planned changes at the permitted facility or of an activity, which may result in permit noncompliance.

- B. Penalties for Violations of Permit Conditions. The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to a civil penalty not to exceed \$25,000 per day or one year in prison, or both, for the first conviction, and \$50,000 per day of violation or by imprisonment for not more than two years, or both, for subsequent convictions. Except as provided in permit conditions on Part III.G., Bypass of Treatment Facilities, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit.

Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.

F. Removed Substances

Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard.

G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. and 3. of this section.
2. Notice:
 - a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.
 - b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part III. I., Twenty-four Hour Reporting.
3. Prohibition of bypass.
 - a. Bypass is prohibited and the Department may take enforcement action against a permittee for a bypass, unless:
 - (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
 - (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

(3) The permittee submitted notices as required under paragraph 2. of this section.

b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in paragraph 3.a. of this section.

V. GENERAL REQUIREMENTS

A. Planned Changes

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants, which are not subject to effluent limitations in the permit.

B. Anticipated Noncompliance

The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

C. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application form and fee should be submitted at least 30 days before the expiration date of this permit.

E. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine

compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

F. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

G. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed as follows:
 - a. For a corporation: by a responsible corporate officer;
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;
 - c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a. The authorization is made in writing by a person described above and submitted to the Department, and,
 - b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)
3. Changes to authorization. If an authorization under Part V.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.G.2. must be submitted to the Department prior to or

together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports

The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than \$25,000 per violation, or by imprisonment for not more than six months per violation, or both.

I. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

K. Property Rights or Water Rights

The issuance of this permit does not convey any property or water rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

The permittee and adjacent landowner using produced water must comply with applicable water rights statutes under MCA, 85-2-306, before any beneficial water

use commences. Information and assistance on the water rights statutes can be obtained from the Department of Natural Resources and Conservation, Water Resources Division at (406) 444-6601.

L. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers

This permit can not be transferred to a new permittee. A new owner or operator of a facility must apply according to the application procedures in Part V.D of this permit 30 days prior to taking responsibility for the facility.

N. Fees. The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:

1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-31-510(3), MCA, or
2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.

O. Reopener Provision

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:

1. Water Quality Standards:

The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. Wasteload Allocation:

A wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.

3. Water Quality Management Plan:

A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.

VI. DEFINATIONS

1. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
2. "Department" means the Montana Department of Environmental Quality.
3. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.
4. "Instantaneous Maximum" is the maximum value allowable in any single sample or instantaneous measurement.
5. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.
6. "Petroleum-related water cleanup" is groundwater or collected stormwater in contact with petroleum-related spills or leaking underground storage tanks that contain petroleum-related products.
7. "Produced Water" is the separated wastewater resulting from petroleum or natural gas producing wells not associated with coal bed methane development.
8. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
9. "Ephemeral Stream" means a stream or a part of a stream, which flows only in direct response to precipitation in the immediate watershed or in response

to the melting of a cover of snow and ice and whose channel bottom is always above the local water table.

10. "Intermittent Stream" means a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface run-off and groundwater discharge.

Section D - Water Balance Calculation:

Fill out for each impoundment, if more than one outfall discharges into one impoundment, the sum of the discharge volumes shall be used in Step 1 as Annual Discharge; several naturally or artificially connected impounded areas can be regarded as one impoundment.

Step. 1 Annual Discharge

Outfall # (fill out all outfalls that discharge into this impoundment) _____

Discharge Rate: _____ gpm \times C = _____ acft

(acft = acre- foot; gpm = gallons per minute ; C is Conversion Factor, $C = 525,600 \text{ minutes} \times 3.069 \times 10^{-6} \text{ acft/gal} = 1.61 \text{ min.acft/gal}$)

Step. 2 Impounding Area and Depth

Do you know the average impoundment area and depth?

Yes, the average impoundment area is A= _____ acre, and the average depth is _____ feet. Attach a topographic map in appropriate scale as **Attachment I** with the impoundment area(s) marked on the map.

No. Please complete the following: (1) Look at Appendix A to estimate needed area and depth of the impoundment based on estimated volume of produced water from Step 1. (2) Look at a topographical map, or visit the field, or conduct a field survey to estimate the area and depth of the impoundment, and fill them in the blanks below, attach a topographic map as **Attachment I** with the impoundment area(s) marked on the map.

The average impoundment area is _____ acres, and the average impoundment depth is _____ feet. Then continue on to step 3.

Step. 3 Other Water Balance Components

A. Annual Precipitation (P): Annual average precipitation in the proposed impoundment area is p = _____ inches. The total precipitation received for the impounding area is $P = \text{_____} (p) \times 1/12 \text{ ft/in} \times \text{_____} (\text{Impounded area}) = \text{_____} \text{ acft.}$

(Where: Impoundment area is the value identified in Step 2, in acres.).

B. Annual Evaporation Loss (E): $E = \text{_____} (\text{Class A Pan Coefficient}) \times \text{_____} (\text{Impoundment Area}) \times \text{_____} (\text{Class A Pan Evaporation}) \times 1/12 \text{ ft/in} = \text{_____} \text{ acft.}$

(Where: Class A Pan Coefficient =0.7; Impoundment area is the value identified in Step 2, in acres. Class A Pan Evaporation can be found from Appendix B, in inches).

C. Average annual seepage or infiltration loss (check only one of the following):

I chose not to calculate this number. I accept the default assumption that the seepage loss is 0 acft.

My calculated seepage from the site is _____ acft (Attach calculation as *Attachment II*).

D. Annual water use (check only one of the following options):

I chose not to calculate this number. I accept the Department's conservative approach and assume the water use is 0 acft for the purpose of impoundment capacity assessment.

My calculated livestock and wildlife water use is _____ acft (Attach calculation work as *Attachment III* following the template provided. Please reference Appendix C for Livestock and Wildlife Water Use Requirement).

Step. 4 Annual Water Balance

$$\frac{\text{Produced water}}{\text{Discharge}} + \frac{\text{Precipitation}}{\text{}} - \frac{\text{Evaporation}}{\text{}} - \frac{\text{Seepage}}{\text{}} - \frac{\text{Livestock Water Use}}{\text{}} = \frac{\text{To be Impounded}}{\text{}} \text{ (acft)}$$

Step. 5 Impoundment Capacity Evaluation

Using the amount of water to be impounded calculated from Step 4 above, find in Appendix A the closest number in column B, look at the numbers in the same row, then find the one that corresponds to the total impoundment area of your outfall. Record this number here: _____ ft. This is the depth of the impoundment needed. Is this number less than your proposed or current impoundment depth in Step 2 (_____ ft) ?

Yes. My impoundment capacity is enough.

No. The impoundment area is not adequate. You should extend your impoundment capacity by either increasing the impoundment area or depth (e.g., find more area or a new location, build earth dam/dike, etc...). Start this process over until you have enough impoundment capacity. The final location and boundary of the proposed impoundment shall be identified and illustrated on your topographic map, and attached to this form. If you are unable to find ephemeral drainages with enough impounding capacity for your discharge, you may apply an individual MPDES permit by submitting forms DEQ 1 and Form 2D.

Step. 6 Attachment check list for Section D (check the box next to the Attachment you have attached).

Attachment I (required); Attachment II (optional); Attachment III (optional).

Section E - CERTIFICATION

Permittee Information:

This Form PW-1 must be completed, signed, and certified as follows:

- For a corporation, by a principal officer of at least the level of vice president;
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Permittees Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print)

B. Title (Type or Print)

C. Phone No.

D. Signature

E. Date Signed

Return the Form PW-1, Impoundment Capacity Self Evaluation Worksheet together with other application materials to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

INSTRUCTIONS FOR
Form PW-1 – Produced Water Impoundment Capacity Self Evaluation
for Oil and Natural Gas Produced Water Discharge to Ephemeral Drainages
under Produced Water General Permit (MTG310000)

The purpose of this form: The Produced Water General Permit authorizes the discharge of produced water from oil and gas production facilities into ephemeral drainages. This form is designed to allow permittee to self evaluate if the proposed receiving water has enough impoundment capacity for the containment of the discharge.

Fill out the form for each impoundment. One facility usually has one outfall, the produced water discharge will form one impoundment. Several naturally or artificially connected impounded areas are regarded as one impoundment. A facility may have multiple outfalls discharging all into one impoundment, the sum of the discharge rate/volumes shall be used in Step 1 of this form. If a facility has several outfalls each discharge to a separate impoundment, the form shall be completed for each impoundment.

You may need the following items in order to complete this form: A copy of your most recently submitted Form 1; Form 2C or Form 2D; Appendix A, B, and C of this form (provided).

Please type or print legibly; forms that are not legible or are not complete will be returned.

SPECIFIC ITEM INSTRUCTIONS

Section A – PW-1 Status:

Check the box that applies and provide the requested information. If Form PW-1 has not been previously submitted for this site, check the first box (New). If you submitted a Form PW-1 and the Department returned it to you as deficient or incomplete, check the second box (Resubmitted); if you are now submitting an Form PW-1 with permit renewal with impoundment area modification, check the third box (Renewal with modification); if you are submitting a permit renewal without change in the facility or site information, check the last box (Renewal without modification). Fill in the permit number if you have one already. If the site is covered under the *Produced Water General Permit*, the number can be found on deficiency letter, completeness letter, or Authorization letter sent to you by the Department. The permit number must be included on any correspondence with the Department regarding this site.

Section B – Facility or Site Information:

The information must be stated exactly the same way as it was stated on the most recently submitted version of your DEQ Form 1, Form 2C or 2D.

Section C – Applicant (Owner/Operator) Information:

The information must be stated exactly the same way as it was stated on the most recently submitted version of your Form 1.

Section D – Water Balance Calculation:

Step. 1 Annual Discharge: Include all outfalls discharge into the impoundment, convert the discharge rate in gallon per minute (gpm) into acre-foot (acft).

Step. 2 Impounding Area and Depth: When propose ephemeral drainage area(s) for produced water impoundment, the permittee shall conduct a field visit or land survey if necessary to estimate the total area and depth for impoundment. The impoundment area shall be marked on a topographic map with sufficient details including the boundary of the impoundment area. The topographic map is a required attachment (Attachment I) to this PW-1 Form. The permittee is responsible to acquire any necessary permit or license if any structures are involved.

Step. 3 Annual Water Balance Calculations:

For annual evaporation loss, please use Appendix B to figure out the Class A Pan Evaporation for your area.

For annual precipitation, please consult local conservation or county.

If permittee choose to calculate the annual seepage or infiltration loss, the calculation process and results shall be attached as Attachment II to this PW-1 Form. The Department does not provide a guideline for this calculation because the seepage and infiltration can be very site specific. However, permittee shall perform the calculation following the hydrogeological principles based on reliable data sources from existing studies, field survey, or professional consultants.

The livestock annual water use can be estimated based on number and type of animals, and average annual water consumption of each animal. The annual water consumption for most of the common animals are provided in Appendix C. If there are animals that are not listed in Appendix C, please provide supporting document to demonstrate the average annual water consumption. The livestock annual water use calculation shall be attached at Attachment III following the template provided in this PW-1 Form.

Step. 4 Annual Water Balance: Substitute the water balance components from Step 1 and Step 3 into the blanks, calculate the annual amount of water need to be impounded.

Step. 5 Impoundment Capacity Evaluation: Follow the instructions of Step 5 in the Form.

If your answer is **Yes**, then stop, you have enough impoundment capacity. Submit your Form PW-1 together with your new or renewal application materials.

If your answer is **No**, you don't have enough impoundment capacity. You have to choices: 1) you have to extend your impoundment capacity by either increasing the impoundment area or depth (e.g., find more area or a new location, build earth dam/dike, etc...). Then start this process over until you have enough impoundment capacity. Only the final results (topographic map with marked impoundment area, calculations, etc.) shall be kept with your final PW-1 Form. 2) If you are unable

to find ephemeral drainages that have enough impoundment capacity for your discharge, you have to apply for an individual MPDES permit by submitting necessary forms (DEQ Form 1 and Form 2D).

Step. 6 Attachment check list: Attachment I is required, Attachment II and III are optional.

Section F – Certification:

If Form PW-1 is filled out by one person and signed by another, the person signing the document should read it thoroughly. Always retain a copy of each of the documents that you send to the Department.

The PW-1 Form and other forms for oil and natural gas produced water discharge permitting or authorization are available at Montana Department of Environmental Quality's Water Protection Bureau website: <http://www.deq.mt.gov/wqinfo/WPBFForms/Forms1.asp>. If you have any questions concerning how to fill out this form, or other forms related to the Montana Pollutant Discharge Elimination System (MPDES) discharge permitting program, please contact the Department's Water Protection Bureau at:

Phone: (406) 444-3080
Fax: (406) 444-1374
1520 East Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901

PW-1 Appendix A: Estimating Impoundment Capacity Look-up Table

Discharge		-----Impounded Area (acre)-----																
A: Rate (gpm)	B: Annual volume (acft)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		-----Impounded Depth(feet)-----																
1	2	1.6	0.8	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	3	3.2	1.6	1.1	0.8	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
3	5	4.8	2.4	1.6	1.2	1.0	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3
4	6	6.4	3.2	2.1	1.6	1.3	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4
5	8	8.1	4.0	2.7	2.0	1.6	1.3	1.2	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5
6	10	9.7	4.8	3.2	2.4	1.9	1.6	1.4	1.2	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.6
7	11	11.3	5.6	3.8	2.8	2.3	1.9	1.6	1.4	1.3	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.7
8	13	12.9	6.4	4.3	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8
9	14	14.5	7.2	4.8	3.6	2.9	2.4	2.1	1.8	1.6	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.9
10	16	16.1	8.1	5.4	4.0	3.2	2.7	2.3	2.0	1.8	1.6	1.5	1.3	1.2	1.2	1.1	1.0	0.9
11	18	17.7	8.9	5.9	4.4	3.5	3.0	2.5	2.2	2.0	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0
12	19	19.3	9.7	6.4	4.8	3.9	3.2	2.8	2.4	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1
13	21	20.9	10.5	7.0	5.2	4.2	3.5	3.0	2.6	2.3	2.1	1.9	1.7	1.6	1.5	1.4	1.3	1.2
14	23	22.5	11.3	7.5	5.6	4.5	3.8	3.2	2.8	2.5	2.3	2.0	1.9	1.7	1.6	1.5	1.4	1.3
15	24	24.2	12.1	8.1	6.0	4.8	4.0	3.5	3.0	2.7	2.4	2.2	2.0	1.9	1.7	1.6	1.5	1.4
16	26	25.8	12.9	8.6	6.4	5.2	4.3	3.7	3.2	2.9	2.6	2.3	2.1	2.0	1.8	1.7	1.6	1.5
17	27	27.4	13.7	9.1	6.8	5.5	4.6	3.9	3.4	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.6
18	29	29.0	14.5	9.7	7.2	5.8	4.8	4.1	3.6	3.2	2.9	2.6	2.4	2.2	2.1	1.9	1.8	1.7
19	31	30.6	15.3	10.2	7.6	6.1	5.1	4.4	3.8	3.4	3.1	2.8	2.5	2.4	2.2	2.0	1.9	1.8
20	32	32.2	16.1	10.7	8.1	6.4	5.4	4.6	4.0	3.6	3.2	2.9	2.7	2.5	2.3	2.1	2.0	1.9
21	34	33.8	16.9	11.3	8.5	6.8	5.6	4.8	4.2	3.8	3.4	3.1	2.8	2.6	2.4	2.3	2.1	2.0
22	35	35.4	17.7	11.8	8.9	7.1	5.9	5.1	4.4	3.9	3.5	3.2	3.0	2.7	2.5	2.4	2.2	2.1
23	37	37.0	18.5	12.3	9.3	7.4	6.2	5.3	4.6	4.1	3.7	3.4	3.1	2.8	2.6	2.5	2.3	2.2
24	39	38.6	19.3	12.9	9.7	7.7	6.4	5.5	4.8	4.3	3.9	3.5	3.2	3.0	2.8	2.6	2.4	2.3
25	40	40.3	20.1	13.4	10.1	8.1	6.7	5.8	5.0	4.5	4.0	3.7	3.4	3.1	2.9	2.7	2.5	2.4
26	42	41.9	20.9	14.0	10.5	8.4	7.0	6.0	5.2	4.7	4.2	3.8	3.5	3.2	3.0	2.8	2.6	2.5
27	43	43.5	21.7	14.5	10.9	8.7	7.2	6.2	5.4	4.8	4.3	4.0	3.6	3.3	3.1	2.9	2.7	2.6
28	45	45.1	22.5	15.0	11.3	9.0	7.5	6.4	5.6	5.0	4.5	4.1	3.8	3.5	3.2	3.0	2.8	2.7
29	47	46.7	23.3	15.6	11.7	9.3	7.8	6.7	5.8	5.2	4.7	4.2	3.9	3.6	3.3	3.1	2.9	2.7
30	48	48.3	24.2	16.1	12.1	9.7	8.1	6.9	6.0	5.4	4.8	4.4	4.0	3.7	3.5	3.2	3.0	2.8
31	50	49.9	25.0	16.6	12.5	10.0	8.3	7.1	6.2	5.5	5.0	4.5	4.2	3.8	3.6	3.3	3.1	2.9

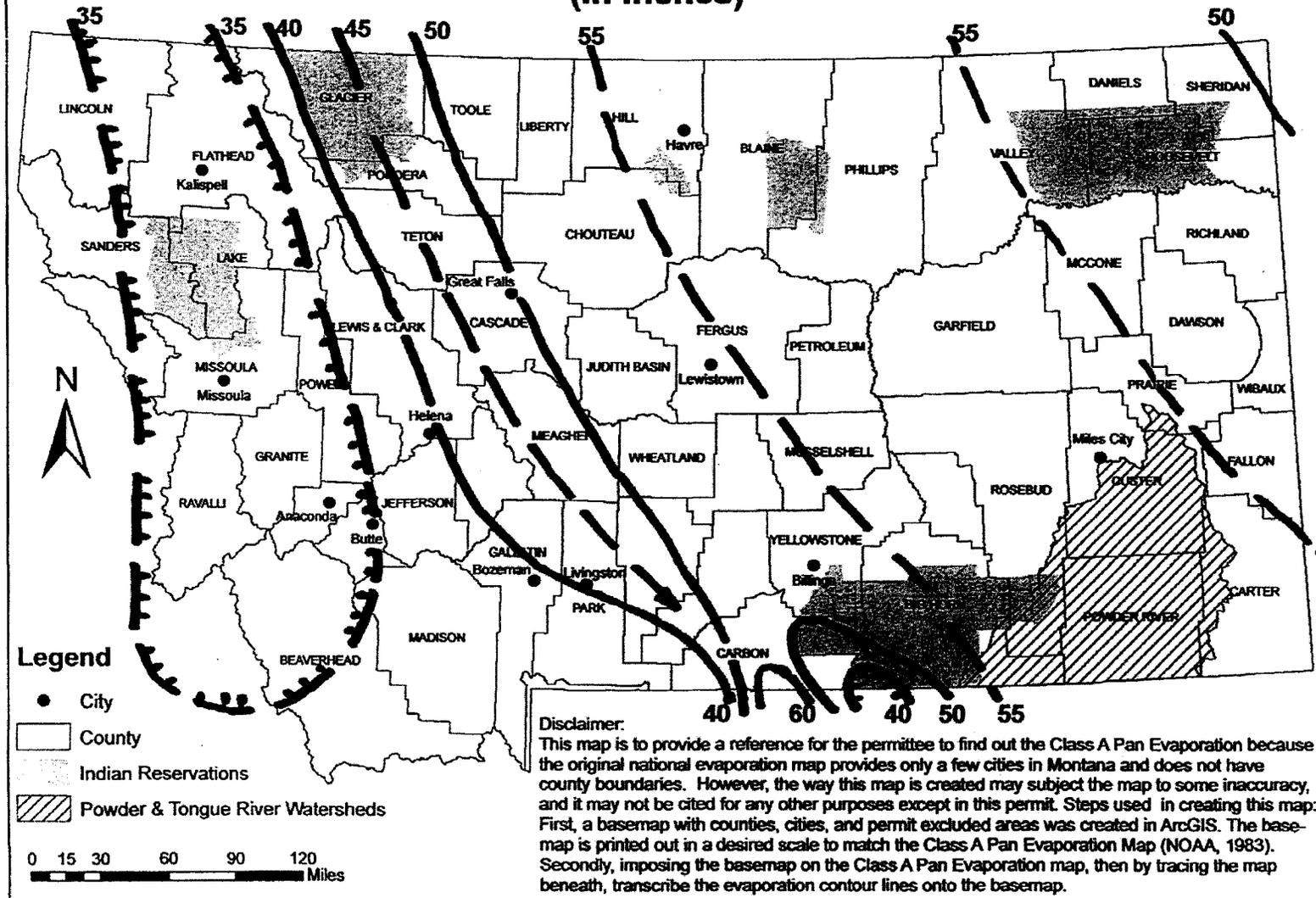
PW-1 Appendix A: Estimating Impoundment Capacity Look-up Table (Continued)

Discharge		-----Impounded Area (acre)-----																
A: Rate (gpm)	B: Annual volume (acft)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		-----Impounded Depth(feet)-----																
32	52	51.5	25.8	17.2	12.9	10.3	8.6	7.4	6.4	5.7	5.2	4.7	4.3	4.0	3.7	3.4	3.2	3.0
33	53	53.1	26.6	17.7	13.3	10.6	8.9	7.6	6.6	5.9	5.3	4.8	4.4	4.1	3.8	3.5	3.3	3.1
34	55	54.7	27.4	18.2	13.7	10.9	9.1	7.8	6.8	6.1	5.5	5.0	4.6	4.2	3.9	3.6	3.4	3.2
35	56	56.4	28.2	18.8	14.1	11.3	9.4	8.1	7.0	6.3	5.6	5.1	4.7	4.3	4.0	3.8	3.5	3.3
36	58	58.0	29.0	19.3	14.5	11.6	9.7	8.3	7.2	6.4	5.8	5.3	4.8	4.5	4.1	3.9	3.6	3.4
37	60	59.6	29.8	19.9	14.9	11.9	9.9	8.5	7.4	6.6	6.0	5.4	5.0	4.6	4.3	4.0	3.7	3.5
38	61	61.2	30.6	20.4	15.3	12.2	10.2	8.7	7.6	6.8	6.1	5.6	5.1	4.7	4.4	4.1	3.8	3.6
39	63	62.8	31.4	20.9	15.7	12.6	10.5	9.0	7.8	7.0	6.3	5.7	5.2	4.8	4.5	4.2	3.9	3.7
40	64	64.4	32.2	21.5	16.1	12.9	10.7	9.2	8.1	7.2	6.4	5.9	5.4	5.0	4.6	4.3	4.0	3.8
41	66	66.0	33.0	22.0	16.5	13.2	11.0	9.4	8.3	7.3	6.6	6.0	5.5	5.1	4.7	4.4	4.1	3.9
42	68	67.6	33.8	22.5	16.9	13.5	11.3	9.7	8.5	7.5	6.8	6.1	5.6	5.2	4.8	4.5	4.2	4.0
43	69	69.2	34.6	23.1	17.3	13.8	11.5	9.9	8.7	7.7	6.9	6.3	5.8	5.3	4.9	4.6	4.3	4.1
44	71	70.8	35.4	23.6	17.7	14.2	11.8	10.1	8.9	7.9	7.1	6.4	5.9	5.4	5.1	4.7	4.4	4.2
45	72	72.5	36.2	24.2	18.1	14.5	12.1	10.4	9.1	8.1	7.2	6.6	6.0	5.6	5.2	4.8	4.5	4.3
46	74	74.1	37.0	24.7	18.5	14.8	12.3	10.6	9.3	8.2	7.4	6.7	6.2	5.7	5.3	4.9	4.6	4.4
47	76	75.7	37.8	25.2	18.9	15.1	12.6	10.8	9.5	8.4	7.6	6.9	6.3	5.8	5.4	5.0	4.7	4.5
48	77	77.3	38.6	25.8	19.3	15.5	12.9	11.0	9.7	8.6	7.7	7.0	6.4	5.9	5.5	5.2	4.8	4.5
49	79	78.9	39.4	26.3	19.7	15.8	13.1	11.3	9.9	8.8	7.9	7.2	6.6	6.1	5.6	5.3	4.9	4.6
50	81	80.5	40.3	26.8	20.1	16.1	13.4	11.5	10.1	8.9	8.1	7.3	6.7	6.2	5.8	5.4	5.0	4.7
51	82	82.1	41.1	27.4	20.5	16.4	13.7	11.7	10.3	9.1	8.2	7.5	6.8	6.3	5.9	5.5	5.1	4.8
52	84	83.7	41.9	27.9	20.9	16.7	14.0	12.0	10.5	9.3	8.4	7.6	7.0	6.4	6.0	5.6	5.2	4.9
53	85	85.3	42.7	28.4	21.3	17.1	14.2	12.2	10.7	9.5	8.5	7.8	7.1	6.6	6.1	5.7	5.3	5.0
54	87	86.9	43.5	29.0	21.7	17.4	14.5	12.4	10.9	9.7	8.7	7.9	7.2	6.7	6.2	5.8	5.4	5.1
55	89	88.6	44.3	29.5	22.1	17.7	14.8	12.7	11.1	9.8	8.9	8.1	7.4	6.8	6.3	5.9	5.5	5.2
56	90	90.2	45.1	30.1	22.5	18.0	15.0	12.9	11.3	10.0	9.0	8.2	7.5	6.9	6.4	6.0	5.6	5.3
57	92	91.8	45.9	30.6	22.9	18.4	15.3	13.1	11.5	10.2	9.2	8.3	7.6	7.1	6.6	6.1	5.7	5.4
58	93	93.4	46.7	31.1	23.3	18.7	15.6	13.3	11.7	10.4	9.3	8.5	7.8	7.2	6.7	6.2	5.8	5.5
59	95	95.0	47.5	31.7	23.7	19.0	15.8	13.6	11.9	10.6	9.5	8.6	7.9	7.3	6.8	6.3	5.9	5.6
60	97	96.6	48.3	32.2	24.2	19.3	16.1	13.8	12.1	10.7	9.7	8.8	8.1	7.4	6.9	6.4	6.0	5.7
61	98	98.2	49.1	32.7	24.6	19.6	16.4	14.0	12.3	10.9	9.8	8.9	8.2	7.6	7.0	6.5	6.1	5.8
62	100	99.8	49.9	33.3	25.0	20.0	16.6	14.3	12.5	11.1	10.0	9.1	8.3	7.7	7.1	6.7	6.2	5.9
63	101	101.4	50.7	33.8	25.4	20.3	16.9	14.5	12.7	11.3	10.1	9.2	8.5	7.8	7.2	6.8	6.3	6.0

PW-1 Appendix A: Estimating Impoundment Capacity Look-up Table (Continued)

Discharge		-----Impounded Area (acre)-----																
A: Rate (gpm)	B: Annual volume (acft)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		-----Impounded Depth(feet)-----																
64	103	103.0	51.5	34.3	25.8	20.6	17.2	14.7	12.9	11.4	10.3	9.4	8.6	7.9	7.4	6.9	6.4	6.1
65	105	104.7	52.3	34.9	26.2	20.9	17.4	15.0	13.1	11.6	10.5	9.5	8.7	8.1	7.5	7.0	6.5	6.2
66	106	106.3	53.1	35.4	26.6	21.3	17.7	15.2	13.3	11.8	10.6	9.7	8.9	8.2	7.6	7.1	6.6	6.3
67	108	107.9	53.9	36.0	27.0	21.6	18.0	15.4	13.5	12.0	10.8	9.8	9.0	8.3	7.7	7.2	6.7	6.3
68	109	109.5	54.7	36.5	27.4	21.9	18.2	15.6	13.7	12.2	10.9	10.0	9.1	8.4	7.8	7.3	6.8	6.4
69	111	111.1	55.5	37.0	27.8	22.2	18.5	15.9	13.9	12.3	11.1	10.1	9.3	8.5	7.9	7.4	6.9	6.5
70	113	112.7	56.4	37.6	28.2	22.5	18.8	16.1	14.1	12.5	11.3	10.2	9.4	8.7	8.1	7.5	7.0	6.6
71	114	114.3	57.2	38.1	28.6	22.9	19.1	16.3	14.3	12.7	11.4	10.4	9.5	8.8	8.2	7.6	7.1	6.7
72	116	115.9	58.0	38.6	29.0	23.2	19.3	16.6	14.5	12.9	11.6	10.5	9.7	8.9	8.3	7.7	7.2	6.8
73	118	117.5	58.8	39.2	29.4	23.5	19.6	16.8	14.7	13.1	11.8	10.7	9.8	9.0	8.4	7.8	7.3	6.9
74	119	119.1	59.6	39.7	29.8	23.8	19.9	17.0	14.9	13.2	11.9	10.8	9.9	9.2	8.5	7.9	7.4	7.0
75	121	120.8	60.4	40.3	30.2	24.2	20.1	17.3	15.1	13.4	12.1	11.0	10.1	9.3	8.6	8.1	7.5	7.1
76	122	122.4	61.2	40.8	30.6	24.5	20.4	17.5	15.3	13.6	12.2	11.1	10.2	9.4	8.7	8.2	7.6	7.2
77	124	124.0	62.0	41.3	31.0	24.8	20.7	17.7	15.5	13.8	12.4	11.3	10.3	9.5	8.9	8.3	7.7	7.3
78	126	125.6	62.8	41.9	31.4	25.1	20.9	17.9	15.7	14.0	12.6	11.4	10.5	9.7	9.0	8.4	7.8	7.4
79	127	127.2	63.6	42.4	31.8	25.4	21.2	18.2	15.9	14.1	12.7	11.6	10.6	9.8	9.1	8.5	7.9	7.5
80	129	128.8	64.4	42.9	32.2	25.8	21.5	18.4	16.1	14.3	12.9	11.7	10.7	9.9	9.2	8.6	8.1	7.6
81	130	130.4	65.2	43.5	32.6	26.1	21.7	18.6	16.3	14.5	13.0	11.9	10.9	10.0	9.3	8.7	8.2	7.7
82	132	132.0	66.0	44.0	33.0	26.4	22.0	18.9	16.5	14.7	13.2	12.0	11.0	10.2	9.4	8.8	8.3	7.8
83	134	133.6	66.8	44.5	33.4	26.7	22.3	19.1	16.7	14.8	13.4	12.1	11.1	10.3	9.5	8.9	8.4	7.9
84	135	135.2	67.6	45.1	33.8	27.0	22.5	19.3	16.9	15.0	13.5	12.3	11.3	10.4	9.7	9.0	8.5	8.0
85	137	136.9	68.4	45.6	34.2	27.4	22.8	19.6	17.1	15.2	13.7	12.4	11.4	10.5	9.8	9.1	8.6	8.1
86	138	138.5	69.2	46.2	34.6	27.7	23.1	19.8	17.3	15.4	13.8	12.6	11.5	10.7	9.9	9.2	8.7	8.1
87	140	140.1	70.0	46.7	35.0	28.0	23.3	20.0	17.5	15.6	14.0	12.7	11.7	10.8	10.0	9.3	8.8	8.2
88	142	141.7	70.8	47.2	35.4	28.3	23.6	20.2	17.7	15.7	14.2	12.9	11.8	10.9	10.1	9.4	8.9	8.3
89	143	143.3	71.6	47.8	35.8	28.7	23.9	20.5	17.9	15.9	14.3	13.0	11.9	11.0	10.2	9.6	9.0	8.4
90	145	144.9	72.5	48.3	36.2	29.0	24.2	20.7	18.1	16.1	14.5	13.2	12.1	11.1	10.4	9.7	9.1	8.5
91	147	146.5	73.3	48.8	36.6	29.3	24.4	20.9	18.3	16.3	14.7	13.3	12.2	11.3	10.5	9.8	9.2	8.6
92	148	148.1	74.1	49.4	37.0	29.6	24.7	21.2	18.5	16.5	14.8	13.5	12.3	11.4	10.6	9.9	9.3	8.7
93	150	149.7	74.9	49.9	37.4	29.9	25.0	21.4	18.7	16.6	15.0	13.6	12.5	11.5	10.7	10.0	9.4	8.8
94	151	151.3	75.7	50.4	37.8	30.3	25.2	21.6	18.9	16.8	15.1	13.8	12.6	11.6	10.8	10.1	9.5	8.9
95	153	153.0	76.5	51.0	38.2	30.6	25.5	21.9	19.1	17.0	15.3	13.9	12.7	11.8	10.9	10.2	9.6	9.0

PW-1 Appendix B Montana Mean Annual Class A Pan Evaporation (In Inches)



PW-1 Appendix C. Livestock and Wildlife Water Use Requirement

Category of Animal	Type or condition of Animal	Daily Water Use per head (gal)	Average Typical Use (Gal)	Average Annual Use (Gal) **
Beef Cattle	Beef cows in general	10-16	13	4745
	Lactating Cows with Calves	11-18	14.5	5293
	Dry Cows, bred heifers	6-15	10	3650
	Bulls	7-19	10	3650
	Growing beef cattle 400 lbs	3.5-9.5	6.6	2409
	Growing beef cattle 600 lbs	5-13		2409
	Growing beef cattle 800 lbs	6-15		2409
	Finish beef cattle 600 lbs	5.5-14.5	10.8	3942
	Finish beef cattle 800 lbs	7-17.5		3942
	Finish beef cattle 1000 lbs	8.5-20.5		3942
	Finish beef cattle 1200 lbs	9.5-22.5		3942
Dairy Cattle	Calves (1-4 months)	1.3-3.5	2.4	876
	Dairy heifers (5-24 months)	3.8-9.6	6.6	2409
	Milk Cows	18-41	30.4	11096
	Dry Cows	9.0-13	10.8	3942
Horses	Horse in General	10-12	11	4015
	Small (500 lbs)	3.4-5.3	4.4	1606
	Medium (1000 lbs)	6.9-10.3	8.6	3139
	Weanling, 650 lbs	10.3-15.6	12.9	4709
Swine	Weaner (15-49 lbs)	0.3-0.9	0.5	183
	Feeder pig (50-79 lbs)	0.9-1.1	1.2	438
	Feeder pig (80-154 lbs)	1.2-1.9	1.2	438
	Feeder pig (155-243 lbs)	2.0-2.6	2.4	876
	Gestling sow/boar	3.6-4.5	4	1460
	Lactating Sow	4.8-6.0	5.3	1935
Sheep and Goats	Sheep and Goats in general	0.5-2	1.3	475
	Rams	2	2	730
	Dry Ewes	2	2	730
	Lactating ewes with Lambs	2.4-2.8	2.6	949
	Feeder Lambs (60-110 lbs)	1.0-1.4	1.2	438
	5-20 lbs Lambs	0.1-0.3	0.2	73
Other Animals	Elk	2-3	2.5	913
	Deer	0.5-1	0.75	274
	Antelope	0.5-1	0.75	274
	Chickens	0.05-0.1	0.08	29
	Turkeys	0.1-0.16	0.13	47

(1): Zacek, J., 1979. USDA Soil Conservation Service Technical Notes No.26. Bozeman, Montana
(2): Canada Ministry of Agriculture, Food and Rural Affairs, 2007. Water Requirements of Livestock Factsheet. Queen Printer for Ontario. Accessed 09/2009 at <http://www.omafra.gov.on.ca/english/engineer/facts/07-023.htm>
(3) Lardy, G., C. Stoltenow, and R. Johnson, 2008. Livestock and Water. North Dakota State University Extension Service, Publication AS-954. Fargo, North Dakota 58105
(4) National Academy of Sciences, 1974. Nutrients and toxic substances in water for livestock and poultry. Washington D.C.
** Numbers are calculated by timing 365 days to the daily use in previous column.