5 Tier 2 Analysis – Is Degradation Necessary and Important?

This section of the document describes the analysis necessary to determine whether significant degradation of high quality (Tier 2) water is justified. It also describes how DEQ will determine if degradation is significant or not, and how DEQ will be assured that controls on other sources of pollution to a high quality water body are being implemented before allowing justifiable degradation. Examples of Tier 2 antidegradation reviews are provided in Appendix E.

For waters that are determined to be of high quality (see Tier 2 determination in section 2.2 Assignment of Tier 2 Protection2.2 Assignment of Tier 2 Protection), the rules at IDAPA 58.0102.051.02 require that before DEQ allows degradation that is significant it must be shown to be:

> "…. necessary to accommodate important economic or social development in the area in which the waters are located."

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This requirement can be broken down into two components: 1) necessity of the degradation in water quality; and 2) importance of social or economic development associated with an activity or discharge. Hereafter we refer to this simply as necessary and important. For the latter, the geographic scope—the area in which the waters are located—is a necessary consideration that must be defined during the analysis. Assuring that degradation of high quality waters is necessary and important has been part of the federal regulation since 1983 and DEQ policy as set in rule since 1993.

While necessity and importance are the core of Tier 2 analysis, federal regulations (40 CFR 131.12(a)(2)) and Idaho policy in rule (IDAPA 58.0102.051.02) also require:

> "In allowing such degradation or lower water quality, the Department shall assure water quality adequate to protect existing uses fully. Further, the Department shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source control."

In 2011, Idaho codified in rule antidegradation implementation procedures that address the above longstanding policy requirements and provide details on the determination of necessary and important degradation. The new rules also provide for allowing insignificant discharges to without Tier 2 waters without analysis of necessity and importance.

For When allowingable degradation in a Tier 2 water, it is always still necessary to assure water quality will still adequately protect existing uses. That is the purpose of Tier 1 protection, which is provided to all waters and is addressed in section 4 Tier 1 Review – Protecting Existing Uses4 Tier 1 Review – Protecting Existing Uses. Tier 2 protection is, in effect, an extra level of protection for some waters that goes above and beyond Tier 1 protection for high quality waters.

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The remainder of this section goes into detail on four questions that come up only in Tier 2 antidegradation analysis:

1. Is the discharge insignificant?
2. Are other required controls in place and operating?
3. Is the degradation necessary?
4. Does the activity bring important social or economic development to the affected community?

~~Before considering these questions, i~~It should be ~~noted~~ remembered that these questions ~~they~~ apply only to:

- activities or discharges that will cause degradation, of
- high quality water where Tier 2 protection is assigned, ~~and~~when
- ~~when~~ an applicant applies for a new or renewed permit or license

5.1 Insignificant Degradation

Although the federal regulations make no mention of insignificant degradation, court cases have allowed for activities or discharges that are "de minimis," that is, too trivial to warrant governmental regulatory concern[19]. The purpose of determining whether some degradation is insignificant is to ensure that limited state resources are focused where they can provide the most good. A determination of insignificance simply means that Idaho is willing to overlook degradation that has little effect in order to focus on discharges or activities that create a larger amount of degradation. Determining that a discharge or activity is significant does not mean that the activity or discharge cannot take place, only that the discharge or activity will need to be justified as necessary and important before it can be permitted. Offsets may be used to prevent what would otherwise be significant degradation (see section 3.4 Use of offsets)

Idaho's antidegradation rule provides for determining a discharge is insignificant. Specifically, Idaho's rule at IDAPA 58.01.02.052.08.a provides:

> a. Insignificant Activity or Discharge. The Department shall consider the size and character of an activity or discharge or the magnitude of its effect on the receiving stream and shall determine whether it is insignificant. If an activity or discharge is determined to be insignificant, then no further Tier II analysis, as set forth in Subsections 052.08.b., 052.08.c., and 052.08.d., shall be required.
>
> i. The Department shall determine insignificance when the proposed change in an activity or discharge, from conditions as of July 1, 2011 will not cumulatively decrease assimilative capacity by more than ten percent (10%).

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[19] In the specific case of antidegradation, the courts have accepted a loss of up to 10% of a water body's assimilative capacity as de minimis, as long as there is a cumulative cap on excused degradation (Kentucky Waterways Alliance v. EPA, 540 F.3d 466 (6th Circuit) Decided Sept. 3, 2008). A 10% threshold for significance is also stated in a August 10, 2005 EPA memo regarding "Tier 2 Antidegradation Reviews and Significance Thresholds" signed by Office of Science and Technology Director Ephraim King.

ii. The Department reserves the right to request additional information from the applicant in making a determination a proposed change in discharge is insignificant.

Assimilative capacity is the difference between ambient concentration and concentration allowed by the controlling criterion. Allowing multiple insignificant regulated sources to collectively use all the assimilative capacity without going through a Tier 2 review is prevented by having a cap on cumulative degradation in water quality that is considered insignificant. Idaho bases its cap on assimilative capacity.

Idaho set a cumulative cap at 10% of assimilative capacity and establishes water quality conditions as of July 1, 2011 as the baseline. Without a cumulative cap, a series of insignificant discharges over time could cumulatively consume a significant share, or all, of the assimilative capacity and ultimately degrade water quality down to the level of the criterion without necessity and importance ever being questioned. A cumulative cap merely prevents the lack of analysis that could occur through a series of incremental steps, none of which are significant in themselves.

This works as depicted in Figure 5, so that the greatest amount of change in a pollutant concentration that can be dismissed as insignificant would occur when the ambient concentration of that pollutant as of July 1, 2011, is lowest.

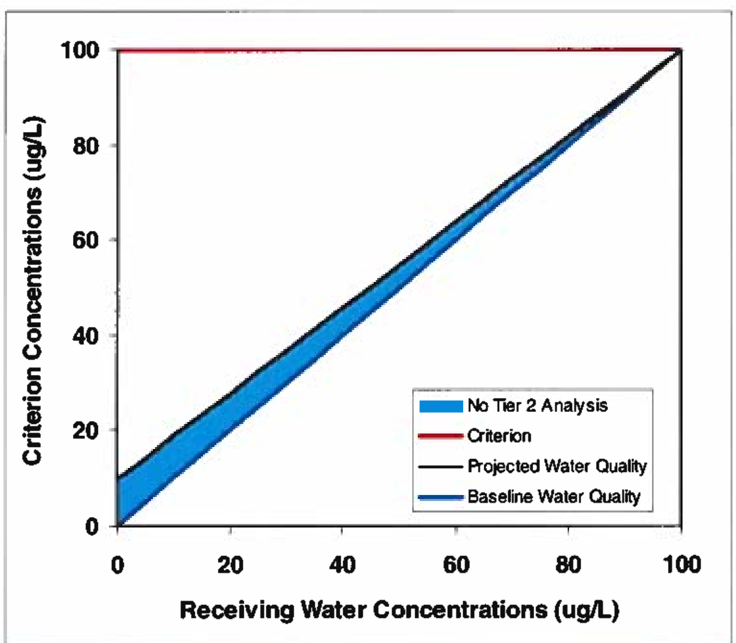

Figure 5. Insignificant Discharge" **This graph illustrates what would be considered "insignificant" when examining a single new/increased discharge in a high quality water**

without consideration of a cumulative cap. First, you determine the applicable baseline water quality. Then you compare that to the criterion to determine the remaining assimilative capacity. Ten percent of the remaining assimilative capacity is the basis for an insignificance determination. The blue shaded area is the change in water quality considered insignificant in this example.

Applying this for parameter~~s~~ concentrations regulated by narrative criteria, such as sediment and nutrients, will require determining a numeric value applicable to the receiving water body in question.

This can also be tabulated as shown in Table 4~~Table 4~~.

As an example, consider pollutant "Y" with a criterion of 100 ug/L and an ambient concentration of 20 ug/L as of July 1, 2011. The assimilative capacity for Y in the water is 80 ug/L and the threshold based on assimilative capacity would be 8.0 ug/L with a cumulative cap of 28.0 ug/L (10% of 80 ug/L = 8 ug/L added to the ambient concentration of 20 ug/L = 28 ug/L).

Table 4. Example of Assimilative Capacity, and Associated Significance Thresholds (all values in ug/L)

Ambient Concentration (July 1, 2011)	Assimilative Capacity (July 1, 2011)	10% of Assimilative Capacity	Threshold Water Quality Change for Significance
10	90	9.0	9.0
20	80	8.0	8.0
30	70	7.0	7.0
40	60	6.0	6.0
50	50	5.0	5.0
60	40	4.0	4.0
70	30	3.0	3.0
80	20	2.0	2.0
90	10	1.0	1.0
100	0	0	0

Now consider a series of discharges, or increases in a single discharge, over time to the same water body. ~~For pollutant Y (ambient concentration of 20 ug/L as of July 1 2011 and criterion of 100 ug/L),~~ Example 1 (Table 5) illustrates how this would work for a series of ~~six~~ four proposed changes in discharge for a pollutant with an ambient concentration of 20 ug/L as of July 1, 2011 and a criterion of 100 ug/L. Initially - that is as of July 1, -2011 - the remaining assimilative capacity is 80 µg/L, of which 10% or 8 µg/L can be lost before the change in water quality becomes significant.

~~In o~~Only the final increase on Jan. 1, 2023 ~~two of the illustrated cases~~ would ~~the change in water quality~~ be considered a significant change in water quality, because~~-~~ the cumulative change would exceed the allowable 10% loss in assimilative capacity. The first three cases of increased discharge are all insignificant because the cumulative loss of assimilative capacity does not exceed 10% (8µg/L) of the initial value (80 µg/L) on July

1, 2011. is the one caused by the discharge change on Aug 1, 2012 when the corresponding change in receiving water concentration would be greater than the 2.0 ug/L threshold. The second case is the final discharge. Although, in the latter case, the receiving water concentration would only change by 1 ug/L from the previous concentration, the cumulative change would exceed the allowed 10% change in assimilative capacity. Therefore, the last discharge would not be insignificant.

Table 5. Example 1 of Significance Determinations for a Series of Changes in Discharge

Date of Change In Discharge	Receiving Water Concentration (ug/L) After Mixing	Remaining Assimilative Capacity µg/L	Used Assimilative Capacity µg/L	Water Quality Change Significant?
(as of July 1, 2011)	20 ug/L	80	na	—
Sept 30, 2011	21	79	1	No, <10% of starting assimilative capacity used
July 30, 2012	22			No
Aug 1, 2012	25			Yes, change is greater than 10% of starting ambient water concentration
Nov 30, 20122015	26.5	73.5	6.5	No
Dec 16, 20122020	28	72	8	No
Jan 1, 20132023	29 29.5	70.5	9.5	Yes, cumulative change in receiving water concentration exceeds 10% of starting assimilative capacity

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Now cConsider a second example for the same pollutant (criterion of 100 ug/L) in another water body where the initial ambient concentration was is 80 ug/L as of July 1, 2011. The threshold for determining significance based on ambient concentration would be 8.0 ug/L. The assimilative capacity for the pollutant Y in the water would be 20 ug/L and thus the threshold for cumulative loss based on this initial assimilative capacity would be 2.0 ug/L, with a cumulative cap of 82.0 ug/L (10% of 20 ug/L = 2 ug/L added to the ambient concentration of 80 ug/L = 82 ug/L). In this example 2.0 µg/L (10% of assimilative capacity), determines the significance of individual changes, up to the cumulative cap, after which all additional change is significant.

Example 2 in Table 6 illustrates how this would work for the same series of proposed discharge changes in discharge as in Example 1. Only the first discharge could claim insignificance. All subsequent discharges are over the cumulative cap and are thus significant, even though the incremental change for each of the third and fourth through sixth discharges is less than 2.0 µg/L.

Table 6. Example 2 of Significance Determinations for a Series of Changes in Discharge

Date of Change in Discharge	Receiving Water Concentration (ug/L) After Mixing	Water Quality Change Significant?
(as of July 1, 2011)	80	—
Sept 30, 2011	81	No, change is < 10% of assimilative capacity and under cap
July 30, 2012	82.1	Yes, change is < 10% of assimilative capacity but over cap
Aug 1, 2012	85	Yes, over cumulative cap
Nov 30, 2012	86.5	Yes, over cumulative cap
Dec 16, 2012	88	Yes, over cumulative cap
Jan 1, 2013	89	Yes, over cumulative cap

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Date of Change in Discharge	Receiving Water Concentration (ug/L) After Mixing	Remaining Assimilative Capacity ug/L	Used Assimilative Capacity µg/L	Water Quality Change Significant?
(as of July 1, 2011)	80	20	na	—
Sept 30, 2011	81	19	1	No, <10% of starting assimilative capacity used
Nov 30, 2015	86.5	13.5	6.5	Yes, cumulative change in receiving water concentration exceeds 10% of starting assimilative capacity
Dec 16, 2020	88	12	8	Yes
Jan 1, 2023	89.5	10.5	9.5	Yes

Analysis of insignificance is necessarily done by pollutant. Thus, it is possible that some proposed changes in pollutant discharge will be found insignificant while others are significant for the same discharge. When this is the case, even one pollutant causing significant change in water quality will trigger the need to take Tier 2 analysis further for that pollutant. If the proposed change in all pollutants evaluated is insignificant, then the discharge as a whole is insignificant and further Tier 2 analysis is not needed.

If a proposed activity or discharge is determined significant, it only means further Tier 2 analysis is required, it does not automatically mean the discharge is not allowed or must be modified. It is possible that no changes in the discharge as proposed are needed before allowing the discharge but that is the subject of alternatives analysis.

Baseline Water Quality as of July 1, 2011

Baseline water quality as of July 1, 2011 does not mean the conditions exactly on that date and that date alone, but rather the water quality under critical conditions that would exist given authorized discharges and non-point source activities as of that date. Furthermore, it is the quality that would be present if other sources of pollutants that affect water quality for the parameter under question were to be discharging at their full permitted load. This is the baseline water quality for judging loss of assimilative capacity and whether new or increased activity or discharge after July 1, 2011 will be causing significant degradation of water quality.

Where ambient monitoring data is available, such as from discharge monitoring reports (DMRs), DEQ recommends that the 95th percentile from at least a year of monthly data be used to characterize baseline water quality. If there are upstream sources that contribute to baseline water quality, then their potential contribution to baseline quality, i.e. full permitted loads if that is not what they were discharging at as of July 1, 2011, will need to be added in. In situations where new or increased upstream sources have contributed to degradation of water quality since July 1, 2011, their contribution will need to be subtracted out.

For many water bodies, it is likely there will be insufficient monitoring data to document the baseline water quality as of July 1, 2011. This is especially true for new sources or a new process or new pollutant of interest. In these situations DEQ will do its best to anticipate the need for data and work with dischargers to acquire the data needed. This will be new data so it will be necessary for DEQ to do its best to estimate water quality under critical conditions by starting with measurements of present water quality, then "backing out" increases in pollutant loads authorized since July 1, 2011, to determine baseline water quality.

Conditions as of July 1, 2011 does not mean the water quality exactly on that date and that date alone, but rather the water quality under critical conditions that would exist given authorized discharges and non-point source activities as of that date. This is the baseline water quality for judging degradation from new or increased activities or discharges after July 1, 2011.

For many water bodies, DEQ will lack the monitoring data to document the baseline water quality as of July 1, 2011. In this situation, it will be necessary for DEQ to do its best to estimate water quality under critical conditions by starting with measurements or calculations of present water quality, then "backing out" all increases in pollutant loads authorized since July 1, 2011, to find water quality as of that date.

See section 3.1 Receiving Water Quality3.1 Receiving Water Quality for more on determining baseline water quality.

5.2 Assurance Other Controls Are Achieved

Federal regulations (40 CFR 131.12(a)(2)) and Idaho's policy in rule (IDAPA 58.0102.051.02) require that degradation of high quality water cannot be allowed unless measures to control other sources of water quality degradation in the watershed will be achieved. This analysis is specific to the pollutants/parameters that are determined to be significant in the proposed or increased activity or discharge. In the Idaho policy, this is stated as:

> In allowing any degradation of high water quality, the Department must assure that there shall be achieved in the watershed the highest statutory and regulatory

> requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source controls. In providing such assurance, the Department may enter together into an agreement with other State of Idaho or federal agencies in accordance with Sections 67-2326 through 67-2333, Idaho Code.

The WQS define "cost-effective and reasonable best management practices (BMPs) for nonpoint source" as approved BMPs specified in the Idaho WQS and "highest statutory and regulatory requirements for point sources" as:

> "All applicable effluent limits required by the Clean Water Act and other permit conditions. It also includes any compliance schedules or consent orders requiring measures to achieve applicable effluent limits and other permit conditions required by the Clean Water Act. " IDAPA 58.0102.010.45

DEQ will generally review point source and nonpoint source controls on a WBID unit basis (including those areas upstream and downstream of the discharge) unless it is determined that a larger spatial extent is necessary for a particular pollutant. While no more is required of other sources than already is required before a new activity or discharge is proposed, this rule language does require DEQ to check up on other sources, in the context of proposed degradation of water quality, and verify they are meeting their respective control requirements or have an enforceable mechanism in place to achieve those requirements.

For other point sources that have NPDES permits, this verification means looking at permit compliance reports and identifying any matters of non-compliance that indicate that the pollutant(s) or parameter(s) of significance are being discharged at a level greater than permitted. If information is lacking, such as in any failure to monitor effluent as required, DEQ will not be able to determine compliance.

For nonpoint sources with approved BMPs, e.g., rules pertaining to the Idaho Forest Practices Act; Stream Channel Alteration Rules and Rules Governing Exploration and Surface Mining, and BMPs in the Idaho Agricultural Pollution Abatement Plan, DEQ will presume such BMPs are reasonable.

DEQ will make efforts to contact, work with, and generally rely on other agencies to verify all required pollution controls for point sources and cost-effective and reasonable BMPs for nonpoint sources are in fact in place and operating.

If noncompliance with required pollutant discharge controls or BMPs is identified for the pollutant(s) or parameter(s) of significance, then DEQ will determine if there is an enforceable agreement in place with the appropriate regulatory authority to achieve compliance. For situations where noncompliance is occurring and no enforceable agreement is in place, DEQ will notify the applicant that the requirements for potentially allowing degradation are not met. DEQ may provide options to the applicant to consider on how to resolve such a situation, including contacting Designated Management Agencies.

5.3 Assuring Necessity through Analysis of Alternatives to Degradation

As stated at the outset of this chapter, federal and state regulations require that in order for DEQ to allow degradation of high quality water it must be *necessary and important*. This section describes the process of determining whether it is necessary, and the process of determining importance is described in the next section.

Determining whether the proposed pollution is necessary requires an analysis of the various alternatives that are available to the discharger to identify the least degrading alternative that is reasonable to reduce or eliminate the pollutant(s) or parameter(s) of significance associated with the discharge. This analysis of alternatives identifies feasible alternatives, evaluates the reasonableness of implementing them, considers costs, and selects one that contributes the least amount of significant pollutant(s) possible under reasonable circumstances.

The Idaho antidegradation implementation rule (IDAPA 58.0102.052.08) establishes principles to be followed in identifying alternatives and selecting the least degrading alternative that is reasonable.

> c. **Alternatives Analysis.** Degradation will be deemed necessary only if there are no reasonable alternatives to discharging at the levels proposed. The applicant seeking authorization to degrade high water quality must provide an analysis of alternatives aimed at selecting the best combination of site, structural, managerial and treatment approaches that can be reasonably implemented to avoid or minimize the degradation of water quality. To identify the least degrading alternative that is reasonable, the following principles shall be followed:
>
> i. Controls to avoid or minimize degradation should be considered at the earliest possible stage of project design.
>
> ii. Alternatives that must be evaluated, as appropriate, are:
>
> (1) Relocation or configuration of outfall or diffuser;
> (2) Process changes/improved efficiency that reduces pollutant discharge;
> (3) Seasonal discharge to avoid critical time periods for water quality;
> (4) Non-discharge alternatives such as land application; and
> (5) Offsets to the activity or discharge's effect on water quality.
>
> iii. The Department retains the discretion to require the applicant to examine specific alternatives or provide additional information to conduct the analysis.
>
> iv. In selecting the preferred alternative the applicant shall:
>
> (1) Evaluate economic impacts (total cost effectiveness, incremental cost effectiveness) of all technologically feasible alternatives;
> (2) Rank all technologically feasible treatment alternatives by their cost effectiveness at pollutant reduction;
> (3) Consider the environmental costs and benefits across media and between pollutants; and

(4) Select the least degrading option or show that a more degrading alternative is justified based on Subsections 052.08.c.iv.(1), 052.08.c.iv.(2), or 052.08.c.iv.(3) above.

Thus, consideration of alternatives that would still allow the desired development with less or no pollution is a required part of the Tier 2 demonstration of necessity.[20]

Evaluating Alternatives and Making a Choice

While only technologically feasible alternatives should be considered, they will likely vary in their level of pollutant loading and may not all be reasonable. They may vary widely and non-linearly in cost-effectiveness of pollution reduction and involve competing environmental costs and benefits. Discharge alternatives will also rank in cost to the discharger and at some point will not be reasonable to implement. Choosing the preferred alternative becomes a matter of balancing cost of pollution reduction versus overall environmental gain, while remaining affordable. The type of pollution controls that are reasonable to implement will be pollutant and process specific.

In some cases, treatment costs can be and are passed on to the consumer, e.g. ratepayers in the case of a publicly-owned sewage treatment plant. Who will ultimately bear the cost is important in fairly assessing whether an alternative can be reasonably implemented. To make the selection process more systematic a four step winnowing of alternatives is recommended, in which the following are determined:

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1. amount of degradation caused,
2. cost-effectiveness of pollutant removal,
3. environmental cost-benefit tradeoffs, and
4. affordability of alternatives.

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Because there are steps described in both the analysis of alternatives and the analysis of social and economic importance, the alternative analysis steps are labeled AA (the socioeconomic importance steps, in the next section, are labeled SEI).

Timing and Integration of Alternatives Analysis

DEQ believes earliest possible consideration of alternatives that will reduce or eliminate pollutant discharge is of paramount importance to minimizing project delay or redesign during water quality permitting and ultimately meeting the intent of antidegradation to maintain high water quality.

It is not DEQ's intent to create a whole separate analysis of alternatives in project design. Rather, to the extent there is a proposed discharge of pollutants that could degrade water quality, DEQ believes it is prudent to consider the implication of water quality

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[20] See EPA Advance Notice of Proposed Rulemaking (ANPRM) 63 Federal Register 36742, 36784 (1998).

degradation and the Idaho antidegradation requirements at the outset and integrate them into project design. To this end, DEQ encourages early communication between project designers, EPA or ACOE permit writers, other federal agencies involved in complying with the National Environmental Policy Act (NEPA) and DEQ staff that will be responsible for review of an application for permit or license.

Identifying Non-Degrading and Less-Degrading Pollution Control Measures

Minimizing degradation is a process to evaluate waste generation as well as treatment, and manner of waste disposal. This can involve changes in location or timing of discharge to surface water, as well as alternatives to the direct discharge to surface waters, such as land application, groundwater injection, or reuse. Finally an entity considering new or increased discharge of pollutants could work with other dischargers upstream in the same watershed to reduce pollutant loads upstream of the degradation and thereby offset their own proposed adverse effect on water quality.

For facilities that have an outfall, relocation or reconfiguration of an outfall or diffuser must be considered where appropriate. While this action alone will not reduce pollutant loads, it can be effective in reducing receiving water concentrations and thus the effect on high water quality. This is particularly true where a larger stream offering greater assimilative capacity is nearby and will be most useful as a consideration in location of a new facility, but for existing discharges it could be beneficial to extend pipe to a larger stream. Diffusers, which do not alter fully mixed concentrations, are effective in altering the extent and distribution of elevated pollutant concentrations and thus minimizing degradation of high quality water.

Generation of waste that needs to be treated and discharged might be reduced through changes in industrial process or greater efficiency in raw material utilization. The latter will save material cost as well as reduce waste. Sometimes a substitution in materials is found to be worthwhile if more costly raw materials create even greater savings in waste treatment costs. For a municipality, waste reduction could include such things as hazardous waste education and collection to reduce loads at the source. Other examples might be recovery of heat from an effluent, water conservation, or reuse.

Usually there is a critical or limiting time for waste discharge, typically during seasonal low flows when assimilative capacity of flowing waters is at a minimum. If wastewater can be stored seasonally or alternatively discharged seasonally, e.g. through land application or irrigation use during the summer, the critical time for aquatic life and recreation use may be avoided and thus reduce overall degradation of water quality and need for load reduction.

Ways to avoid discharge to surface water are to land apply it, inject it into ground water or use a closed loop reuse system. These all have their limitations, e.g. potential impacts to groundwater and indirectly to surface water, and their own permitting requirements. But for some processes in some settings, such non-discharge alternatives can be viable. With the increasing shortage of water in many areas and overall increase in the value of water as a resource, some form of reuse, even if not in the original process, will likely become more attractive and commonplace with time and therefore could become more cost effective to implement.

Often there are multiple sources of pollution, especially for any sizeable receiving water body. Some sources may have been operating for a long time and although they are discharging legally, redesigning their facilities or processes may provide for greater pollution reduction than better design of a new source would. This creates an opportunity for the operator of a proposed new or increased discharge to join forces with other dischargers and forge a binding agreement that would reduce their combined pollutant loads and improve water quality of the water body as a whole compared to what may otherwise be the case.

With advances in application of pollution control technology there are examples in which what was once unreasonable or not even considered becomes possible, then reasonable, and eventually the norm. This is the likely progression for water use and treatment. New efficiencies and treatment technologies are almost certain to arise, driven in part by society's values and also made affordable by society's relative values. But these things cannot be predicted beyond general terms. To account for such changes, DEQ has reserved the right to require an applicant to examine specific alternatives such as reducing waste generation.

The overall goal of alternative analysis is to find ways to minimize or eliminate the detrimental effect on water quality by whatever means can be reasonably implemented for the pollutant(s) or parameter(s) of significance. This analysis may result in the identification of multiple reasonable alternatives. While some cost savings may ensue from some of the alternatives, for the most part steps to discharge less pollution are going to cost more and therefore raise the question whether it is reasonable to implement more costly pollution control alternatives.

~~**Evaluating Alternatives and Making a Choice**~~

~~While only technologically feasible alternatives should be considered, they will likely vary in their level of pollutant loading and may not all be reasonable. They may vary widely and non-linearly in cost-effectiveness of pollution reduction and involve competing environmental costs and benefits. Discharge alternatives will also rank in cost to the discharger and at some point will not be reasonable to implement. Choosing the preferred alternative becomes a matter of balancing cost of pollution reduction versus overall environmental gain, while remaining affordable. The type of pollution controls that are reasonable to implement will be pollutant and process specific.~~

~~In some cases, treatment costs can be and are passed on to the consumer, e.g. ratepayers in the case of a publicly-owned sewage treatment plant. Who will ultimately bear the cost is important in fairly assessing whether an alternative can be reasonably implemented. To make the selection process more systematic a four step winnowing of alternatives is recommended, in which the following are determined:~~

1.amount of degradation caused,
2.cost-effectiveness of pollutant removal,
3.environmental cost-benefit tradeoffs, and
4.affordability of alternatives.

Because there are steps described in both the analysis of alternatives and the analysis of social and economic importance, the alternative analysis steps are labeled AA (the socioeconomic importance steps, in the next section, are labeled SEI).

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AA Step 1 – Ranking alternatives from least to most degrading

First, all feasible alternatives should be ranked from least to most degrading of water quality. The applicant may bypass further analysis of alternatives (steps 2-4) by selecting the least degrading alternative feasible for the pollutant(s) or parameter(s) of significance.

If the applicant opts for the least degrading alternative at this point, the test of degradation necessity is met and analysis to determine social and economic importance should be conducted. If the least degrading feasible option is not preferred, then the next least-degrading alternative may be justified as reasonable on the basis of cost-effectiveness of improved pollutant reduction, environmental trade-offs, or affordability. Steps 2-4 are optional, needed only if the applicant wishes to justify that an alternative other than the least degrading feasible alternative is reasonable.

AA Step 2 – Ranking alternatives by the cost-effectiveness of their pollutant reduction

If proceeding, step 2 is to rank alternatives by their pollutant-reduction cost-effectiveness. Cost-effectiveness looks at the cost per unit mass of pollutant removed, e.g., dollars per pound ($/lb). Most processes generate an effluent stream or volume per day, therefore cost-effectiveness becomes unitized as $/lb/million gallons per day [MGD], or other comparable units.

Greater pollution reduction will typically cost more, but economies of scale and alternate technologies can result in different per-unit costs.[21] It is not within the scope of this guidance to go into detail on treatment costing and the amortization of initial capital costs versus ongoing operation and maintenance costs. Suffice it to say that if alternatives are ranked by their per-unit pollutant reduction costs, the marginal cost of improved pollutant reduction can be simply compared. Doing so may allow the justification of a more-degrading alternative if the incremental cost of improved treatment far outweighs the incremental gain in pollutant reduction.

[21] Some costs of treatment will be scalable. For example, power costs and cost of reagents such as alum go up in proportion to the volume treated. However, differing treatment alternatives have differing costs that aren't always proportional to volume. Instead, a doubling of pollutant reduction may cost more or less than twice as much. Therefore, options are best compared on a per unit basis, taking into account all various costs and their timing.

For example, if the least-degrading alternative removes 100 lbs of a pollutant for $10,000 per MGD, the unit cost is $100/lb/MGD. If the second-least-degrading alternative removes 90 lbs of the pollutant for only $900 per MGD, its unit cost is only $10/lb/MGD. The latter is much more cost-effective as there is a sharp jump in per- pound cost for removing the additional 10 lbs/MGD, a marginal cost of $910/lb/MGD (($10,000 - $900) / 10 lbs). In this case, it would be easy for the discharger to argue that the marginal cost of removing 10 more lbs of pollutant was unreasonable and thus the next best alternative should be accepted as the preferred alternative. In this way, alternatives that impose a cost that is disproportionate to the possible environmental gain may be eliminated from further consideration.

Consider the previous example further. If the third-least-degrading alternative could achieve pollutant reduction of 50 lbs at a cost of $450 per MGD, the cost per lb of treatment would be only slightly better at $9/lb/MGD and the marginal cost of nearly doubling pollutant removal compared to using the second-least-degrading alternative would be $11.25/lb/MGD ($900 - $450 / 40 lbs). ~~Cost-effectiveness alone should not rule; it should be tempered by consideration of affordability and standard practice in the industry. In this example, the second-best alternative is only slightly less cost effective than the third best ($11.25/lb/MGD vs. $10/lb/MGD) but offers a large improvement in pollutant load reduction. While overall treatment costs double they may still be quite reasonable—both affordable and worthwhile give their cost-effectiveness. Furthermore, if the $900 per MGD second-best alternative is commonly implemented by similar facilities, then the argument for the cheaper option is less compelling.~~

AA Step 3 – Considering environmental trade-offs

The example above, comparing alternatives' cost-effectiveness, looks at only one pollutant in isolation. There are almost always multiple pollutants in a discharge and what may be the best alternative for one may not be the best for another. This is a situation in which a lot of judgment is involved.

As a hypothetical example, a discharge may involve adding heat as well as phosphorus to a receiving water. Some of the treatment processes and alternatives may be quite different, e.g., chilling for temperature and ultra-filtration for phosphorus; maximizing one will do nothing for the other and treatment costs will be additive. Finding the optimum environmental solution in this situation may involve some intermediate level of treatment of both phosphorus and temperature. A compromise in treatment may also be warranted if it is found that one of the pollutants is more limiting to support of beneficial uses. In the latter case, it would make more environmental sense to favor the treatment of the limiting pollutant; in this example, favoring temperature reduction over phosphorus reduction. This could be further complicated if costs of treating temperature are substantially greater than the cost of treating phosphorus. In that case phosphorus treatment may offer more environmental benefit per unit cost of pollutant reduction, even though temperature overall is judged the more limiting pollutant. Another alternative for treating both may avoid such trade-off, e.g. land application could deal with both temperature and phosphorus at once, without additive costs for each pollutant, but a trade-off may occur in that there would be less water in the receiving water body.

Another form of environmental trade-off is between media—that is, reducing discharge to water may create more air pollution or solid waste to be disposed of. In addition to the direct effects of increased pollutant loads to other media, either of the latter may eventually affect water quality as well. For example, we may question the virtue of using electricity to run chillers to cool effluent temperatures (to keep our streams cooler) when we have every reason to believe the release of carbon dioxide from thermo-electric power generation contributes to global warming and thus to warming stream temperatures.

The choices may be difficult to delineate and hard to illuminate. It may be difficult to quantify such trade-offs in a common currency such as $/lb/MGD but efforts to do so will be useful and will help reduce the amount of judgment that will otherwise be required. No easy answers can be given, but nonetheless DEQ believes that thinking about and considering such trade-offs is important if not necessary. The applicant is encouraged to raise issues of environmental trade-offs, and may, but is not required, to quantify them.

The only thing we know for sure is that the less pollution discharged to the environment the better environmental quality will be. Finding the best place or medium in which to discharge them, and determining what is the most economically efficient way to treat and handle waste considering both public and environmental health versus public or private economic health is an ongoing challenge.

AA Step 4 – Judging affordability

Following an analysis of pollutant-reduction cost-effectiveness and environmental trade-offs, the affordability of the best remaining alternatives will be assessed. This assessment may be used to determine if an alternative is too expensive to reasonably implement. This approach might result in the selection of the next-least-degrading alternative, while maintaining affordability to the public or private entity. Alternatives identified as technologically feasible are considered affordable if the applicant does not supply an affordability analysis.

Cost-effectiveness alone should not rule; it should be tempered by consideration of affordability and standard practice in the industry. In this example, the second-best alternative is only slightly less cost effective than the third-best ($11.25/lb/MGD vs. $10/lb/MGD) but offers a large improvement in pollutant load reduction. While overall treatment costs double they may still be quite reasonable—both affordable and worthwhile give their cost-effectiveness. Furthermore, if the $900 per MGD second-best alternative is commonly implemented by similar facilities, then the argument for the cheaper option is less compelling.

If the applicant determines that the least-degrading remaining alternative is affordable, then it is the preferred alternative. If it is not affordable, then the affordability of the next alternative should be evaluated until an alternative is chosen that is practicable, economically efficient, and overall reasonable.

A demonstration that an alternative is not affordable should be clearly documented and should show that it would have a substantial adverse economic impact that would preclude its use for the activity/discharge under review.

If, after appropriate discussions with the discharger, DEQ determines that the necessity of the preferred alternative has not been demonstrated, DEQ shall either request more information or deny certification of the activity as proposed.

5.4 Evaluating Justification of Social or Economic Importance

If the preferred alternative will result in degradation to the receiving waters, then the applicant must demonstrate that this alternative activity or discharge(or "activity") will result in important economic or social development in the area in which the waters are located. A justification of Social social or Economic economic Justification importance (SEJ) entails showing that the social or economic benefits occurring from an activity are important to the affected community. An activity needs to be either socially or economically important, not both. However, dDepending on the nature of the project, it may be prudent to focus on one or the other.

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The Idaho antidegradation implementation rule (IDAPA 58.0102.052.08) establishes principles to be followed in showing socio-economic justification of an activity that will cause significant degradation:

d. **Socioeconomic Justification.** Degradation of water quality deemed necessary must also be determined by the Department to accommodate important economic or social development. Therefore, the applicant seeking authorization to degrade water quality must at a minimum identify the important economic or social development for which lowering water quality is necessary and should use the following steps to demonstrate this:

i. Identify the affected community;

ii. Describe the important social or economic development associated with the activity, which can include cleanup/restoration of a closed facility;

iii. Identify the relevant social, economic and environmental health benefits and costs associated with the proposed degradation in water quality for the preferred alternative. Benefits and costs that must be analyzed include, but are not limited to:

(1) Economic benefits to the community such as changes in employment, household incomes and tax base;

(2) Provision of necessary services to the community;

(3) Potential health impacts related to the proposed activity;

(4) Impacts to direct and indirect uses associated with high quality water, e.g., fishing, recreation, and tourism; and

(5) Retention of assimilative capacity for future activities or discharges.

iv. Factors identified in the socioeconomic justification should be quantified whenever possible but for those factors that cannot be quantified, a qualitative description of the impacts may be accepted; and

v. If the Department determines that more information is required, then the Department may require the applicant to provide further information or seek additional sources of information.

A project that is socially justified is one that is important to the social development of the local community in at least one aspect, e.g., population growth or job growth or help meet important community service needs, e.g. sewage treatment or transportation infrastructure.. Socially justified projects are likely to bemay include publicly-owned treatment works that provide additional capacity for wastewater treatment, reclamation of mine sites and cleanup of historical sites as such projects provide added environmental benefits. Socially justified projects would need to demonstrate that there is some local need for the project, i.e., identify the social conditions and relate how the project would fulfill those needs.

A project that is economically-justified is a project that is important to the economic development of the local community. Economic development projects would include those that increase the economic base of the local community. An analysis of the economic importance of a project would likely require more in-depth analysis covering how the costs of the proposed degradation (including downstream effects) are offset equaled or exceeded by benefits to the community. This would be a simplified cost-benefit analysis and is more applicable to non-public dischargers.

The applicant should use the following three steps to show the SEJ:

1. Identify the affected community.
2. Identify the relevant factors that characterize the environmental and social or economic conditions of the affected community.
2. Describe the important social or economic development associated with the activity.
3. Identify the relevant factors that characterize the environmental and social or economic conditions of the affected community.

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SEJI Step 1 – Identify the affected community

The affected community is the community in the geographical area in which the waters are located. This area should be large enough to include both the people living near the site of the proposed activity and those in the community who are expected to directly or indirectly benefit from the activity.

SE~~I~~I Step 2 – Describe the important social or economic development associated with the activity

The applicant must describe the benefits of the activity on the economic or social development of the affected community. This description should describe why the activity resulting in degradation of high quality waters in the affected community is important to the overall social or economic health of the community. The applicant should first describe the existing condition of the affected community. Once the current condition of the affected community is established estimates of changes in the community based on the effects of the proposed activity can be made. The applicant should make every effort to quantify these changes but it is recognized that not all social indicators can be easily quantified and a qualitative assessment of changes to these indicators is acceptable.

Some benefits that may accrue from proposed activities include job growth, ability to serve larger area or greater population, increases to property values or increases to the tax base in the affected community, a decrease in household expenses for services and retention of assimilative capacity for future growth.

SE~~I~~I Step ~~2~~ 3 – Identify the factors that characterize the environmental and social or economic conditions of the affected community

In order to describe the economic or social development associated with the proposed project, the applicant will first need to determine the social and economic factors that best characterize the affected community. ~~Examples of~~These social and economic factors include:

- Employment rate
- Personal or household income
- Property values / community tax base
- Provision of necessary public services (e.g., fire department, school, infrastructure)
- Current or potential public health or safety problems (e.g., levels of lead in people's blood)
- Impacts to uses based on water quality (e.g. fishing, recreation, tourism)
- Retaining assimilative capacity for future industry and development
- Environmental benefits associated with reclamation and other restored property

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The social and economic measures identified above do not constitute a comprehensive list. Nor will all be relevant to all activities or discharges. Each situation and community is different and will require an analysis of unique social and economic factors. The applicant is encouraged to consider analyzing additional factors that characterize the specific community under consideration.

Public versus private entities

Public sector developments encompass publicly owned treatment works, public utilities and other entities that are owned and/or operated by a governmental (local, state or federal) agency or an entity that is controlled by the government. Public sector entities typically do not operate on a for-profit basis and generally gain most of their capital for expenses from ~~tax levies~~ user fees and obligation or revenue bonds. Evaluating impacts to public entities may include looking at financial impacts to the public entity and socioeconomic conditions of the surrounding community. Since governments typically have the authority to ~~levy taxes~~increase fees and distribute pollution control costs among households and businesses~~, they may be able to recover pollution control costs through user fees~~. However, the impact of those pollution control costs often may affect a wider community and the general financial and economic health of the community will determine if the impacts are important.

Private developments typically are owned and operated on a for-profit basis. These private entities use profits or investments from shareholders to raise the capital needed for pollution control costs and may pass along those costs to the end user in the form of higher prices for the goods or services they provide. For these private entities, measuring substantial impacts may require estimating the financial impacts on their balance sheet as well as analyzing the overall impact on the surrounding community (e.g., the impact of lost employment on the community, or the increased cost of goods or services).

The line between public and private entities may be blurred when the public entity provides a service to significant numbers of private entities, e.g., a wastewater treatment plant that services a mainly industrial area, or a private, for-profit hospital that provides a substantial benefit to the public. In this case the methods that evaluate public entities and those that evaluate private entities may both need to be employed to determine an overall economic impact.

~~**SEI Step 3 – Describe the important social or economic development associated with the activity**~~

~~Following the identification of appropriate social and economic measures, the applicant must describe the expected changes in these factors that are associated with the project. The purpose of this step is to demonstrate whether important social or economic development will result from the project. The applicant should first describe the existing condition of the affected community. This baseline condition should then be compared to the predicted change (benefit or loss) in social or economic condition should the activity be allowed.~~

Upon the consideration of all relevant factors, the project will be considered to provide important social or economic development if the applicant demonstrates that the project will lead to overall beneficial changes in the factors presented (i.e., increased jobs, employment, housing, or other appropriate factors balanced against the benefits associated with maintaining a higher level of water quality). This determination will be made on a case-by-case basis using information provided with the application and obtained ~~from the public~~during public comment. Activities which provide necessary public service such as a wastewater treatment plant, hospital, or school, or their ~~expansion, will always~~~~may~~expansion, may be ~~likely~~ determined *a priori* to be ~~*a priori*~~ socially important ~~regardless of economic effect on the community~~.

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When information available to DEQ is not sufficient to make a determination regarding the social ~~and~~ or economic benefits or environmental impacts associated with the proposed activity, DEQ may request that the applicant submit additional information.

If, after appropriate discussions with the discharger, DEQ determines that the ~~SEI~~ SEJ of the proposed activity has not been demonstrated, DEQ shall deny certification of the proposed activity. If DEQ makes such a determination, DEQ will provide a written explanation to the applicant of the deficiencies in this analysis.

5.5 Summary of the Justification for Degrading Water Quality

The preceding discussion describes the approach that shall be followed by the applicant for determining whether less- or non-degrading alternatives to the proposed activity will be required to prevent degradation of Idaho surface waters. The following steps summarize the alternatives analysis process and other relevant actions conducted during Tier 2 antidegradation reviews:

- If it is determined that significant degradation would likely occur due to the proposed activity, an analysis of less-degrading and non-degrading alternatives to the proposed activity will be required for the pollutant(s) or parameter(s) that are significant.

- The applicant will be required to identify feasible pollution control alternatives including those that would result in no degradation, and other less-degrading alternatives as appropriate, in addition to the minimum level of pollution control required.

- If the applicant ~~does not~~ prefers the least degrading feasible alternative, ~~the applicant may justify the next least degrading alternative or mix of alternatives as reasonable~~the alternatives analysis is complete.

- To justify a more-degrading ~~option~~ alternative as reasonable the applicant must evaluate the pollutant reduction cost-efficiency, environmental trade-offs, or affordability associated with each ~~option~~ alternative or mix of ~~options~~alternatives.

- The applicant will identify the least degrading alternative – or mix of alternatives – that is reasonable based on the above evaluation. This will be the preferred ~~option~~alternative.

- If the preferred ~~option~~ alternative (i.e., pollution control alternative or mix of alternatives) will not result in significant degradation of the receiving water segment, DEQ will certify the activity without any further SEJ.

- If the preferred ~~option~~ alternative (i.e., pollution control alternative or mix of alternatives) will result in significant degradation of the receiving water, the applicant will be required to conduct an analysis of economic or social benefit.

- If the ~~preferred option~~activity is deemed to be socially or economically important, DEQ will provide certification~~fy the activity~~.