ADMINISTRATIVE MEMORANDUMS INDEX

As of January 21, 2016

Please note that these Administrative Memorandums will include many memos that have become outdated due to changes in rules, statutes or current Department policy. Some memos have been amended or superseded by others, and some may no longer be applicable.

LICENSING			
No.	**Title**	**Signed**	**Amended or Superseded**
1.	**Municipal Licensing Procedures** Rate of diversion recommended should be the capacity of the system unless it exceeds the permitted amount. Fire protection and municipal uses don't have a volume component.	4-7-75	**10-19-09**
2.	**Amendments Resulting from Field Exams** For Regions: When POU or POD amendment is necessary, indicate the change in the field exam and forward to state office and from there the state office will advise permit holder of amendment.	**6-23-75**	
3.	**Licensing Examinations** If measuring device is required and not yet installed- cannot issue a license. Files need to be kept at regional office until the permit holder complies or requests for the removal of condition.	**7-13-83**	
4.	**Annual Volume Usage in U.S. Forest Service Campgrounds** Standard single in-house domestic of 0.6 af/season should be used—see equation in memo	**1-26-87**	
5.	**Exam Fee Single Family Domestic Use, Stockwater, & Other Small Uses** 42-111 Domestic use from a groundwater source do not require a licensing fee.	4-7-87	11-19-87 **11-1-91**
6.	**Annual Diversion Volume Limits** The limiting volume should be the maximum allowable volume of water that is authorized for diversion annually from the source.	6-21-89	**11-28-89**
7.	**Claim to Water Right Overlaps** When the POU and POD overlap, use combined limit conditions	**12-27-89**	
8.	**Disclaimer Conditions for Licenses** Licenses issued in SRBA should include a condition that addresses non-use after field exam.	**3-4-91**	
9.	**Standards for Irrigation Consumptive Use Requirements, Irrigation Field Headgates Requirements, and Irrigation Season of Use** Maps and guidelines on standard season; use the standard regardless of what's on the application for permit. When dealing w/ a transfer use what was decreed or licensed—can use condition to include new standard.	4-27-92	**10-12-99**
10	**Verification of Place of Use During Beneficial Use Exams** Aerial photo is required for a field exam for evidence of beneficial use. Photos are strongly recommended as well.	**3-11-96**	

LICENSING			
No.	**Title**	**Signed**	**Amended or Superseded**
11.	**Adjudication Claims Tolling Forfeiture – Fish Propagation Facility Volume** For fish propagation rights, do not include facility volume on permit or license and after claim is filed in SRBA, period of non-use should be considered.	**3-24-00**	
12.	**Utilization of the 24-Hour Fill Allowance for Impoundments** Statement of the policy and practical implementation of the 24-hour fill allowance that historically been used by the Department.	**04-18-13**	
13.	**RAFN Municipal Water Right Handbook** Recommendations for the Processing of Reasonably Anticipated Future Needs (RAFN) Municipal Water Rights at the Time of Application, Licensing, and Transfer.	**11-13-13**	**3-16-15**
14.	**Term Limits for Hydropower Use** General guidance regarding lengths of terms for hydropower rights and how the terms will be stated in the conditions of future water rights for power generation.	**1-13-14**	
15	**Seepage Loss Standards for Ponds and Reservoirs** **Spreadsheet - Pond Loss Calculation** Memo establishing guidelines for reviewing seepage losses from ponds and reservoirs to ensure that water rights for storage promote efficiency by meeting a reasonable conservation standard.	3-5-15	

ADMINISTRATOR'S MEMORANDUM

To: Regional Offices
Water Allocation Bureau

App. Processing No. 18
Licensing No. 1

From: Jeff Peppersack

Re: **PROCESSING APPLICATIONS AND AMENDMENTS AND DETERMINING BENEFICIAL USE FOR NON-RAFN MUNICIPAL WATER RIGHTS**

Date: October 19, 2009

This memorandum supersedes Application Processing Memo No. 18 dated November 5, 1979 and Licensing Memo No. 1 dated April 7, 1975.

The 1996 Municipal Water Rights Act recognized common law practices (case law) for growing communities to provide for a municipal water supply for reasonably anticipated future needs (RAFN). There are times when a municipal provider will choose to file an application to appropriate water solely for water needed in the short-term without the burden of demonstrating future needs over an established planning horizon. This memorandum provides guidance to Department staff when permitting and determining the extent of beneficial use for licensing purposes for non-RAFN municipal water right permits.

This guidance provided in this memo pertains to the review and processing of permits to be issued after the date of this memorandum. Existing permits issued prior to the date of this memorandum should be handled on a case-by-case basis when determining beneficial use for licensing purposes. Determination of beneficial use for permits pre-dating this memorandum may depend on the date the permit was issued in relation to the 1996 Municipal Water Rights Act and/or any specific intent to limit the beneficial use that could be developed under the permit at the time it was issued.

PAST DEPARTMENT POLICY AND PRACTICE

Prior to the 1996 Municipal Water Rights Act, the Department acknowledged the need for some flexibility in licensing water rights due to the growth of municipalities and other small communities under two concepts as described below.

Installed Capacity for Municipalities

An incorporated city or a municipal provider serving an incorporated city could perfect a water right based on the maximum instantaneous diversion rate for the pumping system that was installed and operational during the development period of the permit (limited by the permitted amount), even if the city did not beneficially use the entire capacity during the development period of the permit. Note that even though a municipal system may have included multiple wells and pumps, the Department typically licensed a water right based on the diversion capacity of an individual well and pump listed as a single point of diversion on the water right. The Department typically did not review the overall

system capacity and evaluate the new well as an additional increment of diversion capacity or beneficial use under the entire system due to that point of diversion.

When licensing a municipal water right, the Department did not include an annual volume limit on the license. In addition, the place of use was described as the city limits and was allowed to change as the city limits expanded. A city's water use under a license could expand over time as demand for water increased by pumping the maximum rate over longer periods that may have included storage tanks to provide for higher peak demands.

Stub-in Practice for Subdivisions

For unincorporated cities and other small communities that did not qualify as municipalities, and therefore could not obtain a municipal water right, the Department could only license water rights for domestic and associated irrigation, commercial and other uses based on actual diversion and application of the water to beneficial use accomplished during the authorized development period of the permit. The Department provided some flexibility in determining beneficial use for domestic purposes in subdivision developments under the "stub-in" practice. Under the "stub-in" practice, the Department issued water right licenses for domestic purposes in subdivisions if the water diversion and distribution systems were in place, including a service line to each lot, even if water had not yet been put to beneficial use on all the buildable lots. The Department's stub-in practice recognized that the full build out of a subdivision can take longer than the number of years the Department could authorize for completion of a water appropriation project. By issuing a water right license for domestic uses that were yet to be completed, the Department avoided a parade of individual water right filings as each lot was sold. The stub-in practice also helped subdivision developers obtain financing by providing some assurance to lending institutions that a development project would not fail due to water right availability issues that may have arisen as the individual lots were built out over time. The Department's stub-in practice was applied to each home that would individually qualify as a domestic use as defined in Section 42-111(1)(a), Idaho Code.

The stub-in practice was not applied in all subdivision development situations. For example, suppose the Department issued a permit for development of 100 homes in a subdivision and proof was submitted for 100 homes based on the stub-in practice. Many years later, the Department completes an exam and finds only 20 homes were built and using water. The remaining lots remained vacant and undeveloped except for the stubbed-in service line. The Department would only issue a license based on the actual diversion and use of water because sufficient time would have passed to complete development of the subdivision.

1996 MUNICIPAL WATER RIGHTS ACT

The 1996 Municipal Water Rights Act allows municipal providers to obtain water rights for RAFN. Full completion of diversion works and beneficial use is not required during the development period of the permit, under specific conditions (see Application Processing Memo No. 63). The Municipal Water Rights Act also expanded the types of entities that can qualify for municipal water rights and defined expanding service areas for those entities. See Section 42-202B, Idaho Code for definitions.

To appropriate water for RAFN, the municipal provider carries an extra evidentiary burden to establish a planning horizon and to submit population and other planning data in support of the anticipated needs within the planning horizon. If a municipal provider seeks a water right for RAFN, the planning horizon and supporting data cannot be inconsistent with its comprehensive land use plans.

Furthermore, water rights for RAFN cannot be granted to a municipal provider in areas overlapped by conflicting comprehensive land use plans.

Municipal providers can receive the full benefit of the 1996 Municipal Water Rights Act if they file an application for RAFN and demonstrate future needs over an established planning horizon consistent with requirements in Chapter 2, Title 42, Idaho Code. The intent of a municipal provider to seek water for RAFN must be documented with the application for municipal use.

There are times when a municipal provider will choose to file an application to appropriate water solely for use to meet needs in the short-term (limited up to 5 years with possible extension up to an additional 5 years pursuant to Section 42-204, Idaho Code) without the burden of demonstrating future needs over an established planning horizon. The Department considers the definitions for "municipality," "municipal provider," "municipal purposes," and "service area" from the 1996 Municipal Water Rights Act to apply to non-RAFN permits. The following sections provide guidance to Department staff when permitting and determining the extent of beneficial use for licensing purposes for non-RAFN municipal water right permits. Note that some small community water systems (less than 10 homes) do not qualify as municipal providers and would still be subject to licensing under the past stub-in practices described above as a domestic use.

INCORPORATED CITIES AND MUNICIPAL PROVIDERS SERVING INCORPORATED CITIES

Incorporated cities, or municipal providers serving incorporated cities ("city" or "cities") have historically benefitted from common law practices allowing for appropriation of water and acquisition of water rights for long-term growth. Municipal providers in this category may include a city incorporated under Section 50-102, Idaho Code, an entity regulated by the Public Utilities Commission serving water to an incorporated city, or a Water District or Water and Sewer District established pursuant to Chapter 32, Title 42, Idaho Code serving an incorporated city. The 1996 Municipal Water Rights Act does not prohibit the Department from issuing a non-RAFN permit or license to a city without a volume limitation. Issuing a permit and license without a volume limitation would provide for some limited growth, consistent with pre-existing common law practices for municipalities.

Application for Permit

An applicant for a non-RAFN municipal application must demonstrate short-term needs to justify the amount of water required for appropriation. This information should be requested pursuant to the additional information requirements provided under Water Appropriation Rule 40.05.d.i:

> Information shall be submitted on the water requirements of the proposed project, including, but not limited to, the required diversion rate during the peak use period and the average use period, the volume to be diverted per year, the period of year that water is required, and the volume of water that will be consumptively used per year.

The applicant must also demonstrate that the new appropriation is not intended for RAFN by providing total system capacity and existing demand within the municipal service area and comparing that capacity and demand to the entire municipal portfolio of water rights. If existing municipal water rights exceed existing demand and short-term needs, then an application for RAFN would be necessary for an additional appropriation of water. If the applicant desires additional points of diversion without

the need for a new appropriation of water, then an application for transfer to change existing rights would be appropriate.

An applicant for a permit not proposing municipal use for RAFN cannot later amend the application to gain the benefits of a RAFN permit without first demonstrating future needs over an established planning horizon consistent with requirements in Chapter 2, Title 42, Idaho Code. Pursuant to Section 42-211, Idaho Code, an amendment to an application to gain the benefits of a RAFN permit shall be republished and the priority date shall be changed to the date of the application for amendment.

Permit

The permit should not be limited by volume except under circumstances where a volume limitation is necessary to protect the water source or, in the case of an amendment of permit, when the original permit was issued or intended for a use other than municipal. The rate of flow must be reasonable when considered against the water flows available from the source (e.g., it may not be in the public interest to dewater a stream to satisfy the municipal needs). The place of use can be described generally for the service area as defined under Section 42-202B, Idaho Code.

A non-RAFN application for municipal use that includes additional rate justified for fire protection purposes should not be permitted for that additional rate under a municipal use, particularly where the applicant has not sought water for RAFN and offered no evidence to support the future appropriation and use of additional water. Doing so would allow the additional rate to be used for flows that may be required for future long-term growth of the municipality. Additional rate solely for fire protection should be listed as a separate use on the water right or permit to ensure that the rate, if approved, does not create a de facto water right for RAFN.[1]

As an example, suppose an application for permit is submitted by a municipality for a non-RAFN municipal use and the application indicates that 3 cfs is required for the regular and continuous needs of the city and an additional 7 cfs is required to provide water for fire protection on an as-needed basis. The Department should not issue a permit for municipal use for 10 cfs, which would allow for additional rate to be used by the city in the future to meet the regular and continuous needs of the city. Instead, if the application is otherwise approvable, the Department should issue a permit for municipal use in the amount of 3 cfs and for fire protection in the amount of 7 cfs.

The complexity of some municipal systems makes it difficult to ascertain, at the time of a field exam, if an additional increment of beneficial use has been developed pursuant to a permit. To facilitate future licensing, the permit should include a condition requiring the permit holder to submit a report in connection with proof of beneficial use that describes how the water diverted under the permit provides an additional increment of capacity for the municipal water system as opposed to an alternate point of diversion for existing municipal water rights. In addition, the report should describe how the beneficial use intended under the permit (i.e. the reason used to justify the new appropriation of water) was accomplished.

[1] Permits and licenses issued for fire protection purposes to fight an existing fire do not require a volume limitation since the volume would be variable and unpredictable for firefighting purposes. A volume limitation is required for fire protection storage where water is stored to fight a future fire.

A permit issued to a municipal provider that does not provide for RAFN cannot be later amended to gain the benefits of an RAFN permit.

License

When licensing a permit for municipal use for an entity serving an incorporated city, the extent of beneficial use established under a non-RAFN permit should be determined based on the installed capacity developed and operational during the development period of the permit and cannot exceed the amount permitted. However, beneficial use may be further limited if the intended use described in the application as justification for the permit was not accomplished. The license should not be limited by volume except under circumstances where the permit was limited for reasons described above. The place of use listed on the license can be described generally for the service area as defined under Section 42-202B, Idaho Code.

When determining the installed capacity for licensing purposes, the entire municipal portfolio of water rights must be considered to determine the actual increase in installed capacity provided by the permit for the municipal use. Note that the installed capacity of the system is not necessarily the sum of the individual capacities for each pump or diversion into the system.

In situations where a new point of diversion authorized under the permit is developed, but an additional increment of capacity or beneficial use is not developed for the municipal system, a license may be issued limiting the diversion rate in combination with other rights in the municipal system to the existing capacity of the municipal system.

OTHER MUNICIPAL PROVIDERS

Municipal providers that do not serve incorporated cities can receive the full benefit of the 1996 Municipal Water Rights Act if they file an application for RAFN, provide qualifications as a municipal provider, and demonstrate future needs over an established planning horizon consistent with requirements in Chapter 2, Title 42, Idaho Code. For such municipal providers, if they choose not to file an application for an RAFN permit, the ability of the municipal provider to acquire a water right for municipal purposes is limited to the amount that can be diverted and beneficially used based on development during the period authorized under a non-RAFN permit, as described below.

Application for Permit

For an application for permit seeking to divert water for domestic use or some combination of domestic and other uses for a subdivision or other multiple ownership service area, the use would be more properly described as municipal use within the service area if the uses fall under the definition of municipal purposes and the applicant would also qualify as a municipal provider pursuant to Section 42-202B, Idaho Code. An exception would be the use of water for fire protection. Additional rate for fire protection should be listed as a separate use to ensure that the rate, if approved, does not become part of the flows under the permit that may be required for future use of the municipal provider (see fire protection discussion above for permits under Incorporated Cities).

An applicant for a non-RAFN municipal application must demonstrate short-term needs to justify the amount of water required for appropriation. This information should be requested pursuant to the additional information requirements provided under Water Appropriation Rule 40.05.d.i:

> Information shall be submitted on the water requirements of the proposed project, including, but not limited to, the required diversion rate during the peak use period and the average use period, the volume to be diverted per year, the period of year that water is required, and the volume of water that will be consumptively used per year.

The applicant must also demonstrate that the new appropriation is not intended for RAFN by providing total system capacity and existing demand within the municipal service area and comparing to the entire municipal portfolio of water rights. If existing municipal water rights exceed existing demand and short-term needs, then an application for RAFN would be necessary for an additional appropriation of water. If the applicant desires additional points of diversion without the need for a new appropriation of water, then an application for transfer to change existing rights would be appropriate.

An applicant for a permit not proposing municipal use for RAFN cannot later amend the application to gain the benefits of a RAFN permit without first providing qualifications as a municipal provider and demonstrating future needs over an established planning horizon consistent with requirements in Chapter 2, Title 42, Idaho Code. Pursuant to Section 42-211, Idaho Code, an amendment to an application to gain the benefits of a RAFN permit shall be republished and the priority date shall be changed to the date of the application for amendment.

Permit

The permit, if approved, shall include both a rate of flow and an annual volume limitation for the municipal use based on the amount justified. As described above, additional rate justified solely for fire protection should be listed as a separate use on the permit to ensure that the rate, if approved, does not create a de facto water right for RAFN.[1] The place of use can be described generally for the service area as defined under Section 42-202B, Idaho Code.

A permit issued to a municipal provider that does not provide for RAFN cannot be later amended to gain the benefits of an RAFN permit.

License

When licensing a permit for municipal use for a municipal provider that does not serve an incorporated city, the extent of beneficial use established under a non-RAFN permit should be described with both a rate of flow and a volume limitation.[2] Beneficial use shall be based on development within the service area during the authorized development period of the permit and shall include stubbed-in lots for domestic purposes (i.e. a service line is available for each lot to hook up to the municipal delivery system). The rate should be determined based on the installed capacity if reasonable to serve the needs

[2] Beneficial Use Rule 35.01.j indicates that "[t]he field examiner does not need to show total volume of water for municipal and fire protection uses on the field report unless the project works provide for storage of water." Although not required on the field exam, any license issued to a municipal provider that does not serve an incorporated city for a non-RAFN municipal use shall include an annual volume limitation based on the amount justified and approved under the permit and beneficially used as described in this memorandum.

within the established service area.[3] The annual volume limitation should be determined based on the water requirements for the established service area (including stub-ins). The place of use listed on the license can be described generally for the service area as defined under Section 42-202B, Idaho Code.

As described above for municipal providers serving incorporated cities, when determining the installed capacity for licensing purposes, the entire municipal portfolio of water rights must be considered to determine the actual increase in installed capacity provided by the permit for the municipal use.

In situations where a new point of diversion authorized under the permit is developed, but an additional increment of capacity or beneficial use is not developed for the municipal system, a license may be issued limiting the diversion rate in combination with other rights in the municipal system to the existing capacity of the municipal system.

[3] The installed capacity may not represent beneficial use if significantly greater than the diversion required to meet the needs of the developed service area (including stub-ins), even if it does not exceed the amount permitted. For example, if fewer lots are stubbed-in than permitted, the required diversion rate would likely be smaller than the permitted rate.

ADMINISTRATOR'S MEMORANDUM
OPERATIONS DIVISION

TO: All District Engineers
FROM: A. Kenneth Dunn
SUBJECT: Amendments resulting from field exams

When a field exam has been completed and an amendment to the point of diversion or place of use is required, please indicate the proper location on the exam report and forward it to the Boise Office.

We will review the file, and if an amendment is indeed needed, we will advise the permit holder at the time a notice letter or fee letter is prepared.

Please do not send completed amendment forms with the completed field exam reports.

If you have any questions or comments regarding this matter, please contact me.

A. Kenneth Dunn

State of Idaho
DEPARTMENT OF WATER RESOURCES
STATE OFFICE, 450 W. State Street, Boise, Idaho

JOHN V. EVANS
Governor

A. KENNETH DUNN
Director

Mailing address:
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(208) 334-4440

ADMINISTRATOR'S MEMORANDUM

TO: Water Allocation Section
Regional Offices Bureau

FROM: Norman C. Young NCY

DATE: July 13, 1983

RE: Licensing Examinations

Licensing No. 3

Permit holders occasionally submit proof of beneficial use on their projects without installing the required measuring device or access port. These permit holders have not met the conditions of their permit and no license can be issued until the conditions are met.

Every effort should be made to determine the type of measuring device installed and whether it is working or the type and location of the access port prior to the field inspection. If the required device or access port has not been installed, or is improperly located so a measurement is not possible, the permit holder should be given a specific period of time for the installation. If the permit holder feels a measuring device is not necessary, he must request that condition be removed from his permit. A field examination should not be made until an adequate measuring device either is installed or the condition is removed from the permit.

I realize that field visits will be made where a measuring device has not been installed or is not working or where an access port is not installed or is not usable. If it is an efficient use of time, the examiner should determine the acreage irrigated or extent of beneficial use.

One exception to this "no measurement rule" is when it is obvious that the measuring device condition will be removed. Even in those obvious cases a license cannot be issued until the requirement is removed. Therefore, the regions should keep those exams until action is taken on the request to remove the measuring device requirement.

State of Idaho
DEPARTMENT OF WATER RESOURCES
STATE OFFICE, 450 W. State Street, Boise, Idaho

CECIL D. ANDRUS
~~JOHN V. EVANS~~
Governor

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ADMINISTRATOR'S MEMORANDUM

TO: Regional Offices and Water Allocation Section

FROM: Norman C. Young NCY

DATE: January 26, 1987

RE: Annual Volume Usage in U.S. Forest Service Campgrounds

License Processing No. 4

The purpose of this memorandum is to provide guidelines for estimating annual volume for water rights filed by U.S. Forest Service for domestic use in their campgrounds. The following guidelines should only be used when no specific information was obtained in the field examination process.

Most campgrounds using groundwater install hand-operated pumps which have a capacity of about 1 gpm. The campground usage varies but most are designed to meet a peak use of 100 persons/campground. The average season of use according to the Forest Service planners is 180 days. The estimated range of usage is 500 to 650 gallons/day/campground to as high as 10 gallons/day/person.

Using the above estimates, the annual campground groundwater usage is:

$$\frac{10 \text{ gallons}}{\text{day/person}} \times \frac{180 \text{ days}}{\text{season}} \times 100 \text{ persons} = \frac{180{,}000 \text{ gallons}}{\text{season}}$$

$$= \frac{180{,}000}{325{,}850} = 0.55 \text{ af}$$

Since 0.55 af is so close to the annual volume used for the standard single in-house domestic usage, 0.6 af/season should be used on U.S. Forest Service and BLM water rights.

MEMORANDUM

To: Water Allocation Bureau
Regional Offices
Adjudication Bureau

From: Norman C. Young NCY

RE: **LICENSE EXAMINATION FEE APPLICABILITY**

Date: November 1, 1991 Licensing No. 5 (revised)

This memo supercedes my prior memo dated April 7, 1987 on this subject. Amendments to the definition of "domestic purposes" and "domestic uses" by the legislature in 1990 are the principal reason for amendment of the prior memo.

Sections 42-217 and 42-221, Idaho Code, respectively require the submittal of a license examination fee as a part of the proof of beneficial use submittal for water right permits. Domestic uses for which the filing of an application for a water right permit is not required (exempt uses), however, are exempt from the submittal of license examination fees. This category of use must utilize a ground water source and fit within the limitations described below:

A. Water for homes, organization camps, public campgrounds, livestock and for any other purpose in connection therewith, including irrigation of up to one-half (1/2) acre of land, where total use is not in excess of thirteen thousand (13,000) gallons per day.

B. Any other use if the total use does not exceed a diversion rate of 0.04 cfs and a diversion volume of 2,500 gallons per day.

For the purpose of determining the applicability of the license examination fee for items A. and B. above, the upper limits of the described uses can not exceed a diversion rate of 0.04 cfs nor an annual storage volume of more than 4.0 acre feet.

When several uses which do not individually require the submittal of a license examination fee (exempt uses) appear on a permit and cumulatively exceed the amounts described above, a license examination fee is applicable.

Any permit which includes non-exempt uses together with exempt uses is not exempt from the fee requirement solely by virtue of an exempt use appearing on the permit. When an exempt use and non-exempt uses appear on a permit, the rate or volume shown on the proof submittal will determine if the fee applies.

The major difference between this memo and the prior memo is the clarification that a license examination fee does apply to certain permits for stockwater use and that the exemptions do not apply to permits which utilize a surface water source.

Note that Beneficial Use Examination Rule 1,4,4. needs to be disregarded until the rule is amended and can be applied consistently with this memo.

ADMINISTRATOR'S MEMORANDUM

Permit Processing No. 15
License Processing No. 6

To: Regions and Water Allocation Bureau

From: Norman C. Young NCY

Date: November 28, 1989

Re: Annual diversion volume limits

This Supercedes Memorandum of 6/21/89

A need has arisen to further define the annual volume or "duty" of water component of a water right.

"Consumptive use" is one of the measurements of volume that will be used in the Snake River adjudication. For irrigation, consumptive use has been defined as the consumptive irrigation requirement of the most water consumptive crop. Consumptive use will be included in the director's report in the adjudication as required by statute and for the purpose of evaluating a proposed change in a future administrative transfer.

A "field headgate volume" has previously been shown on licenses. "Field headgate volume" for irrigation is derived, in theory, by adding to crop consumptive use an additional increment of water for water losses incurred in applying the water to the crop. For uses other than irrigation, the volume equivalent to "field headgate volume" is generally the amount of water which is required to be delivered to the place where the water is being used.

The difference between consumptive use volume and field headgate volume has confused owners of water rights. Greater demand on limited water resources may require regulation of water rights by annual volume. A limitation on the annual volume which may be diverted for both adjudicated and administrative rights will resolve inconsistencies in volume definition, and will provide a means to regulate the right.

The limiting volume on a water right should be the maximum allowable volume of water that is authorized for diversion annually from the source. For most permits that are presently being licensed, the maximum diversion volume will equal the field headgate volume. If the distance between the point of diversion from the source and the field headgate or place of use is greater than one-half mile, water lost in delivery to the field headgate may be significant. Potential losses must be evaluated, and added, if necessary, to the field headgate volume numbers now in use.

The maximum annual diversion volume will be limited by the following two conditions:

> The maximum diversion volume is defined as the maximum allowable volume of water that may be diverted annually from the source under this right. The use of water confirmed by this right is limited to the amount which can actually be beneficially used. The maximum diversion volume may be adjusted to more accurately describe the beneficial use or to implement accepted standards of diversion and use efficiency.

This water right is restricted and appurtenant to the lands or place of use and to the purpose herein described, as provided by the laws of Idaho.

ADMINISTRATOR'S MEMORANDUM

TO: WATER ALLOCATION BUREAU AND REGIONS

FROM: GLEN SAXTON GS

RE: CLAIM TO WATER RIGHT OVERLAPS

DATE: December 27, 1989 **LICENSING PROCESSING NO. 7**

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During the review of field examinations you will at times find that the right holder has already filed a claim to a water right for the same lands covered by the permit.

Since a claim to a water right filed under Section 42-243, Idaho Code, has not been confirmed in a court of law, and since no field inspection of the place of use or measurement of the diverting system has been made, no adjustments to the right being examined should be made to reflect the overlapping claim, other than adding special condition(s) on the license when it is issued depending on type of overlap.

1. FOR POINT OF DIVERSION OVERLAP USE THE FOLLOWING CONDITION

The maximum combined rate of diversion under this right with all other rights shall not exceed _____ cfs.

The cfs amount should be the amount measured during the examination.

For example, if you measured 3.10 cfs during your exam and an existing claim showed 4.0 cfs from the same well do not use the 4.0 cfs as the capacity of the well, use the amount measured (3.10 cfs).

2. FOR PLACE OF USE OVERLAPS USE THE FOLLOWING CONDITION

<<R05>> The rate of diversion of water for irrigation under this license and all other water rights on the same land shall not exceed 0.02 cubic feet per second for each acre of land.

3. FOR PLACE OF USE AND POINT OF DIVERSION OVERLAPS USE BOTH OF THE ABOVE CONDITIONS

MEMORANDUM

To: Water Allocation Bureau and Regional Offices

From: Norman C. Young NCY

RE: DISCLAIMER CONDITIONS FOR LICENSES

Date: March 4, 1991 Licensing No. 8

Often the department issues a license of water right a number of years after the licensing field examination has been conducted. The delay in issuance of a license can present problems in the ongoing Snake River Adjudication particularly if a period of non-use has occurred after the field exam was conducted.

In order to eliminate the argument that the license issued by the department during or subsequent to the five year period of non-use has in some manner "stayed" the forfeiture provisions of the Idaho Code, the following condition should be shown on licenses issued in the Snake River drainage:

> Issuance of this license does not preclude a determination of forfeiture of this right through non-use which may include a period of time beginning subsequent to the licensing field examination conducted by the department.

The condition should be shown on licenses effective with the issuance of this memo.

ADMINISTRATOR'S MEMORANDUM

To: Water Management Division
Adjudication Bureau

Application Processing Memo #52
Licensing Memo #9
Transfer Processing Memo #16
Adjudication Memo #39

From: Norman C. Young NCY

Re: STANDARDS FOR IRRIGATION CONSUMPTIVE USE REQUIREMENTS, IRRIGATION FIELD HEADGATE REQUIREMENTS, AND IRRIGATION SEASON OF USE

Date: October 12, 1999

A new 1:1,000,000 scale map of the "Irrigation Season of Use" presents a new standard for use in water right adjudication and water right licenses, permits, and transfers. A reduced reproduction of the map is attached to this memo; the reduced reproduction is for illustrative purpose only. The official version of the map is in digital format and can be accessed by contacting the Adjudication Bureau. A full-size copy of the map is available in the SRBA map case.

The 1:1,000,000 scale map of the state of Idaho dated December 1991 and entitled "Consumptive Irrigation Requirement, Field Headgate Requirement and Season of Use" is still necessary for the Consumptive Irrigation and Field Headgate Requirements. A reduced reproduction of the map is also attached to this memo; the reduced reproduction is for illustrative purpose only. An official copy of the map is available in the SRBA map case.

The purpose of these maps is to provide consistent standards in a simple format. Further information concerning the foundation for these standards is available from Jeff Peppersack.

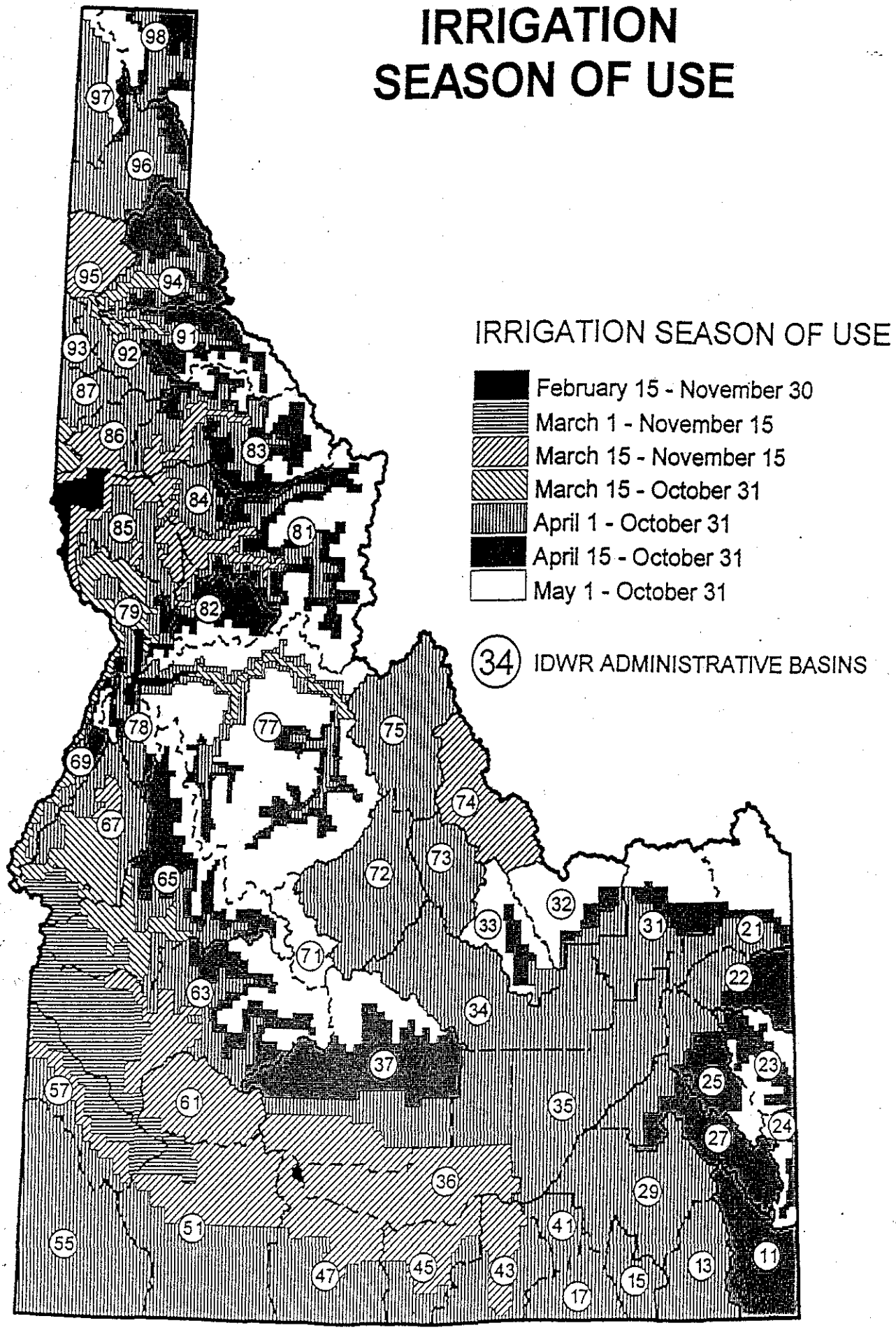
The standard season from the new map is to be used for a new permit regardless of the season stated on the application unless it can be shown to the satisfaction of the director that a different season of use is necessary. Likewise, the standard season from the new map is to be used for a new license regardless of the season stated on the permit unless it can be shown to the satisfaction of the director that a different season of use is necessary.

For a transfer of a license or decreed water right, the transfer approval should retain the licensed or decreed season. However, when the new standard season is longer than the licensed or decreed season, an approval condition like the following may be added:

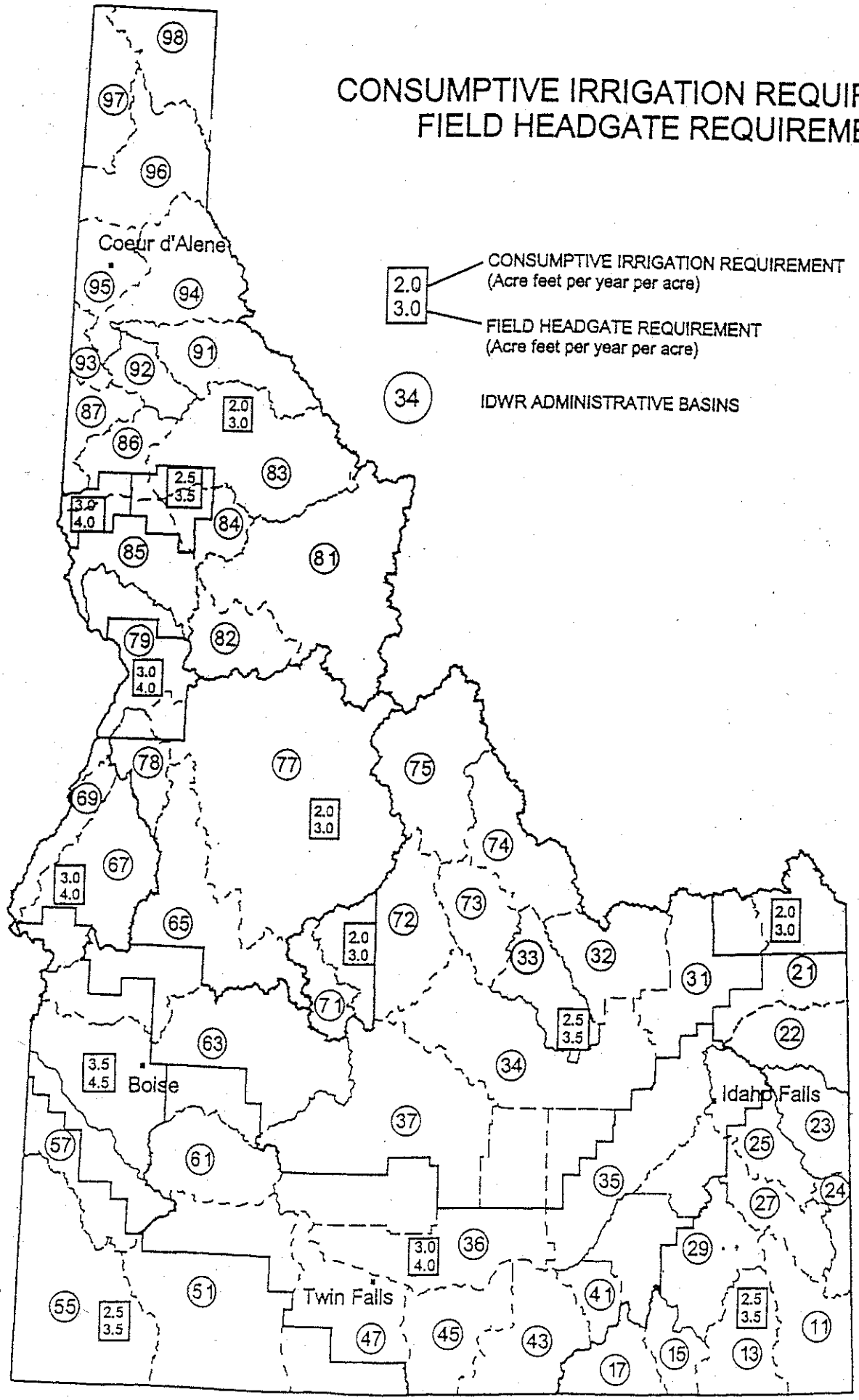
> The period of use for the irrigation described in this approval may be extended to a beginning date of *new standard* and an ending date of *new standard* provided that beneficial use of the water can be shown and other elements of the right are not exceeded. The use of water before *licensed or decreed date* and after *licensed or decreed date* is subordinate to all water rights having no subordinated early or late irrigation use and a priority date earlier than the date of this approval.

The standard season from the new map is to be used for recommendations in the SRBA as described in the Claim Investigation Handbook.

IRRIGATION SEASON OF USE



CONSUMPTIVE IRRIGATION REQUIREMENT, FIELD HEADGATE REQUIREMENT



ADMINISTRATIVE MEMORANDUM
Licensing Memo #10

DATE: March 11, 1996

TO: Water Allocation Bureau and the Regions

FROM: Norman C. Young

RE: Verification of Place of Use during Beneficial Use Exams

==========

Recently the validity of a licensed water right was called into question by a special master working for Judge Hurlbutt in the SRBA because the water right file contained inadequate evidence that the place of use had actually been irrigated. The beneficial use field report contained no aerial photograph of any scale nor any photograph taken by the field examiner to verify the beneficial use of water on the reported place of use.

I want to remind Department field examiners of Beneficial Use Rule 35.1.q, which states:

> An aerial photo must accompany field reports involving ten (10) or more irrigated acres unless waived by the director. If existing photos are not available, the director will accept a USGS Quadrangle map at the largest scale available.

The purpose of the aerial photo requirement is to obtain substantial evidence of the extent of beneficial use of water for irrigation at the reported place of use. Traditionally, the Department has seen the requirement met with photocopies of ASCS 8"/mile aerial photos or with USGS 1/24000 orthophoto quadrangles. More recently, infrared photography such as the 1987 NAPP photography used extensively in the SRBA effort has become available. The examiner should use as many of these sources as is necessary to verify the water right.

When aerial photographs are copied, the examiner should note in the field report the type and location of the original photograph, especially if a particular aerial photograph does not copy well.

I also want to strongly encourage the effective use of photographs taken by the examiner to verify the right. If the aerial photography is inconclusive as to the irrigation of a parcel, such as a corner on a tract that has a center pivot, the examiner should use photographs as much as possible to document the irrigation or lack thereof on the parcel. Photographs should always be labeled with the water right number, the date and time taken, the name of the examiner, the location taken, and the direction of the photograph.

State of Idaho
DEPARTMENT OF WATER RESOURCES
1301 North Orchard Street, P.O. Box 83720, Boise, Idaho 83720-0098
Phone: (208) 327-7900 FAX: (208) 327-7866 www.idwr.state.id.us/idwr/idwrhome.htm

MEMORANDUM

DIRK KEMPTHORNE
Governor
KARL J. DREHER
Director

TO: WATER MANAGEMENT DIVISION STAFF

FROM: NORM YOUNG NCY

RE: 1) ADJUDICATION CLAIMS TOLLING FORFEITURE
2) FISH PROPAGATION FACILITY VOLUME

DATE: MARCH 24, 2000

Adjudication Memo ~~#46~~ 47
Permit Processing Memo #18
Transfer Processing Memo #22
Licensing Memo #11

On December 29, 1999, the Snake River Basin Adjudication (SRBA) district court issued its *Order on Challenge (Consolidated Issues) of "Facility Volume" Issue and "Additional Evidence" Issue*, Subcase Nos. 36-02708, et al., In Re SRBA, Case No. 39576. In that decision the SRBA district court determined, among other things that:

> 1. "Once a claimant files a claim in the SRBA, for a particular water right, the forfeiture provisions of I.C. § 42-222(2) are also tolled for purposes of establishing forfeiture, so long as the claimant continues to prosecute the claim to a partial decree."
>
> 2. Facility volume is not an element of a water right for fish propagation. While a facility volume condition could be carried over from a license into a partial decree, an additional remark would be added to the partial decree indicating that the condition has no effect on the use of the right.

Water Management Division will implement this decision as follows:

Adjudication Bureau:

1. Agents investigating water use in the SRBA shall only investigate water use prior to the date the water right claim was filed with IDWR for purposes of determining whether forfeiture has occurred. Field examinations made, photographs taken, or other evidence of non-use of a water right after the date a claim was filed with IDWR shall not be used in preparing the recommendation on the claim for the Director's Report.

2. Facility volume conditions will not be included in the Director's Report for fish propagation claims whether or not the claim is based upon an existing license that includes the facility volume condition.

Water Allocation Bureau:

1. Filing a claim and participating in the SRBA does not prevent a water user from making use of his/her water right. Therefore, in the context of transfer or other applicable administrative proceedings, IDWR will continue to consider nonuse of water after the filing of an SRBA claim as relevant to whether forfeiture has occurred.

2. Facility volume conditions will not be included in new permits for fish propagation and will not be carried over from a permit to the resulting license. IDWR will not, on its own initiative, endeavor to enforce a facility volume condition associated with any existing right.

Except as specifically discussed in this memorandum, IDWR standards regarding the investigation of SRBA water right claims and the processing of administrative applications remains unchanged.

ADMINISTRATOR'S MEMORANDUM

To: Regional Offices,
Water Allocation Bureau

Application Processing No. 73
Licensing No. 12
Transfer Processing No. 28

From: Jeff Peppersack

Re: UTILIZATION OF THE 24-HOUR FILL ALLOWANCE FOR IMPOUNDMENTS

Date: April 18, 2013

Department practices and policies have recognized the use of the 24-hour fill allowance (aka the "24-hour rule") in establishing the maximum impoundment volume allowed in association with a water right permit, license, or decree, for which a storage component identified as an element of the water right is not required (AP Memo 67[1]). The Department has not provided additional guidance for implementation of this policy; consequently, the 24-hour fill allowance has been implemented by staff in a variety of ways. Additional guidance is necessary to avoid a proliferation of ponds on new or existing water diversion systems that may result in additional consumptive use and lack of control of the water to the detriment of other water users. It is important to note that this memo does not represent promulgated rules, but is instead a statement of the policy and practical implementation of the 24-hour fill allowance that has historically been used by the Department.

The guidance provided in this memo is intended to provide clarity, consistency, and detail in the implementation and use of the 24-hour fill allowance for ponds constructed or proposed to be constructed after the date of this memorandum and to changes in use of existing ponds, where the change in use occurs or is proposed to occur after the date of this memorandum. It is not intended to direct Department staff to initiate investigative or regulatory action for ponds existing prior to the date of this memorandum, that otherwise met past interpretations of the 24-hour fill allowance, or to address the need for a claim to be filed in an ongoing adjudication of water rights. If a written complaint is filed with the Department showing probable injury to an existing water right where the injury is alleged to be related to the use of a pond developed prior to the date of this memorandum, staff is instructed to forward the complaint to the division administrator for case-by-case guidance.

[1] Application Processing Memorandum No. 67 Permitting Requirements for Ponds, signed by Norm Young on February 28, 2003, states in part "A water right permit is not required to construct and use a pond or ponds that are part of a system used to distribute and use water in accordance with a valid water right if the pond or ponds do not impound a larger volume of water than authorized for diversion within a 24-hour period under the water right or rights associated with the project."

Historic utilization of the 24-hour fill allowance came about as recognition that many diversion structures will incidentally impound a certain amount of water to either raise the water level or otherwise facilitate diversion into a canal or other conveyance or distribution system, or to provide for short-term detention (24-hours) to facilitate operation of the distribution system for the purpose of use authorized under the water right. An example of the first case is creation of a small pool of water to ensure proper submergence of the suction piping in a pumping system. An example of the second case is detention of water in a small pond to provide a delayed, adjusted rate of diversion for night-time irrigation of a golf course or other facility where continuous irrigation during the day is not practical. Recognition of the 24-hour fill allowance for such uses is beneficial to the Department and water users because it eliminates the need to describe a storage component on a large number of water rights, allowing for faster processing of water right applications.

Further application of the 24-hour fill allowance by Department staff over time included its use for aesthetic, wildlife and/or recreation ponds. However, such application goes beyond the original intent of the 24-hour fill allowance because the pond is the end use of the water and the water right should include a storage component to properly describe the use. A storage component as part of the water right is necessary for such uses to ensure that the Department can address consumptive use associated with the pond and to describe any quantities, period of use or conditions necessary to limit the use to avoid injury to other water users.

Due to the lack of formal resources addressing the 24-hour fill allowance, questions are often raised by Department staff regarding its implementation. The following explanation and scenarios are intended to illustrate proper use of the 24-hour fill allowance and to prevent future misunderstandings of the policy by Department staff and water users.

DIVERSION RATE USED TO CALCULATE THE 24-HOUR FILL ALLOWANCE

The volume of water provided under the 24-hour fill allowance is calculated by multiplying the diversion rate by a 24-hour time period. As a simple example, if a water right recognizes a diversion rate of 1 cfs for irrigation, an impoundment volume less than or equal to 1.98 ac-ft used to facilitate pumping would not require a storage component on the water right.[2] Conversely, for the same water right, an impoundment volume greater than 1.98 ac-ft would require that the water right contain an element describing the entire storage component consistent with Water Appropriation Rule 35.03 (b) iv and v (*IDAPA 37.03.08)*.

When applying the 24-hour fill allowance to calculate the maximum volume of a pond, series of ponds, reservoir, or series of reservoirs (henceforth referred to as a pond) associated with a specific water right, the diversion rate used in the calculation is limited to the authorized diversion rate associated with the water right and is further limited by the available water supply or the capacity of the works at the inlet to the pond. Regardless of availability of water, diversion rates in excess of that authorized on the water right

[2] 1.98 ac-ft = (1 ft^3/s)*(86,400 s/day)*(1 ac/43,560 ft^2). This conversion is simplified as 1.984 ac-ft per cfs per day.

or rights, specifically utilizing the pond in question, are inappropriate for use in the 24-hour fill allowance calculation.

An example of inappropriate diversion rate includes a natural stream flow rate for an on-stream pond—an extreme variant of this is relying on the peak stream flow rate for analysis and pond sizing. This can be encountered when reviewing on-stream hydropower water rights. In such instances, the 24-hour fill allowance should be limited to the volume derived from the authorized diversion rate of the water right, and consideration of any excess available natural flow rates associated with the stream channel is inappropriate. Another example of a diversion rate that is inappropriate for consideration includes a diversion rate in a delivery system associated with other unrelated water rights for which the pond does not facilitate operation. This may include downstream water rights that use the system for conveyance (e.g. downstream irrigators), or water rights with additional beneficial uses that are not facilitated by the pond (e.g. stockwater used above the irrigation works in the system).

The appropriate diversion rate used to calculate the 24-hour fill allowance volume cannot exceed the fully authorized diversion rate associated with a specific water right; however, oftentimes the actual diverted (measured) rate is something less than the fully authorized rate. In these instances it is the rate that is actually being diverted, not the authorized diversion rate, that should be used in the calculation to determine the 24-hour fill allowance volume. For example, if an irrigation water right authorizes 5 cfs of diversion, but in actuality only 3 cfs of the total rate is conveyed into a part of the system incorporating the pond under consideration, and the remaining diversion rate is used in a separate part of the system, then the 24-hour fill allowance calculation is limited to a diversion rate of 3 cfs.

Combination of Beneficial Uses and/or Multiple Water Rights

It has been the Department's practice to allow for a combined pond volume based on the 24-hour fill allowance calculation of multiple beneficial uses under the same water right, and/or multiple water rights associated with the same system. As an example of the first case, if a golf course resort plans to develop a water right that includes a pond to facilitate a golf course irrigation component (2.5 cfs) and a commercial (equipment washing) component (1.2 cfs for two hours), the appropriate combined 24-hour fill allowance volume is 5.16 ac-ft.[3] As an example of the second case, if an irrigation system includes a pond and has two water rights associated with the system for 2 cfs and 3 cfs respectively, then the appropriate combined 24-hour fill allowance volume is 9.92 ac-ft.[4] Note, both examples are contingent upon the diversion or operation being facilitated by the pond.

Seepage & Evaporation in Conjunction with the 24-Hour Fill Allowance

When calculating the 24-hour fill allowance volume, no consideration should be given to gains and losses to the pond volume associated with precipitation, evaporation, or seepage. The volume calculation is based solely on the product of the appropriate diversion rate associated with the water right and a 24-hour diversion period. No adjustments up or down should be made to the diversion rate or allowable pond volume to reflect actual water balance conditions.

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[3] 5.16 ac-ft = (2.5 cfs)*(1.984 ac-ft/cfs/day) + (1.2 cfs)*(2 hrs)/(24 hrs/day)*(1.984 ac-ft/cfs/day)

[4] 9.92 ac-ft = (2 + 3 cfs)*(1.984 ac-ft/cfs/day)

TYPES OF IMPOUNDMENTS

Off-Stream Impoundments to Facilitate Diversion or Operation of the Distribution System

Application of the 24-hour fill allowance to address off-stream impoundments is appropriate when the impoundment is used to facilitate the diversion of water or operation of a distribution system for the authorized purpose of use. Such impoundments may include sumps for pumping systems or short-term detention ponds for irrigation systems.

Off-Stream Impoundments for Recreation, Wildlife and Aesthetic Uses

As a general rule, it is not appropriate to utilize the 24-hour fill allowance for off-stream impoundments where the impoundment represents the end use of the water such as aesthetics, recreation and or wildlife uses.[5] Such impoundments, which may include wide meanders and/or pools within the conveyance channel, must include a storage component as part of the water right authorizing the use.

On-Stream Impoundments to Facilitate Diversion or Operation of the Distribution System

Application of the 24-hour fill allowance to address on-stream impoundments is limited to impoundments that facilitate diversion of water or operation of a distribution system for the authorized purpose of use. Such impoundments may include use for on-stream hydropower facilities or on-stream diversions for authorized off-stream water uses.

In regards to run-of-the-river (ROR) hydroelectric water uses, application of the 24-hour fill allowance to support incidental on-stream impoundment is an acceptable application. ROR hydroelectric projects are those with small or no reservoir capacity. In the strictest sense of the definition, this implies that water passing through the facility must be used at that moment, or must be allowed to bypass the dam. Oftentimes in practice ROR facilities are actually operated in a "load following" manner. Load following indicates a practice where power output is adjusted to meet the fluctuating demand throughout a 24-hour period. Load following requires that a small amount of storage occur upstream of the dam to provide water releases to meet the peak daily demand for electrical generation. The Lower Salmon Falls Hydroelectric facility is one such example. Traditionally the Department has not required a storage water right in association with ROR facilities if the volume of water impounded upstream of the dam in support of a load following operation satisfies the 24-hour fill allowance calculation. Note that conditions of a hydropower water right, or conditions of other permits associated with the use (e.g. a FERC license) may preclude such practice.

On-Stream Impoundments for Recreation, Wildlife and Aesthetic Uses

Similar to off-stream impoundments for such uses, it is not appropriate to utilize the 24-hour fill allowance for on-stream impoundments where the impoundment represents the end use of the water such as aesthetics, recreation and or wildlife uses. Furthermore, such use would constitute a minimum in-stream

[5] A storage component may not be necessary if the total use falls within the statutory definition of a domestic or stockwater right.

flow because the water right quantity would be described as a flow rate, and consistent with Idaho Code Title 42, Chapter 15, Minimum Stream Flow, only the Idaho Water Resource Board (IWRB) can file an application and hold a minimum stream flow water right.

OTHER CONSIDERATIONS

Water Tanks

Many water users incorporate tanks or cisterns in their distribution system. Such features are generally not considered storage and are not required to be covered under a specific storage water right. Some circumstances, especially where a tank or cistern is added to an established non-municipal water right, may raise injury and/or enlargement concerns and may require a storage component.

Timing of Fill

The diversion of water to a pond where impoundment is only allowed by implementation of the 24-hour fill allowance, and where no storage component is identified on the water right, can only occur during the season of use described on the water right. As an example, if an irrigation water right includes a pond with a volume established by the 24-hour fill allowance, diversion of water to fill that pond can occur no earlier than the first day of the irrigation season of use. It would be an illegal diversion of water if the pond were filled when the water right is out of season, to take advantage of water availability (i.e. early season runoff).

Drainage of Pond

Once diverted, water impounded to facilitate diversion or operation is considered beneficially used and water users are not expected to drain the pond or return the water to the source at the end of the season or when the water is off due to a priority cut. However, significant amounts of water routinely held at the end of the period of use may raise questions regarding the intent of the pond or impoundment and may result in the need for a water right for an alternate use such as aesthetics or recreation storage.

MEMORANDUM

TO: Regional Offices
Water Allocation Bureau

FROM: Mat Weaver MW

RE: Recommendations for the Processing of Reasonably Anticipated Future Needs (RAFN) Municipal Water Rights at the Time of Application, Licensing, and Transfer

DATE: March 16, 2015

Application Processing No. 74
Permit Processing No. 20
License Processing No. 13
Transfer Processing No. 29

See attached Amended RAFN Municipal Water Right Handbook

IDAHO DEPARTMENT OF WATER RESOURCES

Recommendations for the Processing of Reasonably Anticipated Future Needs (RAFN) Municipal Water Rights at the Time of Application, Licensing, and Transfer

March 2015

Table of Contents

Appendix

1. Introduction

This document is intended to provide guidance and support to Idaho Department of Water Resources (the Department) staff in evaluating and processing applications for reasonably anticipated future needs (RAFN) water rights and can be used to provide assistance to applicants seeking RAFN water rights throughout the application, permit, license, and transfer processes. Guidance does not have the force and effect of law. Rather, it is designed to serve as a primary reference tool to assist agency staff and to assist those impacted by agency actions to comply with the law. The appendix includes a number of resources and support items related to RAFN analysis including the following: "*Municipal Water Right Permit Evaluation" checklist* (Item 5), which can be utilized by the applicant when applying for RAFN water rights; methods for estimating residential demand (Item 3); and a detailed example of the determination of RAFN for a small community that implements the methodology described in this document (Item 6).

RAFN vs. non-RAFN Prior to 1996, common law practices allowed municipalities to establish water rights greater than immediate needs. The 1996 Municipal Water Rights Act provided a statutory process for establishing a municipal water supply for reasonably anticipated future needs (RAFN). The 1996 Municipal Water Rights act was codified in Idaho Statutes in the form of amendments to Idaho Code (I.C.) §42-202, the addition of I.C. §42-202B, amendments to I.C. §42-217, amendments to I.C. §42-219, and amendments to I.C. §42-222. A key distinction of the RAFN right is the allowance of components of the water right, namely the diversion rate, to be perfected without physically completing diversion and use in establishing beneficial use during the development period of the permit.

There are times when a municipal provider will choose to file an application to appropriate water solely for use to meet needs in the near-term (up to five years) without the burden of demonstrating future needs over an established planning horizon. This type of municipal water right has been termed a non-RAFN municipal right. Municipal water rights that are not defined as RAFN in conditional language are by default non-RAFN water rights. *Application Processing Memo #18* presents and discusses the distinctions between both types of municipal water rights and provides guidance to Department staff for processing permits and determining extent of beneficial use for licensing of non-RAFN municipal water right permits. It is not the intent of this document to repeat or duplicate the material presented in AP Memo #18. The focus of this document will be on RAFN municipal water rights. When a water right application has been determined to be for a non-RAFN municipal beneficial use, Department staff should consult AP Memo #18 for processing guidance.

In addition to water rights with a designated municipal beneficial use, municipal providers may also own water rights for non-municipal uses such as domestic, irrigation, commercial, etc. These water rights are often associated with uses such as parks, golf courses, cemeteries, and buildings that are not directly connected to a municipal provider's primary municipal water delivery system. These water rights are sometimes acquired from previous non-municipal water right holders with the acquisition of land by the municipality. In other instances they may have been developed directly by the municipal provider for a demand not distributed throughout the entire existing water service area, or not otherwise qualified as a municipal use. When conducting a review of a municipal provider's suite of water rights, these water rights should be considered along with any existing water rights used for municipal needs, and any evaluation of RAFN should take into consideration beneficial use already being met by these types of water rights.

Types of Municipal Providers
Idaho Code §42-202 provides, in relevant part:

> An application proposing an appropriation of water by a municipal provider for reasonably anticipated future needs shall be accompanied by sufficient information and documentation to establish that the

applicant qualifies as a municipal provider and that the reasonably anticipated future needs, the service area and the planning horizon are consistent with the definitions and requirements specified in this chapter.

Idaho Code §42-202B(5) defines three types of municipal providers:

a) A municipality that provides water for municipal purposes (i.e. incorporated cities);

b) Any corporation or association holding a franchise to supply water for municipal purposes, or a political subdivision of the state of Idaho authorized to supply water for municipal purposes, and which does supply water, for municipal purposes to users within its service area (e.g. Water and Sewer Districts; United Water Idaho, a private company that supplies public drinking water to much of Ada County); or

c) A corporation or association which supplies water for municipal purposes through a water system regulated by the state of Idaho as a "public water supply" as described in I.C. § 39-103(12), Idaho Code. (e.g. developers; subdivision home owner associations).

As set forth in M3 Eagle Final Amended Order[1] (M3 Final Amended Order) a corporation or association seeking to qualify as a municipal provider under subsection c above for RAFN must qualify as a municipal provider at the time application is considered by the Department. In other words, at the time of application, the applicant must already supply water for municipal purposes through a water system that is regulated by the state of Idaho as a public water supply. It is insufficient for the applicant to merely be "*ready, willing, and able*" to be a municipal provider once the permit is issued.

2. Evaluating Reasonably Anticipated Future Needs

This section outlines and develops a fundamental protocol that should be considered by the applicant and Department staff in evaluating reasonably anticipated future water needs for qualified municipal providers.

As discussed above, Idaho law allows a municipal provider to secure water rights for RAFN purposes without relying on immediate diversion and use to establish beneficial use. For a qualified municipal provider, a RAFN estimate has four fundamental components:

1. Service Area (I.C. §42-202B (9)),
2. Planning Horizon (I.C. §42-202B (7)),
3. Population Projections within the Planning Horizon, and
4. Water Demand (necessary to serve the population during the planning horizon throughout the service area)

This protocol explains each one of these four components in order, and then describes how they should be used to evaluate a municipal provider's RAFN.

It is important to recognize at the outset that a conservative standard may be appropriate in estimating future needs to justify a RAFN water right, especially in instances where there is a weighing of public interest in an area of recognized limited water supply. There may be a difference between the supply of water sufficient to sustain an urban population and the supply desirable to keep future operating costs low or to provide aesthetic amenities.

[1] Amended Final Order of the Department in the matter of application to appropriate water no. 63-32573 In the name of M3 Eagle LLC dated January 25, 2010.

Service Area

Idaho Code §42-202B (9) defines the service area for a municipality as follows:

> "Service area" means that area within which a municipal provider is or becomes entitled or obligated to provide water for municipal purposes. For a municipality, the service area shall correspond to its corporate limits, or other recognized boundaries, including changes therein, after the permit or license is issued. The service area for a municipality may also include areas outside its corporate limits, or other recognized boundaries, that are within the municipality's established planning area if the constructed delivery system for the area shares a common water distribution system with lands located within the corporate limits. For a municipal provider that is not a municipality, the service area shall correspond to the area that it is authorized or obligated to serve, including changes therein after the permit or license is issued.

For a municipal provider, Idaho code requires the RAFN service area to be contained within the municipality's "established planning area" (I.C. §42-202B (9)) minus "areas overlapped by conflicting comprehensive land use plans" (I.C. §42-202B (8)).

For smaller widely-separated cities, the concern of overlapping comprehensive land use plans is not typically an issue. For these cities to justify a proposed future service area, the applicant should provide evidence of existing "corporate limits" and "other recognized boundaries" (I.C. §42-202B (9)). Idaho Code §50-102 requires the establishment of corporate limits (recorded metes and bounds description of the incorporated area) in association with the incorporation of a city. These limits are established with the counties within which the city is located. Where the applicant is a city, copies of corporate limits should be provided by the applicant. As necessary, staff can cross check corporate limits by obtaining the boundary directly from the city, governing counties, or the state. In addition, the Department maintains a spatial data layer delineating all incorporated cities and their respective city limits within the State of Idaho. This data layer is based on U.S. Census data that is updated every ten years. This data layer can be a good place to start in determining corporate limits, but there is a chance it may not represent the most current boundary, and, when the applicant is a city, staff should always obtain a current delineation of the corporate limits from the RAFN applicant or permit holder at the time of permitting and licensing. The purpose of this current boundary information is to facilitate the Department's review of the proposed RAFN service area.

Other recognized boundaries can include areas of impact, utility service planning areas, or other unique planning areas, provided they have been legitimately adopted by the municipality with verifiable records, as "established planning area[s]" consistent with I.C. §42-202B (9). Idaho Code §67-6526 in the Local Land Use Planning statutes requires that incorporated cities provide a map *"identifying an area of city impact within the unincorporated area of the county"*. In addition, I.C. §67-6508 requires the creation, adoption, and ongoing update of a comprehensive plan for any incorporated city. The comprehensive plan will typically include maps identifying incorporated limits, areas of city impact, and other legitimate planning boundaries.

For types b and c municipal providers, the "established planning area(s)" language does not apply. Rather, the applicant may submit an approved preliminary plat or other approved planning type documents, Public Utility Commission approval documents, Idaho Department of Environmental Quality public drinking water system approval documents, irrigation district and water and sewer district annexation plan, or other official documents which demonstrate a RAFN service area within which the applicant has the authority or obligation to provide water.

Idaho Code §42-202B (8) states, *"Reasonably anticipated future needs shall not include uses of water within areas overlapped by conflicting comprehensive land use plans."* When evaluating a proposed RAFN service

area where two or more municipal providers abut one another, the applicant should research adjacent community planning areas to confirm that overlaps in competing planning areas *specific to water service* do not exist. If overlaps in comprehensive land use planning areas specific to water service do exist between two different municipal providers, the area of overlap cannot be included in the proposed RAFN service area under consideration. As an example, if a subdivision intersects the planning boundaries of two separate municipal providers, and both entities indicate in their comprehensive land use plans the intent to serve the same subdivision with water, then neither entity can include the subdivision in a proposed RAFN water service area until the conflict has been resolved and one of the two entities relinquishes water service to the other. However, in another example, if an overlap exists in the comprehensive land use plans of two municipal providers, but only one plan addresses water service, and the other plan acknowledges that water service is provided by the other entity, then the area of overlap can be included in the RAFN service area of the entity providing water service.

When the applicant is a municipality with multiple municipal water service providers within its city limits or area of impact, the applicant should normally exclude the existing service areas of other municipal providers from the RAFN service area under consideration. However, if the RAFN applicant presents a sound argument and supporting evidence for the inclusion of competing existing water service areas within its own RAFN service area, Department staff may include them in the final RAFN service area delineation. As an example, if the systems of two water service providers are cross connected to allow for one system to provide water to the other during times of emergency, during periods of routine maintenance, or in support of peak water demands, it would be appropriate to include this demand in the RAFN analysis of the municipality that is providing water to the second water service provider, provided the established need is not already covered by an existing water right. If the established need is covered by an existing water right, a unique combined used limitation condition detailing the water supply relationship should be considered.

In conclusion, RAFN service areas should be delimited to include all existing contiguous and non-contiguous areas of water service (assuming they are combined) and adjacent areas poised for development and likely to occur within the established planning horizon time period. However, the proposed RAFN service area cannot include areas where water is not provided at the time of application if the proposed RAFN service area is overlapped by adjacent land use planning boundaries, or is already included within the existing service area of a municipal water provider other than the municipal provider under consideration. In addition, where the applicant is a municipality, the proposed RAFN service area cannot include areas where water is not provided at the time of application if the proposed service area is outside the municipality's currently adopted planning area. The appendix includes an example of a visual delineation of a RAFN service area based on underlying appurtenant boundaries (appendix Item 2).

<u>Planning Horizon</u>
Idaho Code §42-202B (7) defines the planning horizon for a municipal provider as follows:

> *"Planning horizon" refers to the length of time that the department determines is reasonable for a municipal provider to hold water rights to meet reasonably anticipated future needs. The length of the planning horizon may vary according to the needs of the particular municipal provider.*

A municipal provider's planning horizon is the term of years over which it projects its population change and makes water service decisions based on its projection. At the time of application for RAFN municipal water use, the applicant will present a planning horizon time period, including a specified ending year. Department staff must evaluate, among other things, whether the proposed planning horizon is reasonable. Some additional items to consider include:

- The customary standards of practice for water infrastructure planning

- The planning period identified in any applicable Comprehensive Plan
- Planning periods identified by other applicable planning documents
- Regional planning studies

It is important to note that the maximum development period for beneficial use associated with a non-RAFN water right is five years, which can be extended an additional five to ten years for a total of ten to fifteen years. Therefore, a planning horizon of less than five years would not warrant a RAFN water right. The following table (Table 1) summarizes planning horizon durations as published in six water planning references.

Table 1 - Summary of Published Planning Horizon Periods

Published Reference*	Planning Horizon (years)
Fair 1971	10 - 50
Prasifka 1988	10 - 100
Dzurik 1996	< 50
Boumann 1998	< 50
Stephenson 2003	10 - 20
AWWA 2007	20 - 40

*Refer to Bibliography (Appendix Item 1) for reference details.

Table 2 summarizes planning horizons associated with actual water resource planning documents in the State of Idaho. The references summarized in Table 2 represent a variety of planning documents with unique objectives and planning areas. Some of the values are more applicable than others for use in comparison to proposed RAFN planning periods.

Table 2 - Summary of Actual Water Planning Documents and their Respective Adopted Planning Horizon Periods

Planning Area	Planning Horizon (years)	Planning Document Type
Ada & Canyon Counties	25	IDWR Water Demand Study
City of Coeur d'Alene	20	Comprehensive Water Plan
City of Lewiston	20	Master Water Plan
City of Meridian	50	Master Water Plan
City of Nampa	20	Master Water Plan
City of Pocatello	10	Master Water Plan
City of Rexburg	50	2008 Water System Tech. Memo
City of Twin Falls	30	Water Supply Improvement Plan
Rathdrum Prairie Aq.	50	CAMP Water Demand Projections Study
Treasure Valley	50	CAMP Future Water Demand Study
United Water Idaho	55	Water Demand Study

The data presented in Tables 1 and 2 suggest that planning horizons between 10 and 55 years are the standard amongst the planning profession and in the actual adoption of planning documents within the State of Idaho.

The Department must guard against over-appropriation of the resource and against speculative water right filings. Longer planning horizons increase the level of uncertainty associated with predicted values and must be considered by the Department with greater caution. Planning horizons of 15-20 years are generally reasonable and require little scrutiny unless there is substantiated competition for the resource or some other justification for additional scrutiny arises. Planning horizons greater than 20 years can be considered by the Department, but when proposed they should be supported by long-term planning documents such as those listed in Table 2 and by professionally prepared demographic studies substantiating the duration of the planning horizon period.

Idaho Code §42-202B (8) provides additional guidance regarding the evaluation of planning horizons as follows:

> *"Reasonably anticipated future needs" refers to future uses of water…reasonably expected to be required within the planning horizon of each municipality within the service area not inconsistent with comprehensive land use plans approved by each municipality.*

As a final measure, the planning horizon period proposed by the applicant must not only be reasonable, but also consistent with the adopted Comprehensive Plan of the City. This can be interpreted to mean no greater in length than the planning horizon period associated with the Comprehensive Plan, if no other pertinent planning documents exist. When another pertinent planning document exists, such as a master water plan, then the planning document should be consistent with the master plan for the coincident period of time shared between the planning horizons of both documents.

Population Projection within the Planning Horizon[2]

Idaho Code §42-202B (8) indicates that RAFN should be based on *"population and other planning data."* To establish its RAFN, a municipal provider must estimate its future population within its service area at the end of the planning horizon. For most municipalities, planning and demographic studies of one type or another have been completed, and often multiple relevant studies exist. At a minimum, Comprehensive Plans usually address population growth in some form as required by I.C. §67-6508 (b). The U.S. Census Bureau also provides population and demographic data for most municipalities in Idaho in a variety of formats. For communities where appropriate data exists, Department staff should expect the following components and considerations regarding population forecasts to be addressed and discussed in detail by the applicant.

1. A critical survey of existing contemporary population studies applicable to the local area to establish likely upper and lower boundaries for population growth.
2. Project population using standard technical methods, such as regression, extrapolation, or cohort survival models. To make extrapolation appropriate, one should account for geography, resource constraints, economic conditions, and other limiting factors or anticipated events, such as relocation of a commercial or industrial use.
3. Compare the results of the population projections from step 2 to the results of the critical survey from step 1 and apply professional judgment to evaluate whether the population projections are likely to occur within the planning horizon and are, therefore, reasonable.

Department staff should scrutinize population growth rates and projections that fall near or outside the upper boundary established in the critical survey. Staff should also scrutinize results based on short term trends in population growth. Where sufficient data exists population forecasts should be based on a minimum of thirty years of population data. The U.S. Census Bureau provides decadal populations for every county in Idaho. Since 1970 the population growth rate of the entire state of Idaho has been 1.91%. The maximum growth rate in that time was 3.72% in Teton County and the minimum growth rate was -1.20% in Shoshone County. Since 1970, growth rates in excess of 3.00% were only realized in five counties. Growth rates in excess of 2.50% were realized by less than 14% of Idaho counties. As such, applicants should provide extra justification for requested growth rates in excess of 2.50% annually.

In some instances when municipal providers are providing water to a rural or unincorporated community, existing population data specific to the community might be difficult to acquire or may simply not exist. In

[2] The 'Population Projection within the Planning Horizon' section of the RAFN handbook was prepared in conjunction with and under the review of Don Reading, Ph.D., a consulting economist with Ben Johnson Associates, Inc.

other instances the applicant may lack sufficient experience and/or expertise to forecast populations without assistance. In these select cases, the applicant may rely on a population forecasting tool that has been developed by the Department in Microsoft Excel to assist in population forecasting[3]. The tool summarizes dynamic ranges of U.S. Census Bureau population data by county and supports the regression of exponential and linear growth type models to the county census data to allow for the projection or forecasting of future populations. In addition, the spreadsheet tool allows for the development of exponential and linear population growth rate models based on user input population data. Forecasting conducted with this tool is only appropriate as a means of last resort and should not be used for communities where specific data and/or population and demographic studies already exist. The tool may also be useful directly to Department staff as a means of roughly verifying the population forecasts made by an applicant, allowing Department staff the opportunity to "double check" a proposed growth rate or population forecast.

For communities starting from zero or a very small base population, the method of relying on historical or analogous growth rates may not be applicable. In these instances, reliable growth or build-out projections provided by the applicant may be considered by the Department.

Water Demand

Water demand is the final component of a RAFN that must be considered and evaluated by Department staff. Water demand represents the future projected water use in a community. Water use can broadly be placed into two categories: (1) non-residential use and (2) residential use. Non-residential use consists of irrigation of open common spaces (parks, golf courses, etc.), public facility use, industrial use, commercial use, and any and all other municipal purposes. Residential use can be further broken down into in-home use, out of home use (landscape irrigation, car washing, etc.), and fire protection.

To prevent over-appropriation of water, fire protection flow requirements should not be used as justification for water demand as part of a RAFN application. Per Idaho Code §42-201, *"[W]ater may be diverted from a natural watercourse and used at any time, with or without a water right to extinguish an existing fire on private or public lands, structures, or equipment, or to prevent an existing fire from spreading to private or public lands, structures, or equipment endangered by an existing fire..."* If the Department were to allow fire protection flows to be included in estimating RAFN water demand for municipal purposes, it would result in a water right for municipal purposes in excess of the demonstrated continuous future needs. Water flow rates required solely for fire protection may be listed as a separate use on a RAFN application.

Similar to fire protection flows, an additional groundwater point of diversion used to provide redundant supply to a water distribution system should not be considered as justification for water demand on a RAFN application. The Idaho Rules for Public Drinking Water Systems require new community systems served by ground water to have a minimum of two points of diversion if they are intended to serve more than twenty-five connections (IDAPA 58.01.08.501.17). Though the Department recognizes the necessity and value of redundant ground water points of diversion, additional capacity associated with the redundant point of diversion does not constitute an additional increment of beneficial use, justifying a water right. The inclusion of the diversion capacity associated with a redundant point of diversion in the estimation of RAFN water demand results in a water right for municipal purposes in excess of the demonstrated continuous future needs.

Unaccounted for water (UAW) makes up a third category of water. UAW is considered the difference between a water utility's production and its water sales to consumers. Often municipal water providers authorize some types of UAW, including unmetered uses from fire hydrants, street washing, main flushing, sewer cleaning and storm drain flushing, authorized unmetered connections, and reservoir seepage and evaporation. Examples of

[3] The Microsoft Excel file is titled "PopForecastTool.xlsx" and is available to the applicant from the Department upon request.

unauthorized UAW include water distribution system leakage, unauthorized use by theft, abandoned services, and inaccurate or incorrectly read meters. For typical public water supply systems some engineering references estimate a minimum of 2.0% UAW can be anticipated (Prasifka 1988). United Water Idaho maintains monthly accounting of non-revenue water with values typically reported between 3.0-5.0% (Carr 2009). California Department of Water Resources' Urban Water Use in California Bulletin 166-3 reports that the largest percentage of cooperating agencies reported approximately 10.0% UAW in their water supply systems (CDWR 1994). For existing facilities, UAW values greater than 10% should only be approved by the Department as part of a water demand analysis, when the application includes historical diversion records and a technical engineering discussion of the above normal UAW values. For new systems, UAW values greater than 10% are not acceptable. Planning for UAW values in excess of 10% for a new system is contrary to the requirement for conservation of the water resources of the state.

Residential Water Demand Forecasting Methodologies

There are a number of standard recognized approaches for forecasting residential water demand (i.e. RAFN) including judgment based prediction, time extrapolation, disaggregate requirements analysis, single coefficient model development, multi-coefficient model development, econometric demand model development, or a hybrid of one or more of these approaches. Of these approaches, judgment based predictions or water demand based on time extrapolation forecasts are generally viewed as inadequate forecast approaches. Judgment based predictions are simply forecasts of water demand based on the recommendation of an "expert" familiar with the system, who in theory has an "intuitive" feel for water demand specific to the municipal system through prolonged experience with the system. Time extrapolation relies on the prediction of water demand where the only predicting variable is time. For example, 100,000 GPD were needed in the first 10 years, 200,000 GPD were needed in the second 10 year period, and therefore 300,000 GPD will be needed in the third 10 year period. Both of these forecasting techniques lack a technical rigor that is appropriate and necessary when evaluating RAFN water right applications.

Of the remaining methods, one of the most widely implemented approaches, and the one that is presented in detail in this document, is the per capita requirements method, which is a form of the single coefficient model approach. To determine RAFN utilizing this method projected per capita or per household water demand must be applied to the estimated future population within the service area at the end of the planning horizon.

Per Capita Requirements Method

Municipal water demand is often considered a function of population and per-capita consumption[4] (Prasifika 1988). The per capita requirements method relies on the following components to estimate future water demand: (1) projected future number of people or residential services, (1a) if necessary a conversion factor between people and residences[5], (2) average historical water use per capita, and (3) peaking factor(s). A combined future water demand is equal to the product of historical per capita demand, the total number of people or connections, and an appropriate peaking factor.

Per Capita Water Demand

[4] Strictly speaking the "per capita" metric refers to water use per individual person per unit time. The strict and rigorous use of this "per capita" definition is not always in evidence by water right applicants. Oftentimes municipalities do not know specifically how many people are served and thus employ the potentially more useful "per dwelling unit" metric. The terms "single family residence", "single family service connection", "single family dwelling unit" and "equivalent residential unit" can be synonymous with the term dwelling unit. An essential detail of the RAFN application should be the strict definition of the base water demand metric employed by the municipality.

[5] Population forecasts always predict a future population, depending on whether the city is forecasting water demand by person or by service connection the applicant will need to know the number of people per home in order to convert forecast population values into forecast service connections. The U.S. Census Bureau provides data on "persons per household" in their State and County QuickFacts data sets.

Per-capita water consumption is highly variable from region to region and even from one system to another within the same region. Factors that affect per capita water consumption include metering, lot size, climate, age of system, residential irrigation demand, fire protection demand, water rate structure,[6] and physical characteristics of the system. Table 3 summarizes various published values for estimating per capita consumption.

Table 3 - Summary of Published Values of Average Residential Daily Consumption

Published Reference*	Avg. Daily Consumption per Person (GPD)	Avg. Daily Consumption per Home (GPD)
Linaweaver 1967	100	400
Fair 1971	100 – 150	--
Stephenson 2003	50 – 80	150 - 800
Boumann 1998	--	200
Cook 2001	--	194

*Refer to Bibliography (Appendix Item 1) for reference details.

Residential irrigation can have a dramatic effect on per capita water demand. By some estimates water demand to meet peak residential irrigation needs can be 700% of average daily water demand without irrigation (Linaweaver 1967). Many municipal systems provide residential irrigation. However, a growing number of communities and municipalities do not support residential irrigation or have a separate utility specific to irrigation. It is important when evaluating the reasonableness of water demand values to know for certain whether residential irrigation is included in the demand.

Whenever possible, design flows for community water systems (municipal, community, or residential subdivisions) should be based on historical records or studies of similar water use in the area to be served—ideally historical records within the same system will be used. For established municipalities, historical records should be the primary means of evaluating and determining per capita requirements. When a wealth of historical records are available to draw upon, the applicant should rely on the most contemporary values, as they are most likely to reflect future water usage practices.

Frequently, recent data reflect lower per capita usage than older data. This decreasing trend evident in Idaho communities is consistent with national trends over the past three decades and is primarily due to a declining number of residents per household and an increasing pervasiveness of water-conserving (low flow) appliances in the home.[7]

[6] Water rate structures are the frame work in which municipal water providers set the prices for their retail water sales. Examples include flat rate and increasing block rate structures. In a flat rate structure the water user is charged a flat rate regardless of how much water is used. In an increasing block rate structure the unit price for water increases as the volume consumed increases, with prices being set for each block of water use. An increasing block rate structure is much more likely to communicate the value of water and encourage the efficient use of water amongst the users.

[7] For national trends see: Rockaway, P.A. et. al. Residential water use trends in North America. Journal AWWA, 103:2, February 2011. In Idaho, United Water (Boise and SW Ada County) reported that from 2003 to 2011, the average UW customer's water usage has fallen nearly 23 percent. Greg Wyatt, United Water Idaho Vice President and General Manager, attributed the reduced consumption to "successful implementation of a conservation program, as well as weather patterns, plumbing codes and the economy" (United Water 2011). In addition, the City of Meridian has seen not only a reduction in per capita demand, but also in total potable water demand since 2007, despite a rising population. Research conducted for the City's Water Master Plan showed that residents served surface water for irrigation used about 112 gpcpd of potable water while residents that use potable water for irrigation used about 224 gpcpd of potable water (both figures based on ADD). Because all new customers will be served using surface water for irrigation, the overall per capita demand should continue to drop without conservation measures (City of Meridian 2011).

It is not always possible, especially for newer communities, to estimate design flow from historical records as described above. On a case by case basis, the Department can accept calculated estimates for individual systems. There are several "per capita" estimation methods outlining practices and guidelines for estimating domestic design flows currently supported by the Idaho Department of Environmental Quality and the Department. Item 3 of the appendix includes a discussion and comparison of the various methodologies. Item 3 also describes and recommends a method than can be relied upon by the applicant to estimate demand as a last resort when actual historical data does not exist. It is worth emphasizing that the preference in determining per capita demand is always given to actual historical records and that it is only in rare instances that relying upon an artificial means of estimating water demand by the methodology presented in appendix Item 4 is appropriate.

Peaking Factors

In the long term, water demand requirements can vary widely, increasing and decreasing in direct correlation with changes to the population base that is served. Wide variation in water demand occurs in the short term as well. Based upon the transient needs of a static population base, water demand will vary seasonally, daily, and hourly. For example, water demand may be greater during the irrigation season as opposed to the non-irrigation season. Daily in-home demand also increases during times of high use at the start and end of the workday, with daily lows occurring during the middle of the night and early morning. These fluctuations in demand are normally estimated in terms of peaking factors or multipliers, which are often expressed as a percent of average demand.

In general, distribution systems are traditionally designed to carry peak hour flows that typically amount to 200-300 percent of the average day demand, with higher rates usually associated with smaller systems (Robinson and Blair 1984).

When discussing peaking factors, it is important to distinguish between average daily demand (ADD), maximum day demand (MDD), maximum monthly average day demand (MMAD), peak hourly demand (PHD), and peak instantaneous demand (PID). All or some of these terms will often be used in the discussion of a municipal water supply system and as they are used by the Department these terms are defined below. Table 4 summarizes several published ranges of values for residential peaking factors.

Table 4: Summary of Published Peaking Factor Values

Published Reference*	MDD: ADD	PHD: ADD
Dewberry 2002	1.5 - 3.0: 1	2.25 - 4.50: 1
Fair 1971	1.5 - 3.5: 1	1.5 - 3.5: 1
Harberg 1997	1.4 - 1.7: 1	2.0 - 4.0: 1
Linaweaver 1967	2.0: 1	5.0 - 7.0: 1
Lindeburg 1999	1.5 - 1.8: 1	2.0 - 3.0: 1
Mays 2000	1.5 - 3.5: 1	2.0 - 7.0: 1

*Refer to Bibliography (Appendix Item 1) for reference details.

Average Daily Demand (ADD):

The average daily demand is the average of the daily volumes for a continuous 12 month design period expressed as a volume per unit time (typically gallons per day). Often municipal records will only contain monthly or yearly diversion values. In these instances average daily demand for the system is equal to annual diversion volume or the sum of the monthly diversion volumes for one year divided by the number of days in the year.

Maximum Month Average Daily Demand (MMAD):
The maximum monthly average daily demand is the average daily demand from the peak demand month, which is typically July or August when out of home residential water use is at its peak. This value can only be calculated when municipal records contain monthly diversion data. It is obtained by dividing the monthly diversion volume by the number of days in the month, for each month, and selecting the largest monthly value.

Maximum Day Demand (MDD):
The design maximum day flow is the largest volume of flow to be received during a continuous 24 hour period in a calendar year, expressed as a volume per unit time. In order to determine this value, diversion records must have a daily recording interval. Often daily records are not available. In these instances MDD values can be estimated by multiplying ADD or MMAD values by an appropriate peaking factor. If storage is used by the water provider to meet peak demands, then the MDD value represents the maximum diversion rate that should be authorized by the RAFN water right permit.

Peak Hourly Demand (PHD):
The design peak hourly flow is the largest volume of flow to be received during a one hour period expressed as a volume per unit time. In order to determine this value, diversion records must have an hourly recording interval. Municipal data with an hourly recording interval usually does not exist for the entire water system and may only exist for a representative sample of the existing service area for the specific requirement of determining peaking factors. In instances where hourly data does not exist at all, an alternative means of estimating the peaking factor must be employed. If storage is not used by the water provider, then the PHD value represents the maximum diversion rate that should be authorized by the RAFN water right permit.

Peak Instantaneous Demand (PID):
The peak instantaneous demand is a municipal water supply system's anticipated maximum instantaneous water flow. PID is typically met through a combination of direct diversion from surface water and/or wells and the release of storage water. PID should not be confused with the maximum diversion capacity of some or all points of diversion associated with a municipal water supply system (flow into the system), which is an altogether different value that has historically been used by the Department during field examinations as a quantification of beneficial use. In municipal systems PID usually exceeds diversion capacity, with storage releases making up the difference. The PID design value can be appropriate in the sizing of water mains, storage capacity, and other appurtenances associated with a municipal water supply system, but it is not typically recognized in the field of water supply planning and forecasting as an appropriate design standard for projecting future system demand. As such, the use of PID in establishing a diversion rate in association with a RAFN application is generally considered unsound and unlikely to be approved by the Department. This position is consistent with the Idaho Rules for Public Drinking Water Systems, which require that public drinking water system be designed to provide either PHD or the MDD plus equalization storage (IDAPA 58.01.08 501.03).

Ideally, an engineering report or comprehensive plan should be submitted to the Department, which includes the records, studies, and considerations used in arriving at design flows, including all relevant peaking factors. In the absence of historical data or studies, the peaking factor(s) used to determine the diversion rate of the RAFN permit could be estimated from an analogous system. To be considered analogous, water systems should have similar characteristics including demographics, housing sizes, lot sizes, climate, water rate structure, conservation practices, use restrictions, and soils and landscaping. If neither historical data nor an analogous system can be found to estimate peaking factors, then the default peaking factors summarized in Table 5 may be used by the applicant.

Table 5 - Department Standard Default Peaking Factors (PF)

Ratio	PF
MDD:ADD	2.0
MDD:MMAD	1.3
PHD:ADD	3.0

As an example on how to use the peaking factors in Table 5, if the applicant has a known ADD value, the MDD value can be determined by multiplying the ADD value by two. For peaking factors greater than described in Table 5, the applicant will need to provide a technical engineering discussion supporting the numbers. It is insufficient for an applicant to simply reference a published value or claim a value as a standard of engineering practice in defense of values greater than those presented in Table 5.

Storage and the Affects of Storage on Peaking Factors

Municipal water systems can apply a number of strategies to meet the system's peak demand. Some municipalities rely exclusively on the source (surface water diversions and/or wells and booster pumps) to meet peak demand, while other municipalities may rely on a combination of source and storage facilities to meet peak demand. Storage is a component of a municipal system consisting of tanks and reservoirs that physically store water to provide water pressure, equalize pumping rates, equalize supply and demand during periods of high consumption, and provide water for fire fighting and other emergencies during periods of power outages[8]. In some places, authorities overseeing water system design mandate that storage be included in a water supply system and that peak demands be met partially by storage. As an example, the Washington State Department of Health requires that demands in excess of the MDD (i.e. PHD and PID) be met by storage (WSDOH 2009). In Idaho, the Idaho Department of Environmental Quality (DEQ) requires storage if source capacity is less than PHD, in these instances storage is required such that the difference between source demand and PHD is made up by equalization storage[9]. Some references consider it poor engineering practice for a public drinking water system to provide no storage capacity whatsoever (Lindeburg 1999).

It is important for the Department to identify to what extent storage will be utilized by a municipality to meet demand. The diversion rate associated with a RAFN application should reflect whether source alone will meet PHD or whether a combination of source and storage will meet PHD.

Per Capita Demand Conclusion

In conclusion, the following steps can be used to forecast the residential water demand utilizing the per capita demand forecasting approach:

1. Establish the ADD per capita water demand unit (person or residence) and quantity, preferably from historical diversion records.
2. Select the design demand value, typically PHD when source alone will meet the demand or MDD when a combination of source and storage will meet demand.

[8] The storage being discussed should not to be confused with a seasonal storage component of a water right, which is water stored for use at some time in the future and is described on the water right as storage.

[9] Design File Note: Reservoir Sizing – Public Water Systems (April 30, 1998) states, *"The source capacity of a water supply must at least equal [MDD]…If the source capacity is equal to or greater [than] [PHD], then no storage is needed other than pressure tanks to prevent frequent cycling. If the source capacity lies between [MDD] and [PHD], then storage is required as defined in this Guidance."*

3. Multiply the ADD by the appropriate peaking factor to establish the per capita water demand design value.
4. Establish the projected future total population.
5. If needed divide the population projection by the "persons per home" value to arrive at the total number of residences to be served.
6. Multiply the total number of people or residences by the per capita water demand design value to determine the total system-wide residential demand.
7. Apply necessary unit conversions to obtain the permitted rate units of cubic feet per second (CFS)

Non-Residential Forecasting

For many municipal systems residential water demand makes up the vast majority of total demand. As such, many water supply systems, especially smaller systems, are designed mostly to serve single family residences. If non-residential water is identified as being a significant portion of total demand it can be taken into consideration when establishing RAFN. Described below are two methods for estimating this demand.

The first method utilizes the concept of an equivalent residential unit (ERU). An ERU is a unit of measure used to represent the amount of water consumed by a typical full-time single-family residence (WSDOH 2009). ERUs are synonymous with equivalent domestic units (EDU) as defined by the Idaho Department of Environmental Quality (IDAPA 58.01.08 033.42). ERUs can be used to equate non-residential uses and/or multi-family residential uses to the amount used by a single-family residence. ERUs associated with all non-residential uses are determined and added to the ERU count derived from actual single-family residences to arrive at a total demand.

The disaggregate requirements forecasting technique is another common approach to estimating non-residential water demand. In disaggregate forecasting the water user identifies the demand of water associated with any non-residential uses such as irrigation, commercial facilities, industrial facilities, public facilities, recreation uses, etc. and sums them to arrive at a total non-residential water use demand. Historical records are often the best source, and the source preferred by the Department, for estimating the demand associated with non-residential uses. A qualified analogous system can be another recognized source of information for estimating disaggregate water demands.

A tabular summary of average daily demands for a variety of disaggregate uses (Table 6) is presented in Appendix Item 4. Table 6 has been adapted from a number of sources and does not represent the final authority on the water demand values presented. It should be noted that the values in Table 6 are average daily values. It may be necessary to apply a peaking factor or multiplier to the values to obtain a MDD or PHD equivalent value.

Other sources of disaggregated water demand values that may provide additional guidance include individual engineering references, individual water demand studies, the Uniform Plumbing Code, the American Water Works Association, and the Idaho Department of Environmental Quality. When properly referenced and applied, all of the sources previously described can be used if historical or analogous data are missing.

Regarding RAFN demand for the irrigation of lawns within community open spaces, parks, golf courses, cemeteries, etc., and the evaporative loss of water associated with decorative and aesthetic ponds, demand can be established by the appropriate evapotranspiration (ET) values as published by ET_Idaho (Allen and Robison 2009). In recognition of the contribution of precipitation to irrigation requirement it is appropriate to use the precipitation deficit (P_{def}) values in place of actual ET (ET_{act}). Appropriate values would include utilizing data from the nearest ET_Idaho station and as available, using the categories of *"Precipitation Deficit (Grass – Turf (lawns) – Irrigated)"* for P_{def} associated with lawns and grass and *"Precipitation Deficit (Open water-*

shallow systems (ponds, streams))" for P_{def} associated with municipal ponds and water features. When estimating diversion rates associated with P_{def} it is appropriate to use the 20% exceedance (80th percentile) 3-day moving average rate from the month with the largest ET rates. In light of the conservative methods allowed in determining P_{def}, quantification of the demand associated with ET loss from lawns and open water bodies should not include the use of peaking factors or multipliers.

3. Permitting RAFN Water Rights

For an application for RAFN to be accepted by the Department it must include a current application correctly and completely filled out, a municipal water right application checklist[10] completely filled out, the appropriate fees, and a detailed narrative or report summarizing the methods used to determine RAFN. The report must specifically address the four fundamental components of RAFN as identified in section 2 of this document. Lastly, the application package must contain a summary of the applicant's existing municipal water rights portfolio and some form of gap analysis.[11]

Existing Municipal Water Rights Portfolio

In order for an applicant to formulate a requested RAFN proposal, understanding of the future demand is only half the equation. The applicant must also understand the existing supply of water available to it. Therefore, an evaluation or accounting of all existing municipal water right permits, licenses, decrees, and claims is needed to establish the water supply authorized on paper. This includes the review of water right permits and water rights designated municipal, as well as existing permits and rights with other designations that are beneficially used under the contemporary "municipal purposes" umbrella as defined in I.C. §42-202B (6).

Final Determination of RAFN Permit Diversion Rate (Gap Analysis)

An application for RAFN should contain completed analyses of the future water demand (residential, non-residential, and UAW) and the existing water right portfolio. The future water demand calculations should not include current or future fire flow requirements, as Idaho Code does not require a water right to engage in fire fighting activities (§42-201). Neither should the requirement of redundant groundwater points of diversion be used as justification for an additional increment of future beneficial use.[12] The final RAFN water right permit diversion rate is typically calculated by taking the combined projected demand of residential and non-residential water use, multiplied by a factor to account for UAW, less the total diversion rate of water already provided in the applicant's current water rights portfolio.[13]

$$(Municipal\ Demand\ in\ Ending\ Year)\ x\ (UAW\ Factor) - (Existing\ WR\ Diversion\ Rate) = (RAFN\ Permit\ Diversion\ Rate)$$

The municipal provider's water rights portfolio must include the water rights already held by the provider for municipal purposes and may also include any of the following:

- Rights held by the municipal provider for other purposes such as irrigation

[10] A copy of the municipal water right application checklist is included in the appendix as Item 5.

[11] Gap analysis is used in this instance to refer to the analysis of the difference (gap) between what will be needed and what is currently provided for by the existing water right portfolio.

[12] Each point of diversion, including alternate points of diversion to provide a redundant supply, requires authorization under a valid water right.

[13] Alternatively, some municipal water systems with mixed sources of water supply divert water under the authority of water rights with late water right priority dates. This leaves the municipal provider susceptible to curtailment, a regulation based on water right priority date. In such a case, when the curtailment of water rights associated with one source (ex. surface water) do not limit the exercise of water rights diverting from a second source (ex. ground water), the Department may find the municipal provider will use its RAFN water right as an alternative supply. This would result in combined flow limits between the existing municipal water rights and a RAFN permit.

- Rights held by other entities, such as homeowner's associations for municipal use within the proposed RAFN service area
- Rights held by other entities for non-municipal uses within the proposed RAFN service area

The RAFN applicant should explain the assumptions regarding the inclusion or exclusion of these rights in the gap analysis. If the rights will be used for future municipal demand within the proposed RAFN service area, regardless of ownership, the rights must be subtracted from the reasonably anticipated future needs projection or counted among the water rights available to meet the reasonably anticipated future needs.

Item 6 of the Appendix is a detailed example of the determination of RAFN for a hypothetical RAFN application including analysis of RAFN service area, planning horizon, population projection, water demand, and existing water right portfolio.

Final Determination of RAFN Permit Volume

RAFN water right permits should not be limited by volume except in those instances where a volume limitation is necessary to protect the water supply source.

RAFN Permit Approval Conditioning

When issuing a RAFN water right permit the Department will include standard approval conditional language that identifies the permit for reasonably anticipated future needs (X64). All permits that do not have a condition designating RAFN status will be deemed as non-RAFN permits by the Department. All RAFN permits shall include approval conditions requiring the following:

- Filing of the proof of beneficial use no sooner than 4.5 years after the permit is issued (standard condition 236)
- Full system capacity constructed by the date the permit holder submits proof of application of water to beneficial use (standard condition 909),
- Inclusion of an updated RAFN analysis with the submittal of the proof of beneficial use (standard condition 237),
- Capacity installed for redundancy or for fire protection should be excluded when quantifying the amount of water developed for municipal purposes (standard condition 926),
- Submittal of a field examination and report conducted and prepared by a Certified Water Rights Examiner (CWRE) with the proof of beneficial use (standard condition 910).

Amending a permit from non-RAFN to RAFN

Consistent with Application Processing Memo #18 (Administrative Memo adopted October 19, 2009) and Department policy, a permit issued to a municipal provider that does not provide for RAFN cannot be later amended to gain the benefits of a RAFN permit.

4. Licensing RAFN Water Rights

With the submittal of proof of beneficial use in association with a RAFN water right permit, the permit holder is required to submit a field examination report completed by a CWRE. As required by I.C.§42-217, the statement of completion for proof of beneficial use shall include a description of the extent of use and a revised estimate of RAFN, containing a revised description of the RAFN service area, a revised planning horizon, and appropriate supporting documentation. Appropriate supporting documentation means a revised analysis of the same RAFN support material submitted at the time of application reflecting the system as it exists at the end of the permit development period. Also included should be a revised gap analysis including an updated portfolio of existing water rights. If proof is not submitted by the proof due date and an extension to the permit development period has not been granted, as provided under Idaho Code §42-204, the permit shall lapse and be of no further force nor effect as required under Idaho Code 42-218a.

Review of the Description of the Extent of Use

At the time of licensing the Department must first review the "description of the extent of use", including accompanying evidentiary material, and make a determination of the extent of beneficial use that has occurred and whether the permit should be licensed in part or in full. If the permitted amount has been beneficially used already, because the provider experienced unexpected rapid growth, no further review is needed and the full permitted amount can be licensed.

Idaho Code §42-219(B) states *"A license may be issued to a municipal provider for an amount up to the full capacity of the system* ***constructed or used*** *in accordance with the original permit…" (emphasis added)*. IDWR interprets the restrictive language in §42-219 to limit the authority of the agency to only license RAFN permits up to the *full capacity of the system constructed or used*. Full capacity constructed means significant infrastructure has been constructed to accommodate delivery of water throughout the RAFN service area. Full capacity constructed entails more than engineering plans or in-place financing.

Components of significant infrastructure will always include at least the following:

- For ground water diversions a constructed well or series of wells and their associated capacities, for surface water diversions constructed diversion facilities and their associated capacities, or for mixed sources some combination thereof.
- Storage tanks when included as an integral part of the design.
- Trunk lines (major supply conduits) sized and constructed to anticipate service beyond the physically constructed limits of the delivery system at the time proof of beneficial use is submitted.

Significant infrastructure does not have to include the following:

- Service laterals (i.e. stub outs to lots that have not been built out)
- Main line and/or lateral line extensions beyond the physically constructed limits of the delivery system at the time proof of beneficial use is submitted.
- Water quality treatment facilities for diversions in excess of the demand at the time proof of beneficial use is submitted.
- Pumping capacity for diversion in excess of the demand at the time proof of beneficial use is submitted.

Significant infrastructure will never include the following:

- Diversion works and distribution system capacity available for fire protection and/or redundant supply. (The additional capacity provided does not require a water right, so licensing the additional capacity would unintentionally increase the estimated demand to provide for unsupported future growth.[14])

Therefore, when reviewing the "description of the extent of use" and accompanying documentation, Department staff must review the improvements that have been made, which will typically lie somewhere between full system build out and no system build out, to determine to what extent the RAFN permit should be licensed.

Review of Revised RAFN Characteristics Including Diversion Rate

With the proof of beneficial use submittal the permit holder should submit a revised description of the RAFN specifically addressing each of the four fundamental components of a RAFN package: (1) service area; (2) planning horizon; (3) population projections within the planning horizon; and (4) water demand. Department

[14] Small municipal systems may not be designed for peak demand and fire flow. In such a case, the available capacity might justify the full capacity of the system.

staff shall review the revised RAFN in a manner similar to the application review process as detailed in sections 2 and 3.

At the time of licensing, department staff can update the RAFN service area, the planning horizon, and diversion rate as appropriate based on the review of new material and the field examination report. Diversion rate and planning horizon can only be amended downward to reflect a revised lowered future water demand. If new RAFN analysis at the time of licensing indicates an increase in water demand the additional diversion rate and/or longer planning horizon associated with the increased demand must be pursued under a new application for permit or transfer.

Final Determination of RAFN License Volume

RAFN water right licenses should not be limited by volume except in those instances where a volume limitation is necessary to protect the water supply source.

RAFN License Approval Conditioning

When issuing a RAFN water right license the Department will include standard approval conditional language that identifies the license for reasonably anticipated future needs (X64). All licenses that do not have a condition designating RAFN status will be deemed as non-RAFN licenses by the Department. All RAFN licenses shall also include approval conditions requiring that all future needs must be constructed and used by the end of the planning horizon (109) and that the place of use (POU) associated with a RAFN water right shall not be changed to a location outside of the service area (110).

Nonuse of RAFN Water Rights

If sufficient proof of beneficial use is submitted before the end of the permit development period and the municipal water right is licensed for an amount of water for RAFN, the requirement that the system needed to provide water for the RAFN be fully constructed and used by the end of the municipality's planning horizon will continue as a condition of the license. If the municipal provider fails to construct and use the complete system by the end of the permit planning horizon, or the anticipated future needs do not materialize by the end of the planning horizon, the quantity of water under the license may be revised to reflect the needs that actually exist at the end of the planning horizon.

5. Transfer of RAFN Water Rights

The portion of any water right described with a beneficial use of RAFN cannot be transferred or modified to have a beneficial use other than RAFN. However, water rights with beneficial uses other than RAFN can be transferred or modified to a RAFN use.

Idaho Code §42-222 governs the transfer of water to and from RAFN status. When a transfer proposes changing the nature of use of a water right to municipal purposes for RAFN, the municipal provider shall provide to the Department sufficient information and documentation to establish the transfer applicant qualifies as a municipal provider at the time of application, is providing water to a municipality or municipalities, and that the RAFN, the service area, and the planning horizon are consistent with Idaho Code. Supporting documentation must be included with the transfer application including the same RAFN support material that would be submitted with an RAFN application as outlined and described in Section 2 of this document. As discussed in Section 3, gap analysis including a current portfolio of existing water rights must also be included with the transfer application. A transfer application proposing to use a RAFN water right as an alternate source in times of curtailment should include justification for the proposal with the application.

Water rights or portions of water rights that identify RAFN as the beneficial use shall not be changed to a place of use outside the RAFN service area or to a new nature of use (I.C. §42-222). The effect of this statutory

language eliminates the modification of a RAFN water right by transfer for anything other than the addition of a point or points of diversion.

Final Determination of RAFN Transfer Volume

RAFN water rights created by transfer from an existing non-RAFN municipal right should not be limited by volume except where a volume limitation existed in connection with the water right's use prior to the transfer. A transfer to change the nature of use of an established water right from non-municipal to municipal purposes for RAFN shall limit the volume of water to the historic consumptive use established prior to the change.

RAFN Transfer Approval Conditioning

When issuing a RAFN water right transfer the Department will include standard approval conditional language that identifies the water right for reasonably anticipated future needs (X64). All transfers that do not have a condition designating RAFN status will be deemed as non-RAFN water rights by the Department. All RAFN transfers shall also include an approval condition requiring that the system must be fully constructed and used by the end of the planning horizon (109). Finally, all RAFN transfers shall include an approval condition limiting the RAFN to use within the service area and restricting a change in the purpose of use (110).

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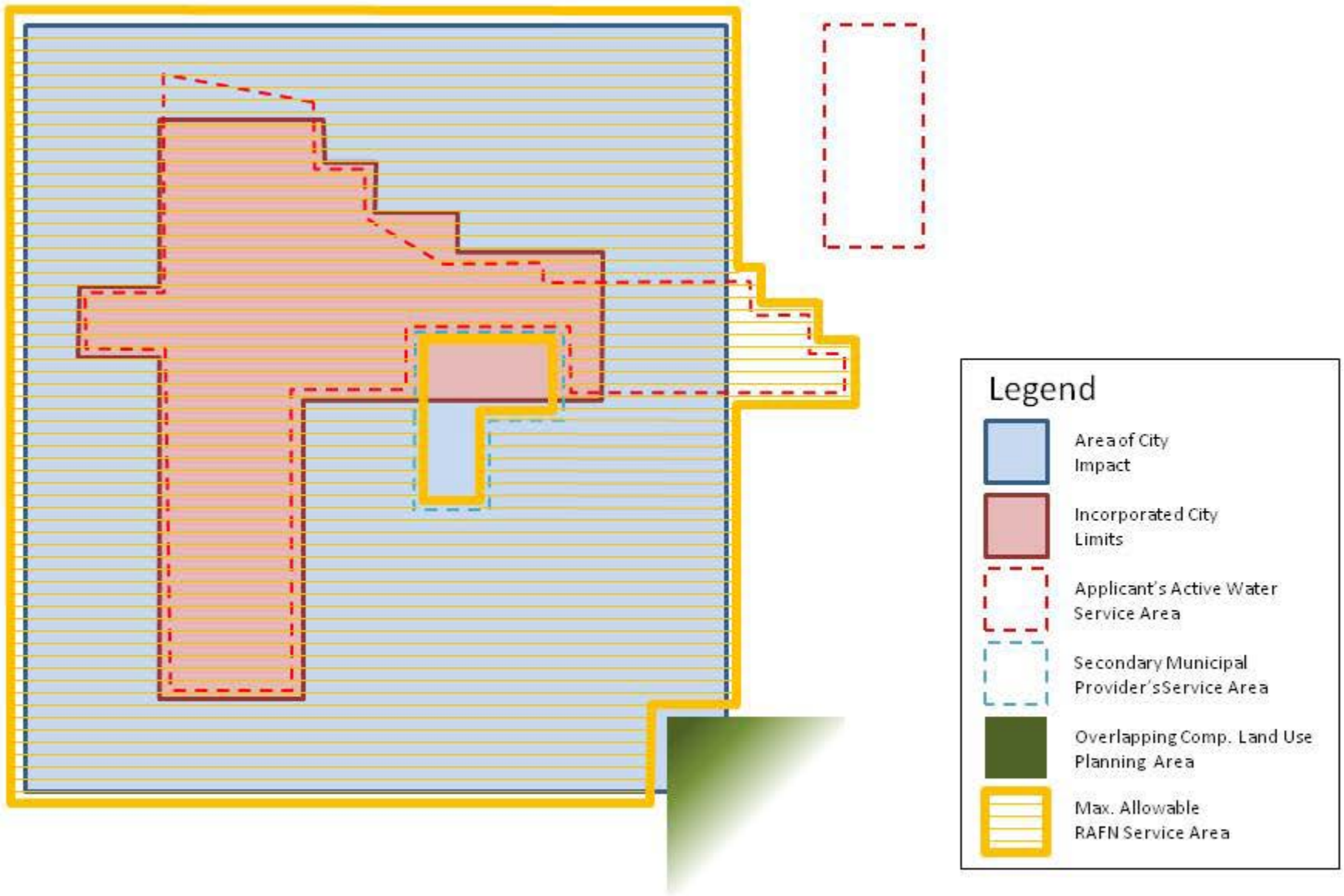


Appendix Item 2 - Illustrative Example of Delineation of Maximum Allowable RAFN Service Area

Appendix Item 3
Comparison of the Idaho Department of Water Resources and the Idaho Department of Environmental Quality Methodologies for Quantifying Residential In-Home Use

The Department's Administrative Memorandum Application Processing #22 (AP22) dated June 4, 1980, addresses the 'Definition of Domestic' and provides guidance, in the form of a chart (Figure 1), for quantifying the rate of flow necessary for the in-house culinary use for multi-household systems. The memo states, "*The flow identified on this graph should be used as a guideline in determining and reviewing domestic use rates of flow on applications for permit with more than one hookup. Greater flow can be accepted if justified.*" Figure 1 is titled "Maximum Instantaneous Water Requirements for Domestic Use" and depicts a power function relationship between the number of houses served (N) and the water demand (Q) in cubic feet per second (CFS). The following equation represents the relationship depicted on Figure 1 of AP22 and allows for the calculation of Q strictly as a function of N.

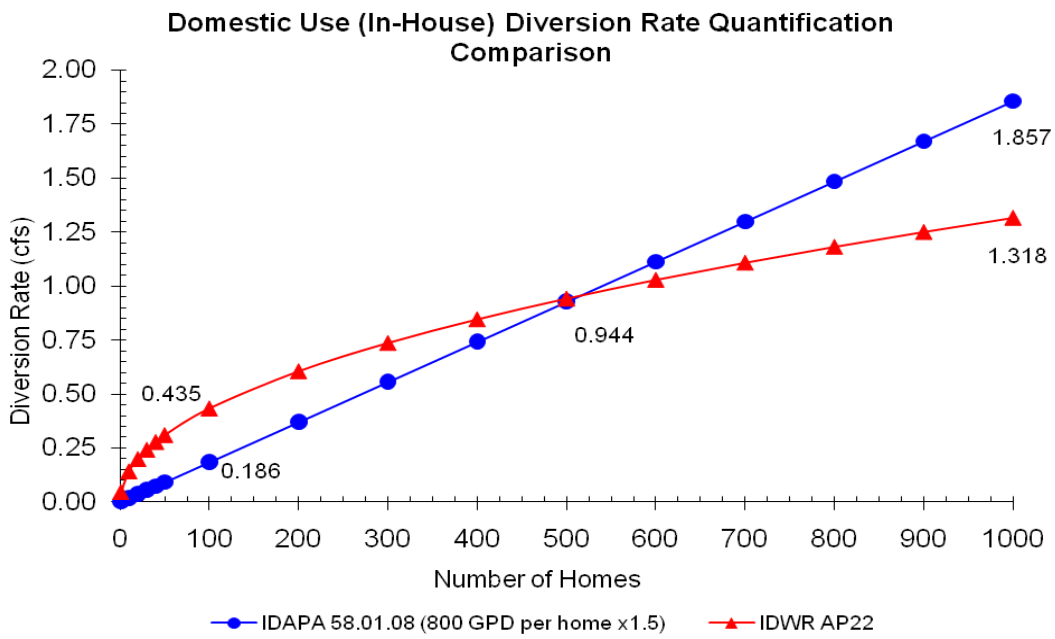
Eqn. 1: $Q\ (CFS) = 0.0473*(N)^{0.4817}$

AP22 does not make clear whether "maximum instantaneous water requirement" is equivalent to peak hour demand (PHD), peak instantaneous demand (PID), or some other value. Nonetheless, for communities ranging from 2 to 1,000 homes this has historically been the equation that Department staff used to quantify the permitted diversion flow rate specific to <u>in-home domestic use</u> when no other rate was justified. It does not account for demand associated with out-of-home uses, namely irrigation.

The Idaho Rules for Public Drinking Water Systems administered by DEQ mandate the capacity of public drinking water systems to be a minimum of 800 gallons per day (GPD) per residence (IDAPA 58.01.08 552-01(a)). This is equivalent to 0.6 gallons per minute (GPM) and 0.001 CFS. The rules define this amount as the "design maximum day demand" (MDD) exclusive of irrigation and fire flow requirements (IDAPA 58.01.08 552-01(a.i)). The rules go on to say that the MDD may be *"less than 800 GPD if the water system owner provides information that demonstrates to the [Department of Environmental Quality's] satisfaction the maximum day demand for the system, exclusive of irrigation and fire flows, is less than 800 GPD per residence"*. The value of 800 GPD per residence was likely initially derived from the Federal Housing Administration's minimum design standards (FHA 1965). The rules do not address peaking factors. However, if we use the standard values from Table 5 we can determine a PHD of 1,200 GPD per residence (PHD = 1.5*MDD). The following figure compares the water demand functions for 1 to 1,000 homes as derived from AP22 and the Idaho Rules for Public Drinking Water Systems.

At first glance it appears there is a conflict between AP22 and the Idaho Rules for Public Drinking Water Systems. This conflict could potentially lead to a deficient municipal water supply system with a combined water right diversion rate, less than the diversion rate mandated by the Idaho Rules for Public Drinking Water Systems. However, such a conflict does not exist for two reasons. First, the Idaho Rules for Public Drinking Water Systems address the concept of "storage" and the ability of equalization storage, in sufficient quantity, to compensate for differences between a water system's maximum pumping capacity and peak hour demand. Furthermore, the rules also address the ability of equalization storage plus fire suppression storage, both in sufficient quantity, to compensate for the difference between a water system's maximum pumping capacity and peak demand plus fire flow, in those systems that provide fire flow (IDAPA 58.01.08 003-71). Secondly, the 800 GPD in-home use value is only valid when MDD flows in the system are equal to or greater than 800 GPD. If actual MDD flows are less than 800 GPD they can be recognized as a valid demand for the system (IDAPA 58.01.08 552-01(a.iii)).

One obvious deficiency in both methods is their lack in quantifying an irrigation demand component, leaving the task of determining total residential demand only partially completed. Another deficiency in the Idaho Rules for Public Drinking Water System is their treatment of demand as a linear function, as it is commonly accepted that for larger communities, demand is not linear with respect to number of homes (Ameen 1965).



It is desirable for the Department to have a single recommended method for quantifying residential demand that addresses both in-home and out of home uses including irrigation. Such a method was developed by the U.S. Department of Housing and Urban Development (DHUD) in their publication titled *A Study of Residential Water Use* (Linaweaver 1967). This method has the added advantage of being currently adopted and under implementation by the Idaho Department of Environmental Quality (DEQ 2005). The DHUD method is presented below in detail and it is recommended that this method be used by applicants and the Department in determining residential demand for those communities for which actual historical demand data does not exist.

The DHUD method calculates the maximum daily demand (Q_{MDD}) and peak hourly demand (Q_{PHD}) as functions of average daily in-home use (Q_{ADD}), consumptive use associated with residential irrigation, and the variability associated with the magnitude of the input factors influencing the demand and the diversity effect associated with the number of dwelling units or residences. The following equations (equations 2 through 8) have been derived from the DHUD publication with some modifications specific to Idaho and the Department. The following equations express the steps necessary to determine values for Q_{MDD} and/or Q_{PHD}.

Eqn. 2: $Q_{MDD} = Q_{ADD} + C*(L_S)*(P_{def}) + 2*(\sigma_{MDD})$, where

Q_{MDD}: maximum daily demand (GPD)
Q_{ADD}: average daily in-home demand per residence (GPD)
C: unit conversion constant
L_S: average irrigable area in acres per unit

P_{def}: precipitation deficit for irrigated turf grass, i.e. lawn (inches)
σ_{MDD}: variability in magnitude of factors and the number of dwelling units

Equation 3 allows for the calculation of Q_{ADD} as a function of average home value from 1965. Equation 4 is used to adjust contemporary home values by inflation to determine historical home values from 1965. When desired for simplicity or lack of data, a Q_{ADD} value of 250 GPD can be substituted for the results of Equation 3 if desired by the applicant.

Eqn. 3: $Q_{ADD} = 3.46*V_{1965} + 157$, where

V_{1965}: average market value in $1000 per residential lot in 1965.

Eqn. 4: $V_{1965} = V_{2010}/(1.044)^{46}$, where
V_{2010}: average market value in $1000 per residential lot in 2010.

Equation 5 is used to calculate the average irrigable area term (L_S) and assumes that irrigation practices are uniform across the entire community. If a source other than the municipal water system is used for irrigation (i.e. surface water irrigation water rights) the L_s term should equal zero.

Eqn. 5: $L_S = 0.803*(W)^{-1.26}$, where

W = gross housing density in dwelling units per acre

Equation 6 is used to calculate the variability term, σ_{MDD}.

Eqn. 6: $\sigma_{MDD} = [(1{,}090 + 166{,}000*L_S^2) + (5{,}480{,}000/n)]^{1/2}$, where
n: number of residences or residential lots

The method presented herein also supports the calculation of a Q_{PHD} as a function of the Q_{MDD} value previously determined. The following equation allows for the calculation of Q_{PHD}.

Eqn. 7: $Q_{PHD} = 2.02*(Q_{MDD}) + 334 + 2*\sigma_{PHD}$, where
σ_{PHD}: variability in magnitude of factors and the number of dwelling units

Equation 8 is used to calculate the variability term, σ_{PHD}.

Eqn. 8: $\sigma_{PHD} = [(2.02*(1{,}090 + 166{,}000*L_S^2)) + (12{,}300{,}000/n)]^{1/2}$, where
n: number of residences or residential lots

The method presented and described above is automated in a spreadsheet tool prepared by the Department titled “ResidentialDemandCalculator.xlsx” and is available from the Department upon request.

Appendix Item 4

Table 6 - Summary of Average Daily Non-Residential Water Uses

Description of Water Use	Water Consumption	Units
Airport (per passenger)	3-5	GPD
Apartment, multiple family (per residence)	50	GPD
Bank (per SF)	0.05	GPD
Barbershop (per chair)	55	GPD
Bathhouse (per bather)	10	GPD
Beauty Salon (per station)	95	GPD
Boardinghouse (per boarder)	50	GPD
Camp:		
Construction, semi-permanent (per worker)	50	GPD
Day, no meals served (per camper)	15	GPD
Luxury (per camper)	100-150	GPD
Resort, day and night (per camper)	50	GPD
Tourist, central bath and toilet (per person)	35	GPD
Car Wash (per SF)	4.9	GPD
Cottage, seasonal occupancy (per resident)	50	GPD
Club		
Country (per resident member)	100	GPD
Country (per nonresident member present)	25	GPD
Highway Rest Area (per person)	5	
Hotel		
Private baths (2 persons per room)	50-68	GPD
No private baths (per person)	50	GPD
Institution other than hospital (per person)	75-125	GPD
Hospital (per bed)	200-400	GPD
Laundry/Laundromat		
Self-serviced (gallons per customer)	50	GPD
Self-serviced (gallons per machine)	400-500	GPD
Livestock Drinking (per animal)		
Beef, yearlings	20	GPD
Brood sows, nursing	6	GPD
Cattle or steers	12	GPD
Dairy	20	GPD
Dry cows and Heifers	15	GPD
Goat or sheep	2	GPD
Hogs/swine	4	GPD
Horse or mules	12	GPD
Livestock Facilities		
Dairy Sanitation (milk room)	500	GPD
Floor flushing (per 100 SF)	10	GPD
Sanitary Hog Wallow	100	GPD
Motel		
Bath, toilet, and kitchen (per bed space)	65-100	GPD
Bed and toilet (per bed space)	50	GPD

Table 6 Continued - Summary of Average Daily Non-Residential Water Uses

Description of Water Use	Water Consumption	Units
Parks		
Overnight, flush toilets (per camper)	25	GPD
Trailer, individual bath units, no sewer connection (per trailer)	25	GPD
Trailer, individual baths, connected to sewer (per person)	50	GPD
Picnic Ground		
Bathhouses, showers, and toilets (per picnicker)	20	GPD
Toilet facilities only (gallons per picnicker)	10	GPD
Poultry (per 100 birds)		
Chicken	5-10	GPD
Ducks	22	GPD
Turkeys	10-25	GPD
Restaurant		
Toilet facilities (per patron)	7-10	GPD
No toilet facilities (per patron)	2.5-3	GPD
Bar and cocktail lounge (add. quantity per patron)	2	GPD
Toilet facilities (per seat/chair)	24-50	GPD
School		
Boarding (per pupil)	75-100	GPD
Community college (per student and faculty)	15	GPD
Day, cafeteria, gym, and showers (per pupil)	25	GPD
Day, cafeteria, no gym or showers (per pupil)	20	GPD
Day, no cafeteria, gym, or showers (per pupil)	15	GPD
Service Station		
Service Station (per vehicle)	10	GPD
Service Station (per SF)	0.18	GPD
Store/Retail		
Department, no food service (per SF)	0.04	GPD
General (per bathroom stall)	400	GPD
General (per SF)	0.05	GPD
Shopping Center/Malls (per SF)	0.25	GPD
Swimming pool (per swimmer) maintenance (per 100 SF)	10	GPD
Theater		
Drive-in (per car space)	5	GPD
Movie (per auditorium seat)	5	GPD
Worker		
Construction (per person per shift)	50	GPD
Day (school or offices per person per shift)	15	GPD
Factory (gallons per person per shift)	15-35	GPD

Table 6 has been adapted from the following sources: Dewberry 2002, Prasifka 1988, and WSDOH 2009.

Appendix Item 5
Municipal Water Right Application Checklist

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

MUNICIPAL WATER RIGHT APPLICATION CHECKLIST
FOR AN APPLICATION TO APPROPRIATE WATER FOR MUNICIPAL PURPOSES

An application to appropriate water for municipal purposes must be prepared in accordance with the requirements listed below to be acceptable for processing by the Department. There are two types of permits for municipal water use. The first type of municipal permit provides water for reasonably anticipated future needs (**RAFN**) over a defined planning horizon.[1] The second type of municipal permit, called non-RAFN, provides water solely for use to meet needs that will arise in the near-term (five years).[2] A **non-RAFN** permit may have an annual volume limitation associated with it. Each type of municipal water use has a distinct set of review requirements.

Applicant Name: _____

1. Type of Municipal Provider. Applicant must qualify as a Municipal Provider to obtain a municipal water right. See Idaho Code § 42-202B (5). Check one:

   ☐ Type 1 – Municipality
   ☐ Type 2 – Franchise or political subdivision supplying water to a municipality
   ☐ Type 3 – Corporation or association regulated as a "public water supply" system by IDEQ

   ☐ Attach documentation of qualification as a Municipal Provider. See Idaho Code § 42-202(2).

2. List existing Water Rights (permits, licenses, decrees, and beneficial use claims) available to the applicant for municipal needs. These rights may or may not have a purpose of use expressly defined as "municipal". Include a separate attachment as needed.

Right Number	Nature of Use	Diversion Rate (cfs)	Annual Vol. (acre-feet)	Service Area

3. List the total diversion rate from Item 2. Be sure to account for any combined diversion rate limits in the approval conditions of each right listed. _____ CFS (total from 2)

4. List the total volume from Item 2. Be sure to account for any combined volume limits in the approval conditions of each right listed _____ AF (total from 2)

[1] For a thorough discussion of RAFN water rights, see IDWR's *Recommendations for the Processing of Reasonably Anticipated Future Needs (RAFN) Municipal Water Rights at the Time of Application, Licensing, and Transfer.*
[2] For a thorough discussion of non-RAFN water rights, see IDWR's Application Processing Memorandum No. 18.

RAFN Min. Requirements Checklist, Rev. 11/2014 1

5. Planning Horizon. See Idaho Code § 42-202B (7). Check one:

☐ RAFN. Specify planning horizon: ___ years. Ending year: 20___. Go to Item 6.
☐ Non-RAFN (≤5 years). Go to Item 7.

6. If application is for RAFN:

☐ Attach justification for planning horizon. See Idaho Code § 42-202(2) and § 42-202B(7).
☐ Attach description of service area. See Idaho Code § 42-202(2) and § 42-202B(9).
☐ Attach population projection within the service area over the planning horizon. See Idaho Code § 42-202(2) and § 42-202B(8).
☐ Attach evaluation for demand within the service area over the planning horizon. See Idaho Code § 42-202(2) and § 42-202B(8).
☐ Attach any supporting documentation relevant to the RAFN application, such as comprehensive plans or other planning documents.

Does demand exceed the totals listed in Items 3 and 4?

Y	N	
☐	☐	Rate?
☐	☐	Volume?

If the answer is "No" to both rate and volume and a new point of diversion is needed, file a transfer application pursuant to Idaho Code § 42-222(1).

7. If application is for non-RAFN:

When submitting proof of beneficial use, non-RAFN permit holders will be required to show that water was diverted for an additional increment of beneficial use over existing water rights during the authorized development period, which may be up to five years from the date of approval. Do existing demand and short term needs exceed the combined authorizations from the existing water rights listed in Items 3 and 4?

Y	N	
☐	☐	Rate?
☐	☐	Volume?

If the answer is "No" to both rate and volume and a new point of diversion is needed, file a transfer application pursuant to Idaho Code § 42-222(1).

Appendix Item 6
Example Determination of RAFN for a Small Rural Municipality

Description of Municipality

Gem City is in the process of acquiring grant money to create a master water plan and expand their existing municipal water system. It has taken this opportunity to apply for a permit for RAFN water rights by conducting a thorough analysis of the future projected demands and their existing water right portfolio. Gem City is located in Benewah County. Gem City currently uses storage to meet demands in excess of their maximum day demand (MDD) and plans to continue this practice into the future. Gem City has recently updated their comprehensive plan (comp plan) including updates to their incorporated city limits and their area of city impact as depicted in Appendix Item 3. The planning horizon associated with the recently adopted comp plan is 20 years. Gem City does not have a current master water plan.

Gem City has rigorously defined their non-residential water use as follows: one hospital (20 beds), one barber shop (5 chairs), one beauty salon (5 stations), one car wash (1,000 square feet (SF)), one Laundromat (10 wash machines), one motel (30 bed spaces), three restaurants (combined seating 80), one elementary school with cafeteria and no gym or showers (100 students), one middle school with cafeteria, gym, and showers (60), and one high school with cafeteria, gym, and showers (60 students), one service station (1,000 SF), and 45,000 square feet of existing retail space. For the next 20 years Gem City has projected an additional development of 30,000 SF of retails space and two factories employing 30 people per shift per day apiece. Gem City has a single 2-acre park within the city limits and a 10-acre cemetery outside the city limits.

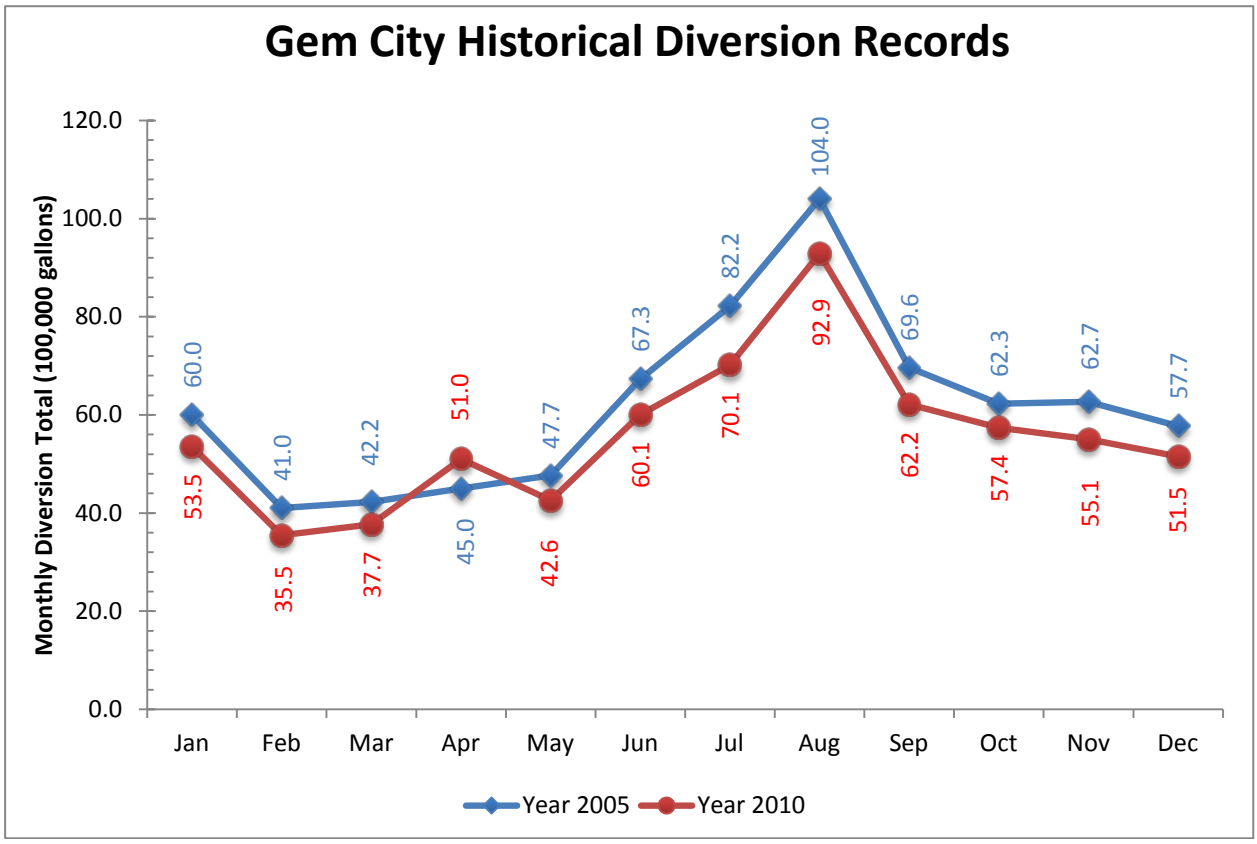
U.S. Census Bureau data for Gem City for the last four censuses conducted is summarized in the following table. The U.S. Census Bureau also reports average persons per household for Gem City at 3.14 in the year 2000 and 2.81 in the year 2010.

Gem City, ID

Year	Population*
1980	610
1990	804
2000	990
2010	1044

*US Census Data

Gem City's monthly municipal water system diversion volumes for years 2005 and 2010 are summarized in the following figure. Gem City does not have a separate irrigation utility and all residential irrigation is provided for by the municipal water system. Gem City does not have diversion data with a finer recording interval than monthly. They have no understanding of their MDD:ADD or PHD:ADD peaking factors, nor adequate data to support the analysis and derivation of these values.



The following table summarizes Gem City's existing water rights portfolio.

Gem City Water Right Portfolio

WR No.	Beneficial Use Desc.	Diversion Rate (cfs)	Annual Diversion Vol. (AF)
95-123	Municipal	0.20	N/A
95-1234	Municipal	0.20	N/A

Analysis – Service Area

Gem City's proposed RAFN service area can include all areas within the existing area of city impact (largest planning boundary that has been adopted by the City). It can include areas outside of the city's area of impact where water service is currently provided through interconnection. It cannot include proposed service areas outside the area of city impact where water service is not already provided. In addition, it cannot include the service area of other municipal water providers and it cannot include areas included in an overlapping comprehensive land use planning area as adopted by another municipality. For the sake of the example we will assume that appendix Item 2 illustrates the service area for the RAFN.

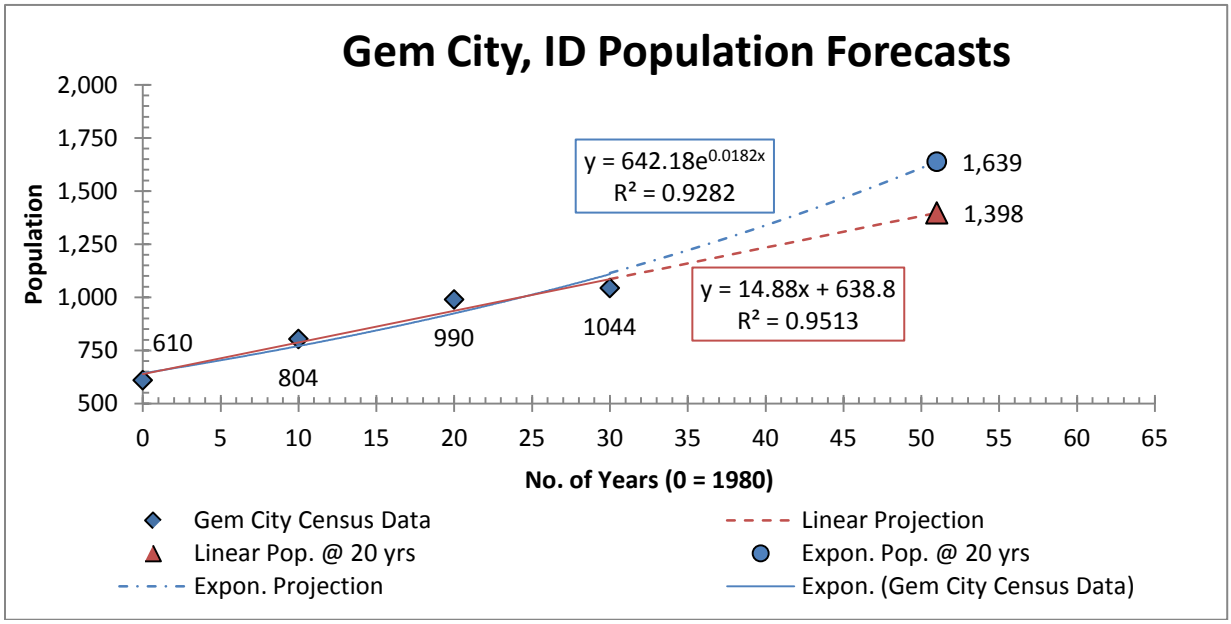
Analysis – Planning Horizon

Gem City has recently adopted a new comp plan with a 20 year planning horizon associated with the document. There are no other appurtenant planning documents such as a master water plan from which to reference an alternative planning horizon. Since a RAFN planning horizon cannot be inconsistent with comprehensive land use plans adopted by the City, the planning horizon is limited to 20 years. In addition, 20 years is consistent with the values presented in Tables 2 and 3 further confirming it as an appropriate value for

use with this RAFN proposal.

Analysis – Population Projections within the Planning Horizon

Gem City does not have any studies of population growth or demographics specific for their community. Therefore, U.S. Census Data represents the only available data regarding the population and demographics of Gem City. To avoid skewing population predictions to ephemeral trends within the census data, it is appropriate to look at a minimum of three decades worth of census data. The following figure is an x-y scatter plot of Gem City population data and years (blue diamonds). Exponential (blue line) and linear (red line) relationships have been molded to the census data and are depicted on the figure illustrating two different models between population and time.



Statistically speaking both models can be considered highly significant with coefficient of determination (R^2) values of 0.9513 for the linear model and 0.9282 for the exponential model. Presented independently either model could be considered reasonable. However, when the two models are presented together, allowing for comparison, the linear model establishes a better fit. As such, the linear relationship should be selected to forecast future populations. Since application for RAFN is being made in 2011 and the planning horizon has been established at 20 years, we are interested in forecasting the population for the year 2031 (or year 51 when 1980 = year 0). The following calculation establishes the future population at the end of the planning horizon.

$P_{2031} = 14.88*(51) + 638.8 = 1{,}398$ people

Analysis – Water Demand

Gem City has presented data for two different water service years, 2005 and 2010. Consistent with state wide and national trends, even though the service population of the town went up from 2005 to 2010, the demand went down, slightly. Since 2010 best captures existing demand characteristics, which are most likely to translate forward in time, it is appropriate to use data from 2010 to establish water demand.

Gem City has presented total diversion records and a breakdown of non-residential demand. They have not provided a breakdown of residential demand exclusive of non-residential demand nor have they presented

data on unaccounted for water (UAW). Without a breakdown of residential demand it is hard to make use of the non-residential demands. From the total diversion data it is possible to derive a per capita water use, but this value will incorporate or carry with it the non-residential demand component. Because of the lack of data exclusive to residential demand the applicant should not utilize the non-residential data in forecasting water demand.

The following table summarizes monthly water demand diversions for 2010. It also summarizes per capita monthly average daily demand, which was calculated by assuming a static population over the entire course of the year of 1,044 people.

Gem City 2010 Municipal Water Supply System Diversion Records

Month	No. Days	2010 Monthly Div. (gal)	Monthly ADD (GPD)	Monthly ADD per Capita (GPD)
Jan	31	5,354,690	172,732	165
Feb	28	3,547,730	126,705	121
Mar	31	3,771,120	121,649	117
Apr	30	5,102,560	166,752	160
May	31	4,259,420	137,401	132
Jun	30	6,009,070	200,302	192
Jul	31	7,014,390	226,271	217
Aug	31	9,285,620	299,536	**287**
Sep	30	6,216,640	207,221	198
Oct	31	5,737,530	185,082	177
Nov	30	5,507,040	183,568	176
Dec	31	5,151,590	166,180	159
Annual	365	66,957,400	--	--

From this data we can calculate the average daily demand (ADD) per capita by dividing the total diversions (66,957,400 gallons) by 365 days by 1,044 people. For 2010 ADD equals 176 gallons per day (GPD) per capita. We can also determine the maximum monthly average daily demand (MMAD) per capita by dividing monthly total diversions by the number of days in the month by 1,044 people and selecting the largest value. For 2010 we can see that the MMAD is equal to 287 GPD per capita and this value occurred in August, which is logical, as this is the month likely to necessitate the greatest irrigation demand on the system. Sufficient data does not exist to calculate maximum day demand (MDD) or peak hourly demand (PHD). Therefore, to determine these values, in consideration of the fact that historical data and analogous systems are insufficient to derive actual values for this example, we will rely upon the peaking factor values presented in Table 3. Utilizing values from Table 3 we can calculate MDD from MMAD by multiplying MMAD by 1.3, this calculation yields a MDD per capita value of 373 GPD. Alternatively we could calculate MDD from ADD by multiplying ADD by 2.0, this calculation yields a MDD per capita value of 352 GPD.

To calculate the total projected future water demand we must multiply the future population at the end of planning horizon (1,398 people) by the selected per capita demand value. Since Gem City relies on storage to meet peak hourly demand, the maximum day demand represents the design demand value for forecasting future water demand. Since estimations of MDD from ADD and MMAD are both valid approaches it is appropriate to use the larger of the two values. With these considerations in mind the projected future MDD water demand is equal to 362 gallons per minute (GPM) or 0.81 cubic feet per second (CFS). Gem City does not have any data on UAW. In this event we can use a maximum UAW value of 10% of total diversions.

Therefore, after accounting for UAW the projected future MDD water demand can be adjusted to 0.91 CFS (0.83 + 0.10*0.83).

Review of Gem City's existing water right portfolio indicates that the city already has 0.40 cfs of diversion rate. This value must be subtracted from the projected future MDD water demand to determine the diversion rate value that will be included on the new RAFN water right, in this instance the final RAFN diversion rate value will be 0.51 CFS (0.91 – 0.40).

Gem City's proposed RAFN service area will include a municipal water right for 0.20 cfs currently owned by a homeowner's association within the proposed service area. The disposition of this water right should be addressed in the RAFN application.

ADMINISTRATOR'S MEMORANDUM

To: Regional Offices
Water Allocation Bureau

Application Processing No.75
Permit Processing No. 21
Licensing No. 14

From: Jeff Peppersack

Re: Term Limits for Hydropower Use

Date: January 13, 2014

INTRODUCTION

House Bill No. 50 from the 2013 legislative session amended Idaho Code § 42-203B. The statute was amended in response to a footnote in *Idaho Power Company v. Idaho Department of Water Resources*, 151 Idaho 266 (2011), suggesting that IDWR's traditional hydropower term condition may not comport with the statute because it does not set a fixed termination date for the water right.

The revised statute no longer requires the Director to limit a hydropower permit or license only to a "specific term" but instead expands the Director's conditioning ability by providing that the Director may "limit a permit or license for power purposes to a term, which may be in the form of a fixed date or by reference to a Federal Energy Regulatory Commission (FERC) license or other authorization issued or contract executed, in connection with the power project." *Idaho Code § 42-203B(6).*

The revised legislation provides for modification of the water right if the Director decides to review the water right and issues an order modifying it prior to the expiration of the term. The legislation provides for the automatic extension of the term if the Director chooses not to review the water right.

This memo addresses how IDWR will determine the lengths of terms for hydropower water rights given the new legislation and how the terms will be stated in the conditions of future water rights for power generation. This memo is intended to serve as general guidance. Situations may arise that justify variance from this memo. If an applicant seeks a term condition different from the conditions used in this memo, or if a different condition seems warranted for some other reason, staff members are encouraged to consult their regional manager, section manager, or bureau chief.

CATEGORIES OF HYDROPOWER FACILITIES

The amended statute requires the Director to evaluate the following factors, ***among others***, when setting a term:

- The term of any FERC license for the hydroelectric project.
- The term of a power purchase contract associated with the hydroelectric project.

- Existing downstream water uses.
- The policy and authority of the Idaho Public Utilities Commission (IPUC) to enforce the Public Utility Regulatory Policies Act of 1978 (PURPA).[1]

To facilitate selecting the most appropriate term condition, we can classify most water rights for power purposes into one of three categories.

Category I -- Water rights for hydroelectric projects that require a FERC license.

Category II -- Water rights for FERC exempt hydroelectric projects with power purchase contracts subject to IPUC review. [2]

Category III -- Water rights for hydroelectric projects that are outside the jurisdiction of the FERC and the IPUC.

DEFINITIONS OF THE TERM CONDITION CATEGORIES

Category I -- Hydroelectric projects that require a FERC license.

According to FERC:

> A license from FERC is required to construct, operate, and maintain a non-federal hydroelectric project that is or would: (a) be located on navigable waters of the United States; (b) occupy U.S. lands; (c) utilize surplus water or water power from a U.S. government dam; or (d) be located on a stream over which Congress has Commerce Clause jurisdiction, where project construction or expansion occurred on or after August 26, 1935, and the project affects the interests of interstate or foreign commerce. [3]

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[1] The Idaho Public Utilities Commission has jurisdiction over electric utilities, pursuant to the authority and power granted it under Title 61 of the Idaho Code and the Commission's Rules of Procedure, IDAPA 31.01.01.000 *et seq*., and the Public Utilities Regulatory Policies Act of 1978 (PURPA). The IPUC has the authority under PURPA and the implementing regulations of the Federal Energy Regulatory Commission (FERC) to set avoided costs, to order electric utilities to enter into fixed term obligations for the purchase of energy from qualifying facilities, and to implement FERC Rules. Reference 18 C.F.R. Section 292. PURPA established a class of generating facilities which would receive special rate and regulatory treatment. They are known as Qualifying Facilities (QFs). Through a provision of PURPA, regulated utilities are required to offer to buy energy from Qualifying Facilities. Although it is a federal law, states determine the rates paid to the Qualifying Facilities. It is the authority that the IPUC has under PURPA which puts power contracts under their purview.

[2] A few FERC-exempt projects do not benefit from a power purchase agreement and so are not subject to IPUC authority. The terms for these projects can be set like Category III projects. See pages 4-5 of this memo.

[3] From http://www.ferc.gov/industries/hydropower/gen-info/licensing/small-low-impact/get-started/exemp-licens.asp

Test (d) includes linking a hydroelectric project to the interstate transmission grid.[4]

A FERC license is issued with an expiration date and must be renewed at the end of each term. An "original" license authorizes the construction and operation of a project and is issued for a term of up to 50 years. A "subsequent" or "new" license, (a.k.a. a relicense), authorizes the continued operation of a previously licensed project. The new license term is 30 to 50 years, depending on the costs that were incurred to develop the project.[5]

As indicated above, the amended statute authorizes IDWR to take the term of the FERC license into account when setting the water right term, and it indicates that the water right term may be established by reference to the term of the FERC license.

Category II -- FERC exempt hydroelectric projects with power purchase contracts subject to IPUC review.

FERC issues two types of development authorizations -- licenses (discussed above in Category I) and exemptions. "Exempt" projects are <u>not</u> exempt from federal and state review and permitting. An exemption is a permit process like a FERC license, but with fewer steps. Unlike a FERC license, a FERC exemption has no expiration date. It is issued in perpetuity.

To determine which projects fit into this category, IDWR will rely on the types of FERC exemptions available when the water right application is filed. FERC currently issues two types of exemptions: [6]

1. 5-MW Exemptions:

   Hydropower projects which are 5 megawatts or less may be eligible for a

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[4] Quoting from the Federal Power Act (16 USC§§ 796):
(11) "project" means complete unit of improvement or development, consisting of a power house, all water conduits, all dams and appurtenant works and structures (including navigation structures) which are a part of said unit, and all storage, diverting, or forebay reservoirs directly connected therewith, the primary line or lines transmitting power therefrom to the point of junction with the distribution system or with the interconnected primary transmission system, all miscellaneous structures used and useful in connection with said unit or any part thereof, and all water-rights, rights-of-way, ditches, dams, reservoirs, lands, or interest in lands the use and occupancy of which are necessary or appropriate in the maintenance and operation of such unit. See http://www.gpo.gov/fdsys/pkg/USCODE-2011-title16/pdf/USCODE-2011-title16-chap12-subchapI-sec796.pdf

[5] During the water right application phase, staff may also encounter a preliminary permit issued by FERC. Before applying for a FERC license, a hydropower developer <u>may</u> apply to FERC for a preliminary permit. A preliminary permit is like staking a claim. Preliminary permits maintain a permittee's priority to file a license application while he gathers data and studies the feasibility of a project at a particular site. Preliminary permits typically expire after three years, and they do not authorize any land-disturbing activities or project construction. During the term of the permit, the permittee prepares an application for an original hydropower license.

[6] For a chart that shows the major differences between a FERC license, a conduit exemption, and a 5-MW exemption, see Project Comparison Chart or http://www.ferc.gov/industries/hydropower/gen-info/licensing/small-low-impact/get-started/exemp-licens/project-comparison.asp

5-MW exemption. The applicant may install or add capacity to a project located at a non-federal, pre-2005 dam, or at a natural water feature. The project can be located on federal lands but cannot be located at a federal dam. The applicant will have all the real property interests or an option to obtain the interests for any non-federal lands.

2. Conduit Exemptions:

   Hydropower projects which are 15 megawatts or less for non-municipal project and 40 megawatts or less for a municipal project may be eligible for a conduit exemption. The conduit (such as an existing canal or pipeline), has to have been constructed primarily for purposes other than power production and be located entirely on non-federal lands. The applicant will have all the real property interests necessary to develop and operate the project or an option to obtain the interests.

Because FERC exemptions have no fixed term, IDWR must use other criteria to set the term of a water right in this category. Among the criteria set forth in Idaho Code § 42-203B, the expiration date of a power sales/purchase contract is the most applicable.

Power sales/purchase contracts are effective for a specific term. 1980s vintage contracts were often written for terms of 35 years. The IPUC limits the term of contemporary contracts to 20 years. A developer may choose a shorter term, but a power sales contract is usually important for financing of a hydroelectric project, so most developers choose a 20-year term.

Category III – Hydroelectric projects with neither a FERC license nor a power purchase contract subject to IPUC review.

Although FERC has broad authority, it does not have jurisdiction over all hydropower projects. IPUC's authority over hydropower facilities is also limited. IPUC is responsible for reviewing power purchase contracts which involve a utility company, but other power purchase arrangements do exist. Therefore, a third category is needed. Category III is a catch-all category for hydropower projects that do not fit into Category I or II.

Most hydropower projects in Category III will be for personal use. These micro hydroelectric projects will be completely contained within the right holder's property. Often the project will be a battery-based system with a single, turbine-generator unit. Due to limitations in the AC to DC technology, the unit will generate less than 4 kW of electrical power, and the power will be consumed by the owner.

Category III includes FERC-exempt hydropower projects that do not benefit from a power sales agreement. Either the project produces power too intermittently to be described by a power sales agreement, or all the power is consumed by the developer rather than sold. In the former case, the power can still be purchased by a utility but the

purchase will be in accordance with that utility's tariff schedule (which can be revised every year) rather than through a long-term agreement.

Also in Category III are projects developed by the Bureau of Reclamation or by a non-federal developer who has entered into a Lease of Power Privilege (LOPP) agreement with the Bureau of Reclamation. These projects do have operational constraints, but they are not accountable to the agencies which have the authority to set the Category I and II fixed term obligations.

The statute allows the Director to employ a range of criteria to set a term for Category III projects. One of the most practical is the useful life of the power generating equipment. IDWR can expect a custom built, conscientiously maintained, large-scale, turbine-generator system to have a 45 – 50 year lifespan. 'Personal use' micro hydros are not as rugged, but a well maintained system can be expected to last 20 - 25 years.

TIMING CONSIDERATIONS

Category I

FERC's pre-authorization processes and IDWR's water rights application processes may overlap in time. However, pursuant to Water Appropriation Rule 45.01.c,[7] the Department will not necessarily require the FERC license to have been issued before a water right permit is issued for the same hydropower project.

Ideally, a FERC order granting an exemption or issuing an original license would be in place before IDWR issues a permit. However, if the term cannot be established at permitting because the FERC review process is not complete, the statute directs IDWR to set the term "as soon thereafter as practicable". In the past, IDWR has considered the act of licensing to be the most practicable point in time. However, delayed water right licensing has resulted in criticism of IDWR's practice. Therefore, IDWR will strive to collect the information needed to set the term when processing proof of beneficial use statements, and IDWR will strive to issue licenses shortly after the proof of beneficial use statement has been submitted. For this reason, term conditions for permits will, in some cases, be different than term conditions for the corresponding water right licenses. Nevertheless, even for permits, IDWR will employ conditions explaining that terms may automatically renew.

[7] c. Criteria for determining whether the application is made in good faith. The criteria requiring that the Director evaluate whether an application is made in good faith or whether it is made for delay or speculative purposes requires an analysis of the intentions of the applicant with respect to the filing and diligent pursuit of application requirements. The judgment of another person's intent can only be based upon the substantive actions that encompass the proposed project. Speculation for the purpose of this rule is an intention to obtain a permit to appropriate water without the intention of applying the water to beneficial use with reasonable diligence. Speculation does not prevent an applicant from subsequently selling the developed project for a profit or from making a profit from the use of the water. An application will be found to have been made in good faith if:…..

ii. The applicant is in the process of obtaining other permits needed to construct and operate the project;….

Category II

The developer of a hydropower facility will know in advance whether the facility will generate power in excess of his needs. The negotiations of a power purchase contract between the developer and a regulated electric utility should precede a project's first energy date. But the Department will likely issue a permit to the developer of a qualifying facility before the IPUC concludes its review and closes the case on the relevant power contract.

The first energy date is a prerequisite to the execution of a power purchase/sales agreement. It is also the first instance of beneficial use. Therefore, it is reasonable to expect that an executed power sales/purchase agreement will be effective when the Proof of Beneficial Use statement is submitted.

Category III

In most cases, it will be impossible to know the plant's first energy date when the permit is issued. Therefore, the term will be calculated from the year of permit issuance. For ease of administration, the term ending date should be December 31 of the year of expiration.

IDWR PERMIT AND LICENSE TERM CONDITIONS

Category I a) -- A FERC license is required but not yet issued.

For permits issued for hydropower projects in this category, apply the following term condition. Because a FERC license will be a prerequisite for the power generation that constitutes beneficial use, this condition will not be applicable to water right licenses.

> The term of this permit shall coincide with the term of the license issued by the Federal Energy Regulatory Commission (FERC) for this hydropower project. The term shall automatically extend to run concurrently with any annual renewals of the project's FERC license. Prior to the issuance of a subsequent or new FERC license for the project, the Director may review the water right permit or subsequent water right license and may issue an order canceling all or any part of the use, establishing a new term, or revising, adding or deleting conditions under which the water right may be exercised. The order shall take effect on the date the current term, as may be extended through annual renewals, expires. If the Director does not issue such an order, the term shall automatically extend to a length equal to the project's subsequent or new FERC license and any prior conditions on the water right permit or subsequent water right license shall remain in effect.

Also apply the following new condition requiring that FERC license information be submitted with the proof statement:

> If it has not been previously provided, the permit holder shall submit a copy of the FERC licensing order for this project in conjunction with the Proof of Beneficial Use statement.

Category I b) -- A FERC license has been issued.

For some permits in Category I and for all water right licenses in Category I, a FERC license will have been issued already. In such cases, apply the following term condition:

> The term of this <permit> <water right> shall run concurrently with <FERC Project Name> license <FERC Docket Number>issued by the Federal Energy Regulatory Commission (FERC), which expires on <Expiration Date>. The term shall automatically extend to run concurrently with any annual renewals of the project's FERC license. Prior to the issuance of a subsequent or new FERC license for the project, the Director may review the <water right permit or subsequent > water right license and may issue an order canceling all or any part of the use, establishing a new term, or revising, adding or deleting conditions under which the water right may be exercised. The order shall take effect on the date the current term, as may be extended through annual renewals, expires. If the Director does not issue such an order, the term shall automatically extend to a length equal to the project's subsequent or new FERC license and any prior conditions on the <water right permit or subsequent >water right license shall remain in effect.

Category II a) -- IPUC review of the power purchase agreement required but not yet completed.

For some projects in Category II, IDWR will issue a permit before the power purchase contract is complete. In such cases, apply the following term condition. Because the power purchase contract, when finalized, will coincide with beneficial use of water, there should be no water right licenses that fall into this subcategory.

> The term of this permit shall run concurrently with the length of any effective energy sales agreement between the right holder and a purchasing utility. Prior to the expiration of the term, the Director may issue an order canceling all or any part of the use authorized herein, may establish a new term, or may revise, delete, or add conditions under which the water right permit or subsequent water right license may be exercised. The order shall take effect on the date the current term expires. If the Director does not issue such an order, the term shall automatically extend to a length equal to the prior term and any prior conditions on the water right permit or subsequent water right license shall remain in effect.

Also apply the following new condition requiring that information be submitted with the proof statement:

> If it has not been previously provided, the permit holder shall submit a copy of the FERC exemption order and a copy of the effective energy sales/purchase agreement for this project in conjunction with the Proof of Beneficial Use statement.

Category II b) -- A power sales agreement has been approved by IPUC.

For permits and licenses for hydropower projects in this category, apply the following term condition:

> The term of this <permit> <water right license> shall run concurrently with energy sales agreement <IPUC Case number, Order number> approved by the Idaho Public Utilities Commission, which expires on <Expiration Date>. Prior to the expiration of the term, the Director may issue an order canceling all or any part of the use authorized herein, may establish a new term, or may revise, delete, or add conditions under which the <water right permit or subsequent> water right license may be exercised. The order shall take effect on the date the current term expires. If the Director does not issue such an order, the term shall automatically extend to a length equal to the prior term and any prior conditions on the <water right permit or subsequent> water right license shall remain in effect. [8]

Category III -- Outside of FERC and IPUC processes.

The statute allows the Director to employ a range of criteria to set a term for Category III projects. One of the most practical is the useful life of the power generating equipment. If the Department finds no other relevant criteria on which to base the term for a Category III hydropower project, it may be based on the expected equipment life of a well maintained system. As noted above, a conscientiously maintained, large-scale, turbine-generator system can have a 45 – 50 year lifespan, and a typical 'personal use' micro hydro can be expected to last 20 - 25 years. IDWR staff members issuing approvals are authorized to exercise professional discretion in estimating the lifespan of a hydropower system and whether it is necessary to require the water right owner to provide additional information about the potential lifespan.

Unless other criteria are used, such as the term of an LOPP agreement with the Bureau of Reclamation, the term for Category III projects can be based on the expected

[8] IDWR intends that a term date based on a power sales agreement will always anticipate the expiration of the contract. It is not uncommon, however, for projects to obtain approved power sales agreements but subsequently fail to meet first energy or scheduled online dates. In these cases, contract amendments are common to extend the term of the power sales agreement beyond the term specified in the original agreement. For projects that have an approved power sales agreement which is subsequently amended to extend the term of the agreement, , the amended term can be addressed when a water right license is issued.

equipment life of a well maintained system. Permits and licenses in this category should be issued with the following term condition:

> The term of this <permit> <water right license> shall extend to [(permit issued year + expected equipment lifespan) = specific date]. Prior to the expiration of the term, the Director may issue an order canceling all or any part of the use authorized herein, may establish a new term, or may revise, delete, or add conditions under which the <water right permit or subsequent> water right license may be exercised. The order shall take effect on the date the current term expires. If the Director does not issue such an order, the term shall automatically extend to a length equal to the project's prior term and any prior conditions on the <water right permit or subsequent> water right license shall remain in effect.

WHERE TO FIND DOCUMENATION

Going forward, the owners of water right permits for power use will be expected to have the documents which will establish the term and to submit copies of them in concert with their applications for permit or their Proof of Beneficial Use statements. Water right files for hydropower use that pre-date this memo will often lack documentation for the basis of a term. Either the field examiner or the reviewer will need to locate these foundational documents and provide copies of them for the water right file. The most straightforward method may be to ask the permit holder to provide the documents. Information may also be found at the locations described below.

Category I -- Term dates are based on FERC license expiration.

A complete list of the FERC issued licenses or a list of issued exemptions is available as an Excel spreadsheet and can be accessed from:

Complete list of Issued Licenses or http://www.ferc.gov/industries/hydropower/gen-info.asp

Issued Exemptions or http://www.ferc.gov/industries/hydropower/gen-info.asp

Category II -- Term dates are based on power purchase contracts under the IPUC's authority.

A list of Qualifying Facility contracts is maintained by IPUC personnel as an Excel spreadsheet. Although the information is public, the spreadsheet is not currently posted where the public or IDWR can access it.

In the absence of access to this IPUC list, IDWR agents will need to either request a copy of any energy sales agreement from the right holder or query the IPUC website, http://www.puc.idaho.gov for individual case records.

Category III -- Term dates are based on equipment life expectancy or other considerations.

The small personal use projects will likely be known only to IDWR.

New large-scale, federal hydropower projects are rare. Existing federal hydropower projects may add turbines which would increase the amount of water used for power generation. Existing federal dams in Idaho which have hydropower are: the U.S. Bureau of Reclamation projects at Anderson Ranch, Black Canyon, Boise Diversion, Minidoka, and Palisades; and the Army Corps of Engineers project at Dworshak.

A site list of potential LOPP projects in the Pacific Northwest can be found at http://www.usbr.gov/power/CanalReport/PN%20Maps.pdf

ADMINSTRATOR'S MEMORANDUM

To: Regional Offices
Water Allocation Bureau

Application Processing No. 76
Licensing No. 15
Transfer Processing No. 30
Water Supply Bank Processing No. 3

From: Jeff Peppersack

RE: **SEEPAGE LOSS STANDARDS FOR PONDS AND RESERVOIRS**

Date: March 5, 2015

BACKGROUND

Idaho Code § 42-203A(5)(f) requires the Department to ensure that proposed water uses are not contrary to conservation of water resources when reviewing new water right applications. Idaho Code § 42-222(1) provides a similar requirement for transfer applications. For many water uses, the Idaho legislature or the Department has established standards intended to promote the efficient use of water. For example, irrigation use is limited to 0.02 cfs per acre unless the applicant can show a compelling need for additional water.

The need to address seepage loss has developed as the Department has seen an increase in water right applications and transfers which propose to store water in small impoundments for purposes, such as aesthetics, that require a full reservoir. The ability to keep a reservoir full requires an appropriation of water not just for a one-time early season fill, but also for the replacement of evaporation and seepage losses throughout the year.

On occasion, applicants or permit holders may have a geotechnical or site engineering report describing seepage loss expectations or test results. In such a case, the reviewer should reference and utilize the measured soil properties presented in the report. Oftentimes, no such report is available to the reviewer. This memorandum establishes guidelines for reviewing seepage losses from ponds and reservoirs to ensure that water rights for storage promote efficiency by meeting a reasonable conservation standard. Without a storage efficiency standard, the diversion of water to replace storage losses could reduce the availability of water for other appropriators.[1]

[1] This guidance does not apply to applications seeking one fill annually with no refill provisions.

SEEPAGE LOSS STANDARDS

The Alabama Agricultural Experiment Station Bulletin 599[2] provided the following mean seepage rates for ponds based on the following Unified Soil Classification System groups:

SM (silty sand, sand silt mixtures) = **0.2 ft per day**
SC (clayey sands, sand clay mixtures) = **0.007 ft per day**
ML (inorganic silts – very fine sands, silty, or clayey fine sands) = **0.02 ft per day**
CL (low to medium plasticity clays) = **0.003 ft per day**
CH (high plasticity clays) = **0.0003 ft per day.**

These published seepage rates provide reasonable seepage loss expectations for appropriately designed small ponds and reservoirs. In addition, soil type OL is very similar to ML; use 0.02 ft per day with this soil type. Soil types MH, OH, and PT are very similar to CH; use 0.0003 for these soils.

The maximum allowable seepage rate is 0.2 ft per day. In general, the Department should not authorize the appropriation of water to replace seepage losses in excess of these rates, except as described in this memorandum.

The following soil types are all sandy and/or gravelly soils that would likely exceed 0.2 ft per day.

GW (well-graded gravels and gravel-sand mixtures)
GP (poorly graded gravels and sandy gravel mixtures with little or no fines)
GM (silty gravel and poorly graded gravel/sand-silt mixtures)
GC (clayey gravels and poorly graded gravel-sand-clay mixtures)
SW (well-graded sands and gravelly sands with little or no fines)
SP (poorly graded sands and gravelly sands with little or no fines)

Ponds developed in these soils should be equipped with a liner or other construction modifications to reduce seepage.[3]

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[2] Stone, Nathan M., and Claude E. Boyd. Alabama Agricultural Experiment Station Bulletin 599. Auburn University, Alabama. *Seepage from Fishponds*. 1989.

[3] There are many ways to reduce seepage losses. The United States Department of Agriculture through the Natural Resources Conservation Service ("NRCS") Agriculture Handbook Number 590, *Pond – Planning, Design, Construction* recommends that pond sites should have at least 20 percent clay soils (page 63). If a pond site doesn't have at least 20 percent clay, the NRCS recommends a variety of methods to seal the pond using chemical additives, bentonite, water proof liners, or compaction (pages 62-65).

EXCEPTIONS

There are some circumstances where it is not reasonable to apply the seepage rate standards described above. The following are some situations where the seepage rates listed above may be exceeded without further review:

- Storage facilities being used as infiltration basins for ground water recharge purposes should not be expected to comply with the seepage rate standards listed above. The purpose of recharge is to cause water to seep into the ground, not to maintain a full reservoir for aesthetics or similar purposes. Such uses are mutually exclusive. Water users should not be allowed to exceed the seepage rate standards by referring to ponds for other uses as recharge ponds.
- Excavated ponds filled by intercepting ground water should not be expected to comply with the seepage rate standards listed above. Under normal conditions water seeps *into* these ponds, not out of these ponds.
- Idaho Code §42-202 provides for a maximum of 5 acre-feet of stored water per acre of land irrigated. It is not necessary to apply seepage rate standards to reservoirs used to store water for irrigation purposes. Irrigation storage amounts in excess of 5 acre feet per irrigated acre require justification for the total amounts.

NEW APPLICATONS FOR PERMIT, TRANSFERS, AND WATER SUPPLY BANK RENTALS

The seepage rate standards described in this memorandum should be applied to new appropriations, transfers of water to new ponds or reservoirs, and Water Supply Bank rentals resulting in new ponds or reservoirs. Applications exceeding the standards need to justify the additional seepage amounts by demonstrating that they are consistent with the conservation of water resources or that the exception is necessary to accomplish the proposed beneficial use. If the additional seepage amounts are not justified, the approvals should be based on the standards set forth in this memo.

LICENSING OF EXISTING PERMITS

The seepage rate expectations discussed in this administrative memorandum will be applied when licensing water rights that have already been permitted as of the date of this memorandum. In general, replacement of seepage losses exceeding the standards set forth in this memorandum will not be considered to constitute a beneficial use of water. Therefore, seepage losses factored into the storage volume for water right licenses should not exceed the seepage loss standards listed above unless they meet one of the exceptions listed above, even if the permit pre-dates the issuance of this memorandum. Department staff members authorized to sign water right licenses may evaluate established storage facilities that exceed the seepage rate standards described in this memorandum on a case by case basis to determine if replacement of the additional seepage losses constitutes a beneficial use of water. Such determinations should be documented in the water right file.

SEEPAGE LOSS EVALUATION SPREADSHEET

The Department has developed a spreadsheet for estimating reservoir fill capacity, evaporation losses, and seepage losses. Department staff members are encouraged to share the spreadsheet with prospective applicants, consultants, and certified water right examiners for preparing and evaluating applications, as well as for conducting beneficial use field examinations. Applicants may utilize the NRCS Web Soil Survey, NRCS Published Soil Surveys, or the GIS layer 'PondSoils' found on the Department's website. Other technically sound methods for evaluating seepage losses may also be employed or accepted in IDWR's water right processes; however, alternate methods must consider conservation of water when determining acceptable seepage rates.

Pond Loss Calculation Spreadsheet

March 2015

Note: This macro-enabled workbook was created using Microsoft Excel 2007. The use of macros is optional. To enable macro functionality, access the macro security settings: (1) click the Microsoft Office button, (2) click Excel Options, (3) click Trust Center, (4) click Trust Center Settings, and then (5) click Macro Settings and select the option desired.

Idaho Department of Water Resources designed this spreadsheet in support of the guidance memo *Seepage Loss Standards for Ponds and Reservoirs*. It can be used to estimate the total volume required for a storage use. IDAPA Rule 37.03.08.035.03.b.v requires Department staff to account for all refills of a storage facility. This need has become especially acute with the increased popularity of ponds and reservoirs for aesthetic, recreation, and wildlife (ARW) purposes. Unlike irrigation reservoirs, ponds and reservoirs for ARW purposes are typically kept full all year. This spreadsheet was designed to account for the initial fill volume, refills to replace "from storage" uses, and the volume needed to replace evaporation losses and seepage losses to provide a more accurate accounting of the total water needed for a storage facility.

Tab #1 - Soil Classification with the NRCS Web Soil Survey:

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties.

This sheet will give the user instruction on how to efficiently access the soil classification information for their pond location under examination.

Tab #2 - Seepage Loss:

The Seepage Loss sheet guides the reviewer through necessary calculations to determine seepage loss of a pond. The reviewer will need to choose the suggested soil value for the soil that most represents the soil at the location and depth of the pond. The reviewer also must have the surface area of the pond in square feet. The sheet has a calculator to convert the surface area from acres to square feet if you determine the surface area from Arc Map.

For additional background, review pond seepage loss information on page 16 of the "Seepage from Fish Ponds" Bulletin 599, August 1989, Alabama Agricultural Experiment Station, Auburn University, Alabama, Lowell T Frobish Director, written by Nathan M. Stone and Claude E. Boyd. This document can be found in the *Field Examiner's Handbook on our WENET page under Water Right Permits Section - Field Examiner's Handbook - Peer Reviewed section - Library - Elements of water rights - Water use - Storage.*

Tab #3 - Evaporation Loss:

This sheet calculates the evaporation losses based on the University of Idaho Evapotranspiration web page. For Department staff, there are links in the spreadsheet to this web page and you can find the most representative station in Arc map using the ETIdahostations shape in X:/Spatial/Climate/ETIdahostations.shp.

Please Note: For an alternate method to calculate acres required to be retired in a water right transfer from irrigation to storage to cover the evaporative losses, please see Transfer Processing Memo # 26.

Tab #4 - Total Storage:

This sheet automatically takes the seepage volume amount calculated in the Seepage Loss Sheet and the evaporation volume calculated in the Evaporation Loss sheet and combines with the pond capacity to determine total storage volume required for this pond.

Tab #5 - Pond Capacity:

This sheet contains mathematical equations which are helpful in determining the volume of a given pond. Four pond shapes are presented for user reference. If the pond found at the field exam does not conform to any of the example shapes presented, the examiner should utilize other mathmatical equations to determine pond capacity.

This sheet also calculates the minimum flow required to maintain the pond level, and the number of days to fill the pond. The number of days to fill the pond incorporates the seepage and evaporation losses.

Enter Data — All Data that you enter into this sheet will be in yellow boxes with blue text.

Calc'd Data — All calculated data will be in green boxes with red text.

Explanation — All blue boxes will provide explanations, tips and other helpful information.

Tab #6 - Notes and Tips:

This tab supplies useful information and explanations on the spreadsheet. It is recommended that you read this tab prior to filling out the spreadsheet. This tab also contains a diagram showing the items that must be factored into a water balance for a storage water right.

Tab #1.1 - Soil Classification with ArcMap:
(Alternative to Soil Classification with the NRCS Web Soil Survey)
The Soil Classification (GIS) sheet is designed for users with access to ESRI ArcMap and corresponding Geographic Information System software. For reviewers that are already familiar with the functionality of GIS, this sheet explains how to interpret the SSURGO and STATSGO soils layers in order to determine the soil classification at the pond site.

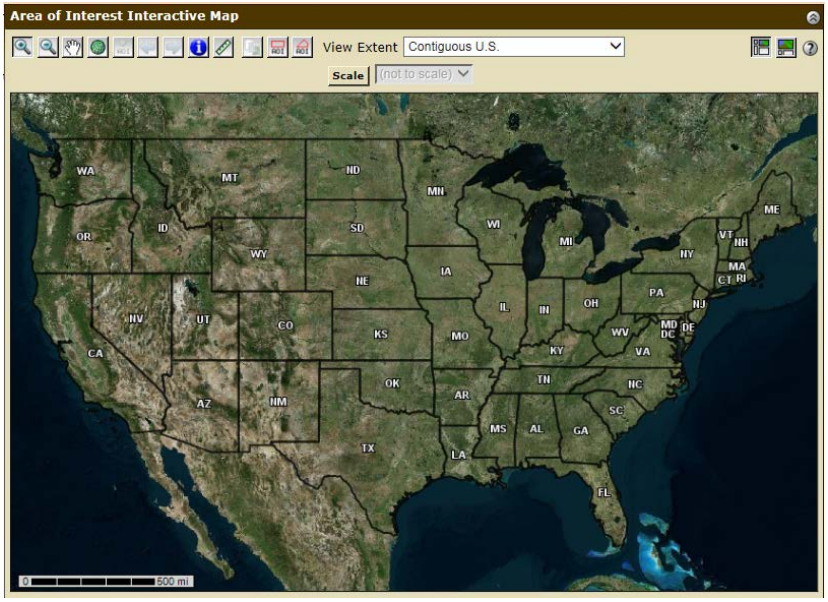
Tab #1.2 - Soil Classification with Published Soil Surveys:
(Alternative to Soil Classification with the NRCS Web Soil Survey)
The Soil Classification (PDF) sheet includes instructions on how to utilize NRCS Published Soil Surveys to obtain subsurface soils data for excavated ponds. Most Idaho Published Soil Surveys are designated by the name of the county. Others are published under multiple county names or by a significant natural feature in the area (ie. Caribou National Forest, City of Rocks National Reserve, Middle Fork Payette River Area, Duck Valley Indian Reservation, etc.). The GIS Layer was taken from the Soil Survey Geographic Data Base compiled by the Natural Resources Conservation Service (NRCS). The reviewer may have to utilize supplemental maps to determine the applicable Soil Survey report for the pond location. This sheet methodically guides the reviewer through the process of how to determine the USCS Soil Classification for use on the sheet entitled "Seepage Loss."

Soil Classification with the NRCS Web Soil Survey

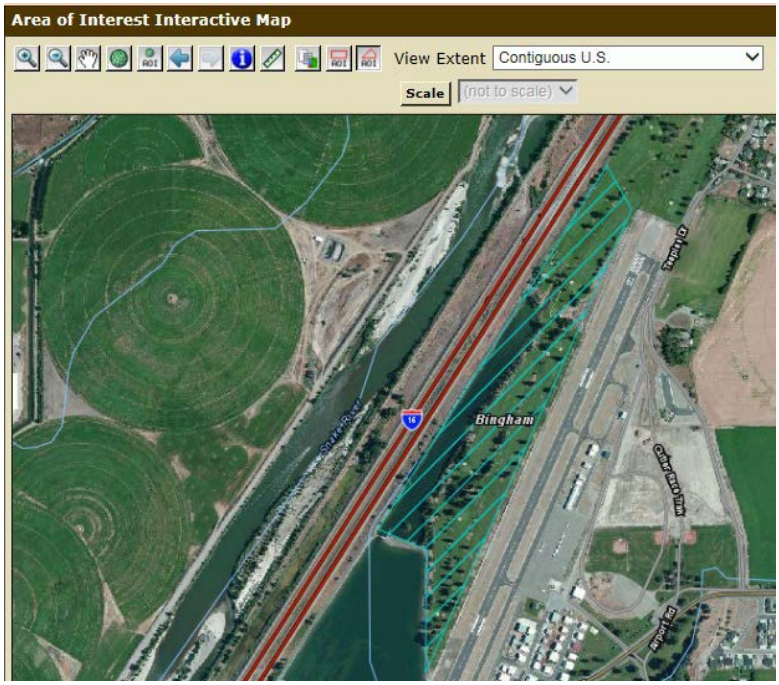
This spreadsheet has been designed by Idaho Department of Water Resources to determine the soil type and classification at the pond site.

Use the link to access the NRCS Web Soil Survey: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx	*Alternative methods of obtaining soil classification information may be found in the last two tabs of this worksheet.*

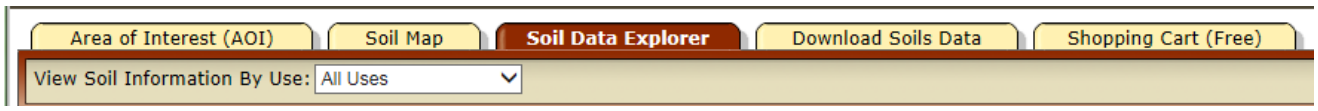
1. Use the {  } tool to zoom in to the location of the pond.



2. Under the "Area of Interest" tab, create an Area of Interest (AOI), where you would like information about the soil. Use the following tools to create your area of interest: { } and { }

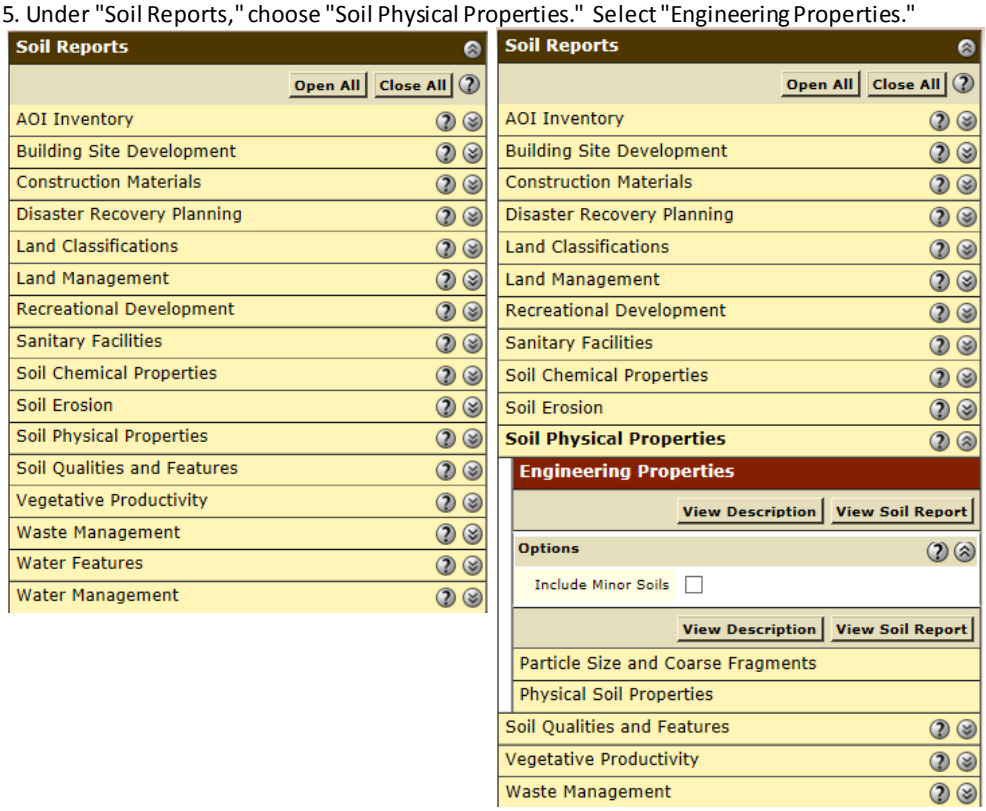


3. Click the "Soil Data Explorer" Tab.



4. Click the "Soil Reports" Tab.

5. Under "Soil Reports," choose "Soil Physical Properties." Select "Engineering Properties."



6. Click the "View Soil Report" button and wait for the WSS to load.

Report — Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007

7. View the soil information chart below the map.

Bingham Area, Idaho

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*Pct*	*Pct*					*Pct*	
HsA—Heiseton sandy loam, 0 to 2 percent slopes														
Heiseton	80	A	0-8	Sandy loam	SC, SC-SM	A-2, A-4	0	0	90-100	90-100	60-85	30-50	20-28	4-10
			8-38	Fine sandy loam	SC-SM, SC	A-4	0	0	90-100	90-100	65-85	40-50	20-28	6-10
			38-45	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-85	20-33	6-13
			45-65	Very gravelly sand, very gravelly coarse sand, extremely gravelly coarse sand	GP, GP-GM, GW	A-1	0	0	20-50	10-30	5-10	0-5	0-19	NP-2
Rv—Riverwash														
Riverwash	100		0-60	Stratified sand to gravel	—	—	—	—	—	—	—	—	—	—
Wb—Wardboro soils														
Wardboro	80	A	0-2	Sandy loam	SC-SM, SC	A-2, A-4	0	0	100	100	74-79	36-41	21-28	6-10
			2-11	Sandy loam	SC, SC-SM	A-2, A-4	0	0	100	100	74-79	36-41	21-28	6-10
			11-60	Extremely gravelly coarse sand	GC-GM, GP, GM	A-1	0-15	10-45	15-30	10-25	0-25	0-25	0-22	NP-4

8. Look for the soil type with the greatest "Pct. of map unit" or for the soil which is most representative of the pond location. Choose the depth which most closely corresponds with the depth of the pond under examination. After this, move right across the table to find the Unified Soil Classification System (USCS).

If you find that this depth arrives at more than one classification, choose the classification which is most advantageous to the applicant (highest seepage rate). You may need to toggle between the "Soil Class" and "Seepage" sheets in order to view the table entitled "Suggested Seepage Rates for Different Soil Types."

9. Use this soil classification to find the Total Seepage Loss on the next sheet "Seepage Loss."

Seepage Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total annual seepage losses from a pond.

FILE NUMBER	xx-xxxxx
REVIEWER	Joe Agent
DATE	1/1/00

User Input
Calculated value
Formula Explanations

Print Page to PDF

INPUTS

Pond Surface Area (AC.)	5	AC.
Pond Surface Area (SQ. FT.)	217800	SQ. FT.
I used the following method to obtain my Soil Classification information:	NRCS Web Soil Survey	
My Soil Classification is	GP	
Suggested Seepage Rate (FT./DAY)	0.2000	FT./DAY

Formula: (Surface Area X Seepage Rate) X 7.48 = Gallons Per Day Loss

Convert to GPD	325829	GPD
Total Seepage Loss (AFA)	365.0	AFA

Though sand and gravel seepage rates may actually be higher, the maximum allowable rate is 0.2 ft/day, pursuant to Administrative Memo "Seepage Loss Standards for Ponds and Reservoirs."

Suggested Seepage Rates for Different Soil Types:
GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) **= 0.2 ft per day**
OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) **= 0.02 ft per day**
SC (clayey sands, sand clay mixtures) **= 0.007 ft per day**
CL (Low to medium plasticity clays) **= 0.003 ft per day**
MH, OH, PT and CH (high plasticity clays) **= 0.0003 ft per day**
LINED PONDS (liners can be chemical, fabric, or bentonite) **= 0 ft per day**
Ponds Intercepting Groundwater (excavated ponds filled by ground water) **= 0 ft per day**

PLEASE NOTE: The initial basis for the Suggested Seepage Rates in the table above is found on Page 16 of Seepage from Fish Ponds, Bulletin 599, August 1989 Alabama Agricultural experiment Station, Auburn University, Auburn University Alabama. If you don't know the soil type, please refer to the map provided at the NRCS Web Soil Survey (Tab #1) , an ArcMap Soil Classification Map (Tab #1.1), or published NRCS Soil Survey (Tab #1.2) . Use "0" if the pond fill relies on the water table.

Evaporation Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the annual evaporation losses from a pond.

FILE NUMBE	xx-xxxxx
REVIEWER	Joe Agent
DATE	1/1/00

User Input
Calculated value
Formula Explanations

USING THIS SPREADSHEET

Use the link below to access the Kimberly Research Center website. This website provides the Precipitation Deficit for a station most representative of the pond under examination. The Precipitation Deficit is the total amount of free water surface evaporation minus the precipitation for a given area, which gives the total amount of evaporative losses incurred by the pond. There are several weather sites that are used throughout the state. IDWR staff can find the nearest site using Arc Map. The shape file containing the sites can be found at X:/Spatial/Climate/ETIdahostations.shp.

The acronyms used on the Kimberly Research Center website are defined below:

P = Precipitation
ET= Evapotranspiration
P_d = Precipitation deficit
P_d =ET-P

Instructions:

1. Use the link below to navigate to ET Idaho 2012.
2. Select the station which is most representative to your pond location.
3. Click Submit Query.
4. Under "Land Covers with Evapotranspiration Estimates," select "Open Water - Shallow Systems (ponds, streams)" or "Open Water - small stock ponds" depending on the pond size.
5. Click the link to "Precipitation Deficit."
6. Reference and copy (ctrl + C) the first subheading "Mean" values.
7. Click the "Paste Values from ET Idaho" button. The table will automatically enter a zero (0) for any negative precipitation deficit values.

Paste Values from ET Idaho

Print Page to PDF

Found at: http://data.kimberly.uidaho.edu/ETIdaho/

Precipitation Deficit

Station: Twin Falls 2 NNE (NWS -- 109294)

Month	mm/day[1]	*Days per month*	mm/Month
Jan	-1.34	31	0.00
Feb	-0.72	28	0.00
March	-0.29	31	0.00
April	1.09	30	32.70
May	1.77	31	54.87
June	3.33	30	99.90
July	4.41	31	136.71
August	3.81	31	118.11
September	2.28	30	68.40
October	0.89	31	27.59
November	-1.27	30	0.00
December	-1.76	31	0.00
	Total mm/year =		538.28

PLEASE NOTE: The seasonal average for precipitation deficit should not be used for calculations because precipitation often exceeds evaporation during wetter months of the year. If the pond is kept full, excess precipitation during wetter months does not serve to refill the pond during drier months.

For example, see Sandpoint KSPT (NWS -- 108137), the annual precipitation deficit is -106 mm. However, April through September have positive precipitation deficit values. To properly estimate the annual volume of water necessary to refill a pond due to evaporation losses, the table will automatically enter a zero (0) for each month that the precipitation value is reported as a negative value.

As described above, precipitation offsets evaporation in winter months, so the net effect is that wintertime precipitation deficit is usually zero.

[(mm/yr) ÷ (convert to feet)] X (Surface area of pond, in acres) = Evaporation Loss in Acre Feet

(538.28 ÷ 304.8) X 5.00 = 8.8 AFA

Surface Area of Pond is automatically carried over from the Seepage Loss Sheet.

Example Data:

Data enter negative values above as "0"

Twin Falls 2 NNE (NWS -- 109294)

Statistics based on thirty year normal spans 1943 to 1973 years

For a different land cover or crop click on the above link.
Highlight this table and copy via the clipboard to a Mircosoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Open water - shallow systems (ponds, streams)
Precipitation Deficit (Click here for a graph)

Mean[j]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season[a]	Non Growing Season[b]	Annual
	mm/day												mm		
Monthly[c]	-0.37	0.32	1.19	2.40	3.13	3.73	4.94	4.24	3.11	2.00	0.22	-0.33	751	0	751
15-Day Moving Average[d]	-0.50	0.31	1.19	2.42	3.09	3.74	4.97	4.23	3.08	2.02	0.12	-0.35			
7-Day Moving Average[e]	-0.41	0.32	1.19	2.40	3.10	3.72	4.96	4.25	3.12	2.02	0.16	-0.38			
3-Day Moving Average[f]	-0.37	0.33	1.20	2.41	3.12	3.73	4.94	4.24	3.12	2.01	0.20	-0.35			

The above table is a snap shot of the tables you find at the Kimberly Research Center Webpage. (Use link above.) Copy (ctrl + C) the numbers found in this table.

Total Storage Calculations

FILE NUMBER	xx-xxxxx
REVIEWER	Joe Agent
DATE	1/1/00

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total seepage, evaporation and fill capacity required for a pond.

User Input
Calculated value
Formula Explanations

Print Page to PDF

Surface Area (AC.)	5	"Surface Area" is automatically carried over from the "Seepage Loss" sheet.
Average Pond Depth (FT.)	6.8	"Average Pond Depth" depicts the actual depth of the pond either measured or estimated. Note: If you know the maximum depth and not the average depth, the Field Examiner's Handbook suggests multiplying the maximum depth by 0.4 to get the average depth, or you can use any method that seems reasonable to attain average depth.
Pond Capacity (AF)	34	Pond Capacity is calculated by multiplying the Pond Surface Area by the Average Pond Depth. If you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above. Note: If pond capacity is determined using a method shown on the "Pond Capacity" sheet, the user may need to modify the value of "Pond Capacity" (cell B9) manually. Note that if the value is modified manually, the formula will be altered for future use.
Multiple Fill Volume Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (AF)	5	The "Multiple Fill Volume Above Initial Fill" is the acre-feet of water required to meet a *from storage* component if the *from storage* component exceeds a one time fill. This section should not include the amount of water needed to fill the pond initially or the amount of water needed to maintain the pond level due to evaporation or seepage. For example: if a pond has a capacity of 5 acre feet and 2.5 acre feet of seepage and evaporation, but the pond is used for irrigation that requires 10 acre feet of from storage for the irrigation use, then you would insert 5 acre feet into this location (10 acre feet needed - 5 acre feet from the initial fill = 5 acre feet of additional storage needed). Note: You must have a "From Storage" component exceeding the initial fill on the permit to include a volume in this space.
Estimated Seepage Loss (AF)	365.0	The "Estimated Seepage Loss" is automatically carried over from the "Seepage Loss" sheet.
Estimated Evaporation Loss (AF)	8.8	The "Estimated Evaporation Loss" is automatically carried over from the "Evaporation Loss" sheet.
Total Volume Required (AF)	412.8	The "Total Volume Required" is calculated by adding the Pond Capacity, Multiple Fills, Seepage Loss, and Evaporation Loss amounts to determine the total amount of storage required.

Flow Rate into Pond (CFS)	**1.00**	The "Flow Rate into Pond" depicts the actual flow, either measured or estimated, into the pond. For offstream facilities, this will be equivalent to "diversion to storage" rate.
Highest Daily Evaporation Rate From Evaporation Tab. (mm/Day)	**4.41**	This number is carried over from the "Evaporation Loss" sheet. It is the highest recorded number in the "Precipitation Deficit Table".
Required Daily Maintenance Volume (AF/Day)	**1.07**	"Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year to maintain pond volume. It is calculated by adding the highest daily evaporation loss to the average daily seepage loss in acre feet. The average daily seepage loss is calculated by dividing the "Estimated Seepage Loss" by 365 days. This is acceptable, since the seepage rate shouldn't vary throughout the season unless the pond completely freezes over during the winter months. The highest daily evaporation loss is calculated by dividing the Highest Daily Evaporation Rate by the 304.8 conversion factor and multiplying this number by the pond surface area to attain a combined daily acre feet requirement.
Minimum Maintenance Flow (CFS)	**0.54**	The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determined by dividing the "Maximum Required Daily Maintenance Volume" by 1.9835. This flow can be used to determine if the flow rate into the pond is adequate to maintain the pond level.
Days Required to Fill the Pond	**37**	The "Days Required to Fill the Pond" is calculated by dividing the "Pond Capacity" by the "Flow Rate" minus "Minimum Maintenance Flow" multiplied by 1.9835. This section will assist you in determining if the flow rate being diverted to the pond is adequate to fill the pond while maintaining the pond level. The length of time to fill the pond will help determine if the flow rate is adequate for the size of pond being proposed. If this number is *approximately* 6 months (180 days) or more, the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond.
Days Required to Fill the Pond at 13,000 Gallons per Day	**-33**	Some water users may want to fill a pond under the 13,000 gallons per day domestic exemption. The "Days Required to Fill the Pond at 13,000 Gallons per Day" is calculated by converting the "Pond Capacity" and the "Required Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Required Daily Maintenance Volume" in gallons to determine the number of days to fill pond. If this number is *approximately* 6 months (180 days) or more, the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond. Negative values indicate that the supply of 13,000 gallons per day is not enough volume to overcome the required daily maintenance volume; the pond will never fill.

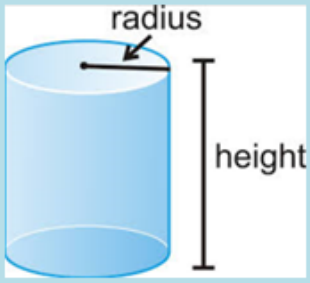
Pond Capacity Determination

Cylinder Shaped

Volume = $\pi \cdot (\text{radius})^2 \cdot \text{height}$

OR

Volume = circular surface area · depth



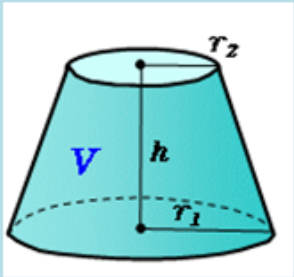
Truncated Cone Shaped

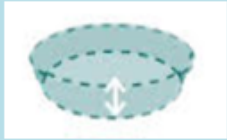
Volume = $(1/3) \cdot \pi \cdot (r_1^2 + r_1 \cdot r_2 + r_2^2) \cdot h$

where h = water depth

r_1 = radius at top of basin

r_2 = radius at bottom of basin



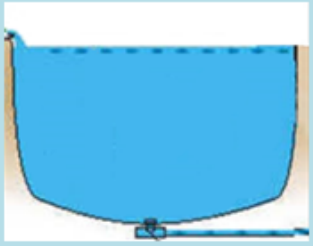


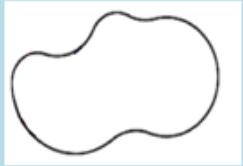
Freeform Polygon with Sloped Sides and Bottom

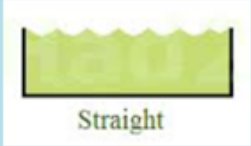
Volume = surface area · (2/5) · maximum depth

Freeform Polygon with Vertical Sides and Flat Bottom

Volume = surface area · maximum depth







The surface area of a freeform polygons should be measured using aerial photography and ArcGIS.

For ponds with an unusual shape and inconsistent depth, the reviewer may be able to combine different shapes to calculate a total pond volume.

Helpful Tips for Determining Pond Volumes

Types of Ponds and Reservoirs

The following is an excerpt from the report that is the basis for the University of Idaho Evapotranspiration Web Page. In this report, evaporation from three classes of open water was estimated:

small, shallow stock ponds: K_c* = 0.7 was used for all months

large, shallow water bodies or deep water bodies that have high turbidity: K_c* = 0.6 for all months. This class may be generally applicable to *relatively shallow* (< 4 m or 13.1 feet in depth) *ponds, reservoirs and streams*

deep systems (relatively clear lakes and reservoirs deeper than 4 m or 13.1 feet): use aerodynamic evaporation algorithms developed for American Falls Reservoir (Allen and Tasumi, 2005). Appendix 10# provides details on the procedure development and application. The evaporation estimations assume that no freezing occurs. If water systems are known to freeze, then the evaporation rate will tend toward zero during the periods of ice cover.

*The crop coefficient (K_c) is defined as the ratio of actual or potential evapotransporation by a specific crop or land cover condition to the reference evapotranspiration value.

#Allen, R., & Robison, C. (2006). Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho. *University of Idaho: University of Idaho Research and Extension Center at Kimberly, ID.*

Components of Storage

To get water to a pond that is not on the stream, you will need a water right component called **"Diversion to Storage."** **"Diversion to Storage"** components only have a rate of diversion. The volume components for this use are described in the **"Storage Component."**

The **"Storage Component"** of a water right allows a one-time fill (also known as **Pond Capacity**) plus the **"Evaporation Losses"** plus the **"Seepage Losses."** The **"Storage Component"** only describes a volume. Any diversion rate is considered under the **"Diversion to Storage"** component. **"Evaporation Losses"** and **"Seepage Losses"** are also described as the amount of water it takes to keep the pond full.

"Seepage Loss" is one of the most overlooked volumes in the **"Storage Component."** It can also be the largest contributor to the **"Storage Component."** When you initially fill a pond that sits above the water table, the pond will lose water. When the soil becomes saturated with water, the **"Seepage Rate"** drops to a steady state. The **"Seepage Rates"** used in this spreadsheet are determined using the saturated soil.

"Evaporation Loss" is simply the amount of water that evaporates from the surface area of the pond, minus the precipitation to the extent it offsets evaporation. We use the evaporation rates described in the University of Idaho Evapotranspiration Web Page. The evaporation web page accounts for variability in evaporation rates throughout the year. The reason that we use a "0" on all negative monthly values from the web page is to show that precipitation exceeded evaporation during that time period, and credit is not given for additional precipitation.

Components of a Storage Water Right

Water rights can also have a **"From Storage"** component. Generally, the **"From Storage"** component is limited to the capacity of the pond. However, there are times that the pond is filled and emptied, refilled and emptied several times if the permit allows. When a pond is filled and emptied several times, this is known as **"Multiple Fills."** This spreadsheet has a space to account for the **"Multiple Fills."** To figure out the additional volume for a **"Multiple Fill"** situation, you simply take the total amount of water needed to supply the **"From Storage"** component and subtract the **"Pond Capacity"** to determine the additional water needed to fulfill the **"Multiple Fill"** requirement. This methodology would leave the water user with a depleted pond at the end of his yearly usage. If the the owner wants to leave the pond full year round, the **"From Storage"** volume should be considered an addition to the **"Pond Capacity."** If this is the case, this needs to be well documented in the file.

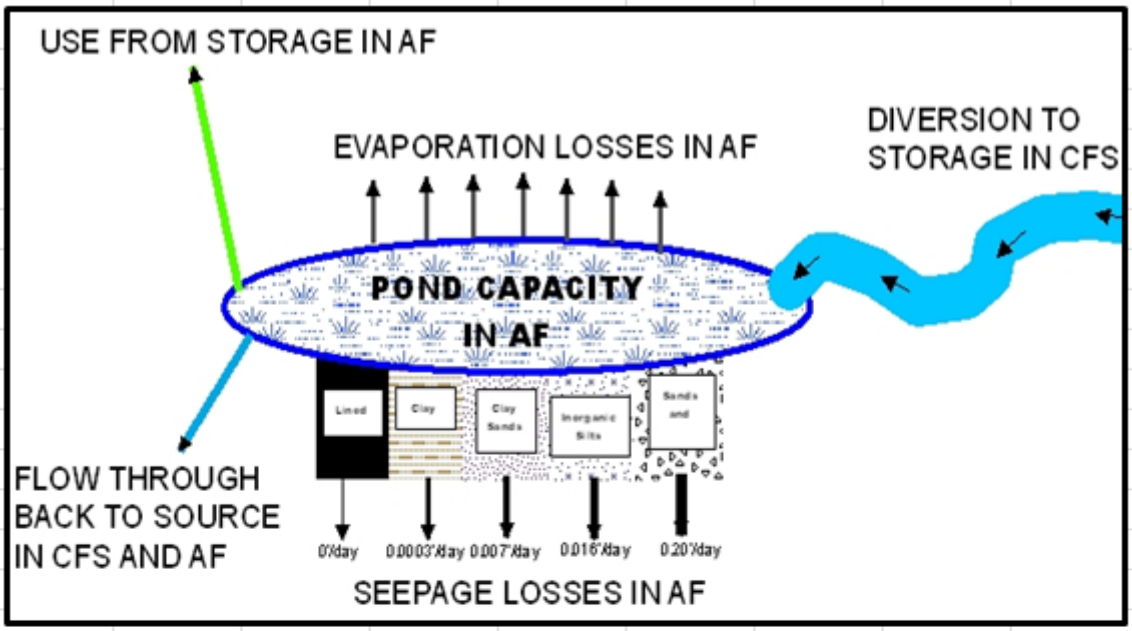
Calculating the **"Total Volume Required"** for storage is done by simply adding the **"Pond Capacity"** plus the **"Seepage Losses"** plus the **"Evaporation Losses"** and any **"Multiple Fills."** It is important to ensure the total volume needed for the uses described in the water right are included. This avoids having to file a second water right application to cover the amount of water not covered by the original water right, which will take additional time and increase the cost of attaining a water right to cover all of the water users needs.

"Time to Fill a Pond" Functions

This spreadsheet has a couple of functions that allow the user to determine if the pond design has a chance of being successful. Please see below for a description of these functions.

"Minimum Maintenance Flow" allows the water user to see the minimum diversion rate that would be required to maintain the pond level in order to overcome seepage and evaporation losses. This is an important tool for agents reviewing the water right application to ensure that the proposal is reasonable. If the diversion rate that the applicant proposes can't maintain the pond, then the applicant should be contacted to discuss the design and intent of the application. This may avoid the need to file and process additional applications.

"Days Required To Fill The Pond" is another tool used to see if a proposed application for permit is reasonable. If it takes too long to fill the pond, the water user will either need to increase the rate of diversion to the pond, reduce the size of the pond, or find an alternate supply to fill the pond.



The Flow Through Component

Another component of a water right would be the **"Flow Through Component."** This component is the amount of water diverted into the pond that is not used for seepage, evaporation or from storage uses, and flows out of the pond back into the source it was diverted from. This use is generally used to keep the pond fresh and free from moss and from going stagnant. This component has a diversion rate and volume. The diversion rate is the amount of water flowing out of the pond, and the volume is calculated by determining the volume of water diverted out of the pond. This is obtained by multiplying the diversion rate by the number of days or hours the water flows through the pond.

If there is a **"Flow Though"** component, then you will need to add this to the Total Volume Required to achieve the total volume that is required for a water right.

Temperature

Though temperature calculations have not been included in this spreadsheet, the Department recognizes temperature as a valid water quality concern for some beneficial uses. For example, aesthetic fish ponds may need to be kept at a specific temperature to preserve aquatic life. At times, ponds may need to be kept full, at a low temperature to minimize evaporation when air temperatures are above average. For such uses, the applicant will need provide scientific justification for each request for additional diversion rate and volume related to temperature concerns.

Soil Classification with ArcMap

Alternative to Soil Classification with the NRCS Web Soil Survey

This spreadsheet has been designed by Idaho Department of Water Resources to determine the soil type and classification at the pond site.

This sheet is designed for users with access to ESRI ArcMap and corresponding Geographic Information System software.

External users will need to download the **PondSoils** layer from the IDWR website.

For IDWR employees, the filename and path for the **PondSoils** layer can be found here:
X:\Spatial\Soils\USCS\PondSoils.mdb

The **PondSoils** layer may also be accessed using the WRedit toolbar (Process > Base Layers > Soils).

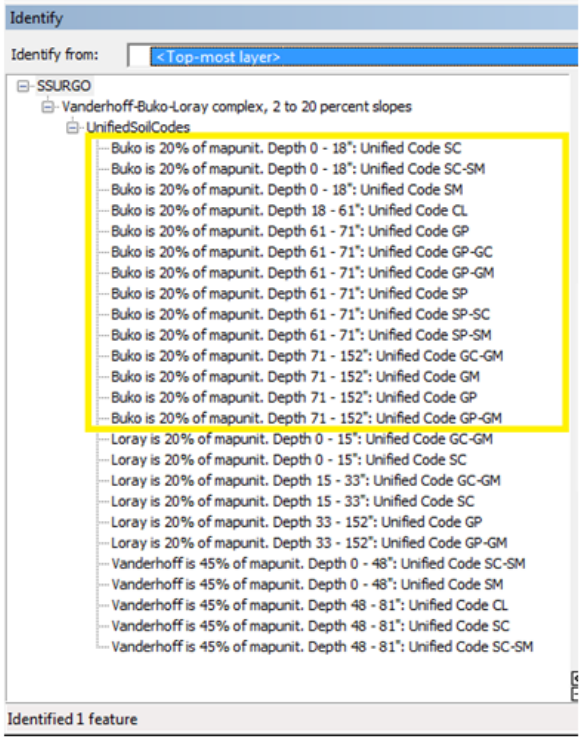
The **PondSoils** layer is comprised of two soils layers:

1. The **SSURGO** (Soil Survey Geographic database) layer contains detailed spatial and attribute data. It covers about $^2/_3$ of Idaho. If no SSURGO soil polygon is available for an area, the STATSGO soils are shown.
2. **STATSGO** is a more generalized soil layer. It covers about $^1/_3$ of Idaho. The STATSGO (State Soils Geographic database) layer will provide a few short remarks about the soil classification.

An example from each of the layers is shown below:

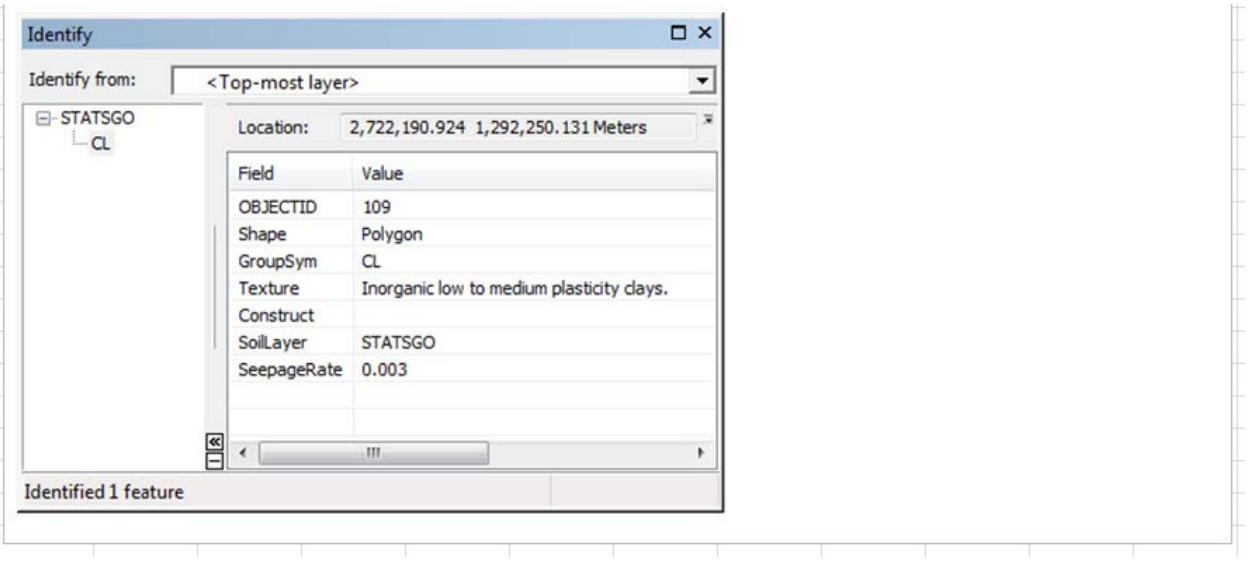
1. **SSURGO**

- The percent (%) each soil component comprises of the soil type is shown. The percentages shown for the soil components may not add up to 100%. Generally the remainder percentage indicates non-soil areas within the soil type (ie. rock outcroppings or bedrock etc) In the example below, the Buko soil component is highlighted; 15% of the soil type polygon may be rock.
- Each soil type (polygon) can have up to 3 soil components (ie. Vanderhoff-Buko-Loray complex, 2 to 20 percent slopes). There is no polygon feature which displays exactly where each soil component is located.
- Each soil component (ie. Buko) can have up to 6 soil horizons. There is no map feature for a soil horizon.
- Each soil horizon will have a depth range and Unified Soil Code (ie SP). When looking at the soil horizons, they may not sort in order of depth.



2. STATSGO

- The STATSGO (State Soils Geographic database) layer will provide the Unified Soil Code, soil texture, remarks on pond ponstruction (if applicable), and an average seepage rate (feet per day) in non-gravelly soils.
- For gravelly soils, a pond liner may be necessary. Even in gravelly soils, 0.2 feet per day is the maximum seepage rate allowable.



Soil Classification with Published Soil Surveys

Alternative to Soil Classification with the NRCS Web Soil Survey

This spreadsheet has been designed by Idaho Department of Water Resources to determine the soil type and classification at the pond site.

FILE NUMBER	xx-xxxxx	Print Page to PDF	User Input
REVIEWER	Joe Agent		Calculated value
DATE	1/1/00		Formula Explanations

County: Ada , Idaho

1. Navigate to the NRCS Soil Survey Website

NRCS Published Soil Surveys for Idaho found at:

http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=ID

Reviewer used the Survey entitled: Ada County Area

2. Use GIS and the Soil Survey to determine Soil Type

Utilize ArcGIS to Obtain the Soil Symbol (may be a number or abbreviated name)

The shapefile SSURGOOnePlan is found at X:\Spatial\Soils\SSURGOOnePlan\soils.shp

Soil Symbol (GIS field MUSYM): 116 What if my Soil Symbol is 999?* (see box

Find the name of the soil in the Soil Legend.

The Soil Legend is typically the last bookmark in the Soil Survey report.

The Full Name of This Soil is: Payette-Quincy complex, 15 to 30 percent slopes

3. Use the Soil Survey to determine the USCS Classification

Within the county NRCS Soil Survey report, click the bookmarked link to "Tables."

Scroll down until you reach a table called "Engineering Properties and Classifications" or "Engineering Index Properties." The table is ordered by soil symbol and the soil name.

Scroll down until you reach the soil which matches your soil symbol and name.

The table lists the USCS Classification for each depth in the soil profile.

Be sure to use the predominant soil classification for the pond depth where seepage occurs.

If the pond has a greater depth than the soil survey, use data from the lowest depth reported.

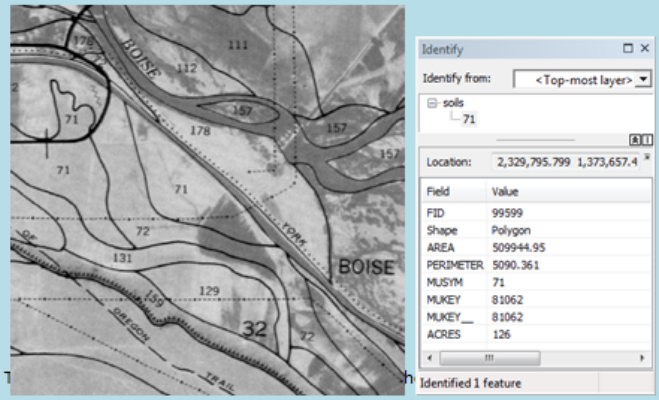
Pond Depth:	4	feet	=	48	inches

The Soil Survey states the soil USCS Classification at	48	inches is	SM

How to Read Soil Maps in the NRCS Soil Survey s

The reviewer may need to utilize the soil maps found within the NRCS Soil Survey. The desired bookmark will be named "Index to Map Sheets" or "Detailed Soil Map." The index page displays the county divided up into individual map sheets. Click the sheet which represents the location of the pond under examination. The **small** font number found in the center of each polygon is the Soil Symbol.

For example, the soil symbols shown below include 71, 72, 111, 112, 129, 131, 157, 159 and 178. In the map below, the number 32 is not a soil symbol.



***What if my Soil Symbol is 999 or null?**

The SSURGOOnePlan shapefile displays soil types for much of Idaho, but it does not cover all land area. No soil data is available in GIS for areas which display a Soil Symbol Number of 999.

Many of these null regions are located at Idaho's core - harshly mountainous land. The NRCS has not published Soil Surveys for these locations. On this sheet, type in USCS Soil Classification as "unknown." On the next sheet, a seepage loss rate of 0.2 ft. per day should be used.