Lower Boise River Implementation Plan Total Phosphorus

Final

Lower Boise Watershed Council
and the
Department of Environmental Quality

December 2008

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Prepared by:

Lower Boise Watershed Council

in cooperation with the

Boise Regional Office
Department of Environmental Quality
1445 N. Orchard
Boise, Idaho

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- MWH

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Abbreviations, Acronyms, and Symbols

§303(d) Refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section

µ micro, one-one thousandth

§ Section (usually a section of federal or state rules or statutes)

ACHD Ada County Highway District

BAG Basin Advisory Group

BLM United States Bureau of Land Management

BMP best management practice

BNR biological nutrient removal

BOR United States Bureau of Reclamation

CFR Code of Federal Regulations (refers to citations in the federal administrative rules)

cfs cubic feet per second

cm centi meters

CWA Clean Water Act

CWAL cold water aquatic life

IDEQ Department of Environmental Quality

DO dissolved oxygen

EPA United States Environmental Protection Agency

FPA Idaho Forest Practices Act

FWS U.S. Fish and Wildlife Service

GIS Geographical Information Systems

HUC Hydrologic Unit Code

I.C. Idaho Code

ICWC Idaho Clean Water Cooperative

IDAPA Refers to citations of Idaho administrative rules

IDFG Idaho Department of Fish and Game

IDL Idaho Department of Lands

IDWR Idaho Department of Water Resources

KAF thousand acre-feet

km kilometer

km^2 square kilometer

LA load allocation

LBR Lower Boise River

LBWC Lower Boise Watershed Council

LC load capacity

m meter

m^3 cubic meter

mi mile

mi^2 square miles

MGD million gallons per day

mg/L milligrams per liter

MOS margin of safety

MS4 municipal separate storm sewer systems

NAS National Academy of Sciences

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

PAT Public Advisory Team

ODEQ Oregon Department of Environmental Quality

ppm part(s) per million

QA quality assurance

QC quality control

SBA subbasin assessment

SCC Soil Conservation Commission

SR-HC Snake River-Hells Canyon

SS suspended sediment

TMDL total maximum daily load

TP total phosphorus

TSS total suspended solids

U.S. United States

USDA United States Department of Agriculture

USDI United States Department of the Interior

USFS United States Forest Service

USGS United States Geological Survey

WAG Watershed Advisory Group

WBAG Water Body Assessment Guidance

WBID water body identification number

WLA wasteload allocation

WQS water quality standard

WWTF wastewater treatment facility

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Executive Summary

The Idaho Department of Environmental Quality (IDEQ) prepared the Snake River – Hells Canyon Total Maximum Daily Load (SR-HC TMDL) (IDEQ/ODEQ 2004) in conjunction with the Oregon Department of Environmental Quality (ODEQ), the Environmental Protection Agency (EPA), and a Public Advisory Team (PAT) for the Snake River from its intersection with the Oregon/Idaho border near Adrian, Oregon (RM 409) to immediately upstream of the inflow of the Salmon River (RM 188). As the report states, "The overall goal of the SR-HC TMDL is to improve water quality in the SR-HC TMDL reach by reducing pollution loadings from all appropriate sources to meet water quality standards and restore full support of designated beneficial uses" (IDEQ/ODEQ 2004, p. 17).

To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a May 1 to September 30 instream total phosphorus (TP) target of 0.07 milligrams per liter (mg/L) in concert with a mean growing season limit for chlorophyll *a* of 14 micrograms per liter (ug/L) (nuisance threshold of 30 ug/L with exceedance threshold of no greater than 25%) for the SR-HC reach upstream from Brownlee Reservoir. To meet this target, the SR-HC TMDL allocates TP loads to point sources and nonpoint sources discharging directly to the SR-HC reach and treats tributaries to the reach "as discrete, nonpoint sources for the purposes of loading analysis and allocation within this TMDL" (IDEQ/ODEQ 2004, pp. 21, 235, 439, 447). The SR-HC TMDL assigned target concentrations of 0.07 mg/L to the mouths of each of the SR-HC reach tributaries as the basis for determining seasonal tributary loading that will attain the SR-HC reach instream TP target (IDEQ/ODEQ 2004, p. 447).

After EPA approved the SR-HC TMDL in September 2004, the task of developing TP allocations for tributary point and nonpoint sources in order to attain the concentration-based tributary targets of 0.07 mg/L fell to IDEQ and the tributary watershed advisory groups (WAGs). Idaho Code section 39-3611(6) provides: "If a pollutant load is allocated to a tributary inflow as part of a downstream TMDL, the director shall develop a plan to meet such allocation in consultation with the tributary watershed advisory group." The SR-HC TMDL anticipated that, in consultation with tributary WAGs, "existing or future tributary TMDL processes will distribute load allocations in the form of load allocations and/or waste load allocations within their specific watersheds", "as an extension of the SR-HC TMDL process" (IDEQ/ODEQ 2004, pp. 21, 235, 439-440, 447).

The Lower Boise Watershed Council (LBWC) serves as the Lower Boise River WAG pursuant to its articles and bylaws, and Title 39, Chapter 36 of the Idaho Code. TP allocations have been developed in consultation with the LBWC to attain the 0.07 mg/L target assigned to the Boise River by the SR-HC TMDL. Attainment of this target will be measured at the mouth of the Boise River. This allocation framework allocates the 0.07 mg/L Parma target to lower Boise River nutrient sources on an equitable and reasonable basis.

Total Phosphorus Allocations

Based on the available information for each of the sources, current loads at the locations of each source in the watershed are estimated as summarized in Table A.

Table A. Summary of Estimated Current (Baseline) Source Loads in kg/day

Source Loads	Load Kg/day
WWTFs	674
Stormwater	79
Agricultural	792
Background	89
Ground Water	31
Sum Source Loads	1664

Monitoring data at Parma indicate that Parma loads are approximately 1,030 kilograms per day (kg/day), compared to the estimated source load of 1,664 kg/day. This means that through a combination of reuse and/or attenuation, not all of the phosphorus generated by sources reaches Parma.[1] By calculating relative contributions, the Parma-adjusted loads are shown in Table B. Note that applying these relative contributions conservatively overestimates the load that reaches Parma, as compared to the available empirical monitoring data.

Table B. Summary of Estimated Current (Baseline) Parma-adjusted Loads in kg/day

Parma Loads	Load Kg/day
WWTFs	310
Stormwater	46
Agricultural	642
Background	9
Ground Water	24
Sum Parma Loads	1,030

A summary of the overall load reduction approach is as follows:

- Significant reduction of phosphorus in effluent from wastewater treatment facilities (WWTFs) within three National Pollutant Discharge Elimination System (NPDES) permit cycles. The proposed approach consists of three steps with an ultimate 15-year time frame for WWTF controls: 1) 1 mg/L, 80+% reduction, via enhanced biological phosphorus removal (EBPR) or equivalent within the first permit cycle; 2) 0.5 mg/L, 90-92% reduction, within the second permit cycle; and 3) 0.200 mg/L, 96-97% reduction, within the third permit cycle.
- An overall TP reduction goal of 50% will be implemented by stormwater dischargers and applied to new development and substantial redevelopment. The 50% TP reduction from stormwater would be accomplished through establishing best management practices (BMPs) that target phosphorus reduction, and increased attention to on-site stormwater inspection, maintenance, and public education.
- Voluntary BMP implementation on agricultural lands, contingent on available funding levels and previously-developed implementation plans. This analysis assumes 50% BMP effectiveness, which is lower than the 68% achieved in the Rock Creek Project (IDEQ/ODEQ 2004, Appendix I**)**. Reductions in TP discharges from irrigated lands greater than 50% will require conversion to sprinkler irrigation, zero discharge, and other treatment methods that may be feasible in certain locations, but cannot be applied broadly due to financial constraints, hydrology, crop requirements, and other factors affecting BMP implementation.

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[1] Under low flow conditions, loading at Parma is also lower. At flows of approximately 400 cubic feet per second (cfs), the daily loading at Parma is approximately 300 kg/day, which is less than 20% of the phosphorus loads estimated to be generated at each of the sources (1,660 kg/day).

- Conversion of agricultural land to other land uses is a critical assumption in meeting the TP load target at the mouth of the Boise River. Urban land has a lower phosphorus loading rate, on a per acre basis, than agricultural land. Thus, as agricultural land is converted to urban land use, there will be a subsequent reduction in phosphorus loading. Load allocations are based on actual land use conversion rates consistent with adaptive management identified in the SR-HC TMDL.

Given the combination of point and nonpoint sources in the watershed and their associated loads, all sources must be considered together to achieve the TP target of 0.070 mg/L at Parma. Under median flow conditions in the Boise River (1,225 cfs), the loading at Parma that achieves this concentration is 210 kg/day. (The SR-HC TMDL allocates 242 kg/day for the Boise River. However, this is based on median flows in the Snake River.)

Table C shows the long term prediction of time needed to reach a seasonal average of 0.07 mg/L TP in the lower Boise River watershed.

Table C. Long-term Prediction of a Seasonal Average of 0.07 mg/L

	Year															
Estimated Load at Parma (kg/day)	**Baseline**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**% Change*** **
WWTF Load	310	112	63	30	31	33	35	37	38	40	42	44	45	47	49	-84%
Stormwater Load *	46	47	49	51	53	54	56	58	60	61	63	65	67	68	70	54%
Agriculture Load **	642	542	506	418	387	311	283	219	195	143	123	104	84	64	44	-93%
*Ag reductions due to land use conversion ** *	0	40	79	119	158	198	237	277	316	356	395	435	474	514	553	-86%
*Ag reductions due to BMPs ** *	0	60	56	105	97	133	121	146	130	143	123	104	84	64	44	-7%
Background	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	0%
Ground water	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	0%
Parma Load	1030	735	652	532	504	432	407	347	327	278	262	245	229	213	**197**	-81%

NOTES:

* Increases in stormwater loads due to land use conversion that is expected to add urban-suburban acreage.

** *Reductions in agricultural loads include two elements: reductions due to loss of agricultural lands (due to land use conversion 59%) and reductions due to BMP effectiveness (34%).*

*** % Change represents % difference between baseline and estimated long-term (Year 65) loads. Numbers are based on estimated future acreage (land use conversion rates).

The Lower Boise River model is used within this framework to show that the TP load reductions and attainment of the goal at Parma is estimated to be ultimately achieved via a combination of controlling point and nonpoint sources. Ultimately, the SR-HC target is the attainment of beneficial uses, which is driven by chlorophyll *a* levels that will need to be monitored in relationship to the TP goal.

Based on known river dynamics including assimilation, distance, and detention time in Brownlee Reservoir, this scenario will improve water quality in the Snake River and the reservoir.
The concept of nutrient spiraling by Newbold et al. (1981) describes variability in nutrient uptake, processing, and retention in streams and rivers. This concept has been examined in a number of subsequent studies, where abiotic and biotic interactions have been observed to control nutrient cycling rates (Thomas et al. 2005; Mulholland et al. 2001). The irrigation system in the Lower Boise River, with its numerous canals and ditches, effectively increases stream channel, stream bank, and riparian zone ratios. This in turn provides more opportunity for processing/assimilation via hyporheic exchanges and aquatic plant (algae, macrophytes) and animal (macroinvertebrates, bacteria) growth. MacCoy (2004) suggests this in her study of the Lower Boise River when she noted, "The tributaries contributed 1,290 lb/d [pounds per day], primarily as ortho-phosphorus, and 350 lb/d was lost, probably owing to withdrawals or plant uptake." She also noted this in the main Boise River, "…and 1,450 lb/d was lost, probably owing to irrigation withdrawals or plant uptake." This would suggest that phosphorus is attenuated in the Lower Boise River during the irrigation/growing season.

In Brownlee Reservoir, given its short retention time (34 days on average), phosphorus moves rapidly through the reach (IDEQ/ODEQ 2004, p. 316). However, this is dependent on season, water year, and tributary input. It should also be noted that the largest biomass of algae occurs in May and June, coinciding with spring runoff, and begins to taper off in July, August, and September (IDEQ/ODEQ 2004, figure 3.2.20). This suggests that phosphorus coming into Brownlee Reservoir in those months from the Lower Boise River would not contribute to significant algae blooms.

Given the information discussed in the Plan regarding river dynamics, retention times, and the timing of algae growth, DEQ believes the allocations and reductions contained in the Implementation Plan, including the achievement of 0.20 mg/L total phosphorous effluent limits by the WWTFs, are consistent with the assumptions underlying the SR-HC TMDL and the goal of reducing algae growth to levels that support beneficial uses in the Snake River. However, EPA has indicated its belief that the SR-HC TMDL target for the Boise River compels NPDES Permits discharging to the Boise River to contain a 0.07 mg/L effluent limit "at end-of-pipe". Therefore, DEQ intends to reexamine the SR-HC TMDL target for total phosphorus for the Lower Boise River tributary. If DEQ's reexamination and analysis confirms DEQ's belief that a change in the target should be made, DEQ intends to work with the appropriate stakeholders and agencies to modify the SR-HC TMDL to reflect the change in the target.

It is important to note that the estimation that the TP load reductions specified in the Plan will attain beneficial uses in the Snake River as well as the estimation of the current TP target at Parma relies on a variety of the best available data sources, numerous assumptions, and margins of safety. Future monitoring will determine the status of beneficial use support. Because this information is based on the best information today, which may be different in the future, an adaptive management approach is necessary. The following factors and uncertainties also affect establishing an appropriate TP target for the Lower Boise River and will be considered during DEQ's reexamination of the Lower Boise River target:

- Actual rate of land use conversion
- Effects of that land use conversion on runoff and infiltration
- Urban-suburban water demand and use
- Urban-suburban stormwater runoff concentrations (wet- and dry-weather)

- Effectiveness of stormwater BMPs
- Effectiveness of agricultural BMPs
- Ability of ground water phosphorus levels to recover in converted areas
- Future drainage and water management policies

Implementation Strategies

The time frame for achieving these allocations will depend on the rate of land use conversion, the available funding that can be applied to nonpoint agricultural BMPs, and the recovery rate of ground water as land uses are converted. The long-term time frame may be shortened if funding for non point source control is increased substantially and quickly, and/or significant technological breakthroughs occur in nonpoint source control technology.

The implementation schedule is designed to be flexible within an adaptive management framework. The Federal Clean Water Act and the Idaho Water Quality Standards (IDAPA 58.01.02) indicate that in general, actions taken should achieve the highest attainable use through the implementation of point and nonpoint source control programs.

The concept of adaptive management allows for on-the-ground implementation to proceed where uncertainty exists about how and when reduction targets will be met. The adaptive management approach acknowledges that beneficial uses may not be restored for a long period of time, but provides a short-term pathway by which to gauge progress toward that goal.

It may take some period of time to fully implement the appropriate management practices, particularly in this watershed, because of the rapidly changing land use patterns. Many producers are reluctant to commit to financing long-term pollutant management activities because of the rapid land use transitions that are occurring.

The specific level of reduction realized by attainment of the concentration-based target is dependent on the type of water year and the tributary. Setting a concentration-based target means that in high flows, the loading delivered at the target value will be greater than the load delivered at the target value during medium or low-flow years. Low and average flow years may show a larger relative percentage reduction in nutrient loading by meeting the 14 ug/L mean growing season chlorophyll *a* concentration and 0.07 mg/L TP targets as loading is based on instream flow (load = flow x concentration).

For the Lower Boise River, concentration reductions under varying flows have been calculated. The average reductions required are 73%, 79%, and 80% for high, median, and low-flow conditions respectively.

The Lower Boise River Implementation Plan allocations when fully implemented are projected to result in an 82% load reduction in low-flow years.

The 90th percentile flow duration interval (90% of flows exceed) for May – September (379 cfs Boise River at Parma) was considered as an appropriate low flow scenario. Based on the projected nonpoint source loads after full implementation and land use conversion and even with total removal of wastewater effluents from the river, a less than or equal to target of 0.07 mg/L total phosphorus in the Boise River at Parma is not achievable during low flow scenarios such as these. However, as seen in Table C, when loads are based on mean flows, a seasonal average concentration of 0.07 mg/L is achievable. In light of the foregoing, IDEQ believes the Lower Boise River target may be overly conservative and intends to reexamine the Lower Boise River target.

All of these reasons indicate that an adaptive management approach to implementation is appropriate. The stakeholders involved in developing these allocations remain committed to ensuring implementation and continue toward meeting the water quality goals outlined in the SR-HC TMDL.

During the period of adaptive management, focused monitoring will continue to be important. Monitoring should take place at four levels:

1. SR-HC Reach. IDEQ has committed to monitoring this reach as stipulated in the SR-HC TMDL. In addition to the conditions stipulated in the SR-HC TMDL, an equally important monitoring objective is to assess whether beneficial uses are being attained, especially as related to the phosphorus loading and progress toward the target.
2. Lower Boise River Reach. Continued monitoring at key monitoring locations in the lower Boise River (Glenwood, Middleton, and Parma) and at the mouth of key tributaries will provide an indication of how well nonpoint source improvements are performing.
3. BMP Effectiveness Monitoring. Monitoring will be focused on evaluating specific treatment to verify BMPs are properly installed, maintained, and working as designed; evaluating the effectiveness of implementation actions for reducing pollutant loading; gathering information to fill data gaps; and making effectiveness monitoring results available to the public.
4. NPDES Permit Monitoring. Monitoring will be conducted to comply with WWTF discharge limits and municipal separate storm sewer system (MS4) requirements not addressed above.

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1 Introduction

1.1 Background

The Idaho Department of Environmental Quality (IDEQ) prepared the Snake River – Hells Canyon Total Maximum Daily Load (SR-HC TMDL) (IDEQ/ODEQ 2004) in conjunction with the Oregon Department of Environmental Quality (ODEQ), the U.S. Environmental Protection Agency (EPA), and a Public Advisory Team (PAT) for the Snake River from its intersection with the Oregon/Idaho border near Adrian, Oregon (RM 409) to immediately upstream of the inflow of the Salmon River (RM 188). As the report states, "The overall goal of the SR-HC TMDL is to improve water quality in the SR-HC TMDL reach by reducing pollution loadings from all appropriate sources to meet water quality standards and restore full support of designated beneficial uses" (IDEQ/ODEQ 2004, p. 17).

To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a May 1 to September 30 instream total phosphorus (TP) target of 0.07 milligrams per liter (mg/L) in concert with a mean growing season limit for chlorophyll *a* of 14 micrograms per liter (ug/L) (nuisance threshold of 30 ug/L with exceedance threshold of no greater than 25%) for the SR-HC reach upstream from Brownlee Reservoir. To meet this target, the SR-HC TMDL allocates TP loads to point sources and nonpoint sources discharging directly to the SR-HC reach and treats tributaries to the reach "as discrete, nonpoint sources for the purposes of loading analysis and allocation within this TMDL" (IDEQ/ODEQ 2004, pp. 21, 235, 439, 447). The SR-HC TMDL assigned target concentrations of 0.07 mg/L to the mouths of each of the SR-HC reach tributaries as the basis for determining seasonal tributary loading that will attain the SR-HC reach instream TP target (IDEQ/ODEQ 2004, p. 447).

After EPA approved the SR-HC TMDL in September 2004, the task of developing TP allocations for tributary point and nonpoint sources in order to attain the concentration-based tributary targets of 0.07 mg/L was the responsibility of IDEQ and the tributary watershed advisory groups (WAGs). Idaho Code section 39-3611(6) provides: "If a pollutant load is allocated to a tributary inflow as part of a downstream TMDL, the director shall develop a plan to meet such allocation in consultation with the tributary watershed advisory group." The SR-HC TMDL anticipated that, in consultation with tributary WAGs, "existing or future tributary TMDL processes will distribute load allocations in the form of load allocations and/or waste load allocations within their specific watersheds", "as an extension of the SR-HC TMDL process" (IDEQ/ODEQ 2004, pp. 21, 235, 439-440, 447).

The Lower Boise Watershed Council (LBWC) serves as the Lower Boise River WAG pursuant to its Articles and Bylaws, and Title 39, Chapter 36 of the Idaho Code. TP allocations have been developed in consultation with the LBWC to attain the 0.07 mg/L target assigned to the Boise River by the SR-HC TMDL. Current average seasonal concentrations of TP at Parma are 0.28 mg/L, indicating that a concentration reduction of approximately 76% is required to attain the May 1 to September 30 SR-HC TMDL TP target. Attainment of this target will be measured at the mouth of the Boise River (at Parma, see Figure 1). TP loads to the Boise River will be measured at appropriate discharge and other monitoring points located within the Boise River watershed and identified in implementation plans and National Pollutant Discharge Elimination System (NPDES) permits.

EPA has indicated its belief that the SR-HC TMDL target for the Boise River compels NPDES Permits discharging to the Boise River to contain 0.07 mg/L effluent limits "at end-of-pipe". In light of the Plan, DEQ believes such effluent limits are overly stringent and unnecessary to achieve the goal of attainment of water quality standards in the Snake River because of river dynamics, retention times and the timing of plant growth. Thus DEQ intends to reexamine the Lower Boise River TP target. If DEQ's reexamination and analysis confirms DEQ's belief that a change in the target should be made, DEQ intends to work with the appropriate stakeholders and agencies to modify the SR-HC TMDL to reflect the change in the target.

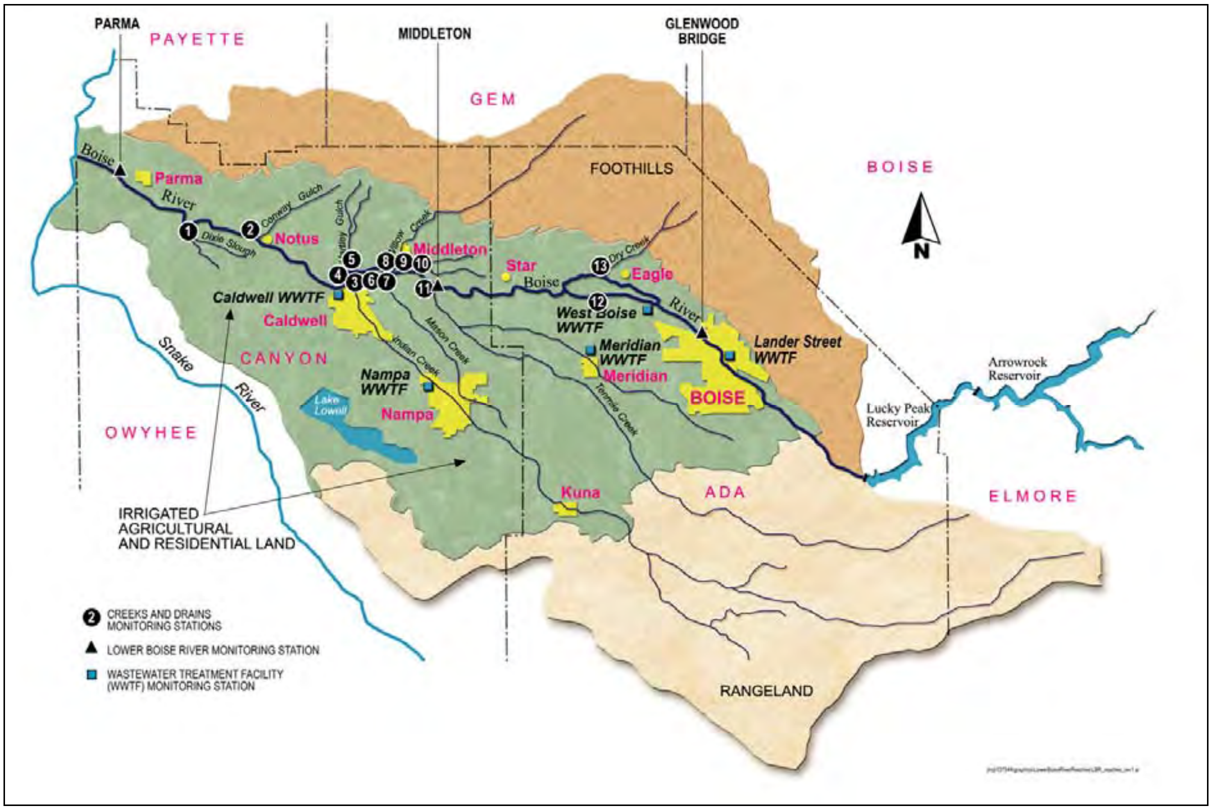

Figure 1. Lower Boise River Watershed

1.2 Snake River – Hells Canyon (SR-HC) TMDL

The final SR-HC TMDL approved by EPA in September 2004 (IDEQ/ODEQ 2004) allocated TP loads to point and nonpoint sources that discharge or drain directly to the SR-HC reach of the Snake River. The SR-HC TMDL treats tributaries discharging to the SR-HC reach "as discrete, nonpoint sources for the purposes of loading analysis and allocation within this TMDL" (IDEQ/ODEQ 2004, pp. 21, 235, 447). Five major tributaries received gross phosphorus allocations at their mouths, including the lower Boise River.

The SR-HC TMDL target to protect designated beneficial uses is a seasonal average of 14 ug/L of chlorophyll *a*, and a maximum concentration of 30 ug/L of chlorophyll *a*. To attain this target, the SR-HC TMDL established tributary target inputs of 0.07 mg/L TP. There is uncertainty about the relationship between chlorophyll *a* and TP, and it is possible that the chlorophyll *a* target will be attained at different (higher or lower) TP concentrations. Ultimately, the SR-HC target is the attainment of beneficial uses, which is driven by chlorophyll *a* levels.

Compliance with the SR-HC TMDL will be determined based on the 0.07 mg/L TP target applied at the mouth of the lower Boise River (at Parma). The concentration target applies between May 1 and September 30. Currently, average seasonal concentrations of TP at Parma are approximately 0.30 mg/L (as determined by United States Geological Survey [USGS] monitoring [MacCoy 2004; p. 34] and modeling [Donato and MacCoy 2004; p. 25] discussed in more detail later).

This implementation plan allocates the 0.07 mg/L Parma target to lower Boise River nutrient sources on an equitable and reasonable basis.

1.3 Target Interpretation

The SR-HC TMDL assigned a load allocation to the Boise River to meet the 0.07 mg/L TP target at its confluences with the Snake River. The SR-HC TMDL (IDEQ/ODEQ 2004, p. 447, footnote *a* to Table 4.0.9) explains the instream SR-HC Target:

> The SR-HC TMDL target for total phosphorus for each tributary is a concentration of less than or equal to 0.07 mg/L total phosphorus as measured at the mouth of the tributary and applies from May through September. Because the total phosphorus target is concentration-based, actual allowable tributary load allocations under the TMDL are dependant on actual tributary flow and will fluctuate year to year. The total phosphorus load allocations listed in this table are based on averaged tributary flows measured in 1979, 1995 and 2000, which were average Snake River flow years, not necessarily average tributary flow years. Therefore they do not necessarily represent the calculated load allocations for any specific year or different series of years.

1.4 Physical Characteristics

The lower Boise River watershed is one of the more complex watersheds in Idaho. Sources of phosphorus include wastewater treatment discharges, stormwater runoff, agricultural runoff, background (from Lucky Peak Reservoir releases), and ground water return flows. Phosphorus from these sources is routed through a physically complex, interconnected network of surface and ground water systems. Figure 2 shows the delineation of subwatersheds based on major drains and drainage areas.

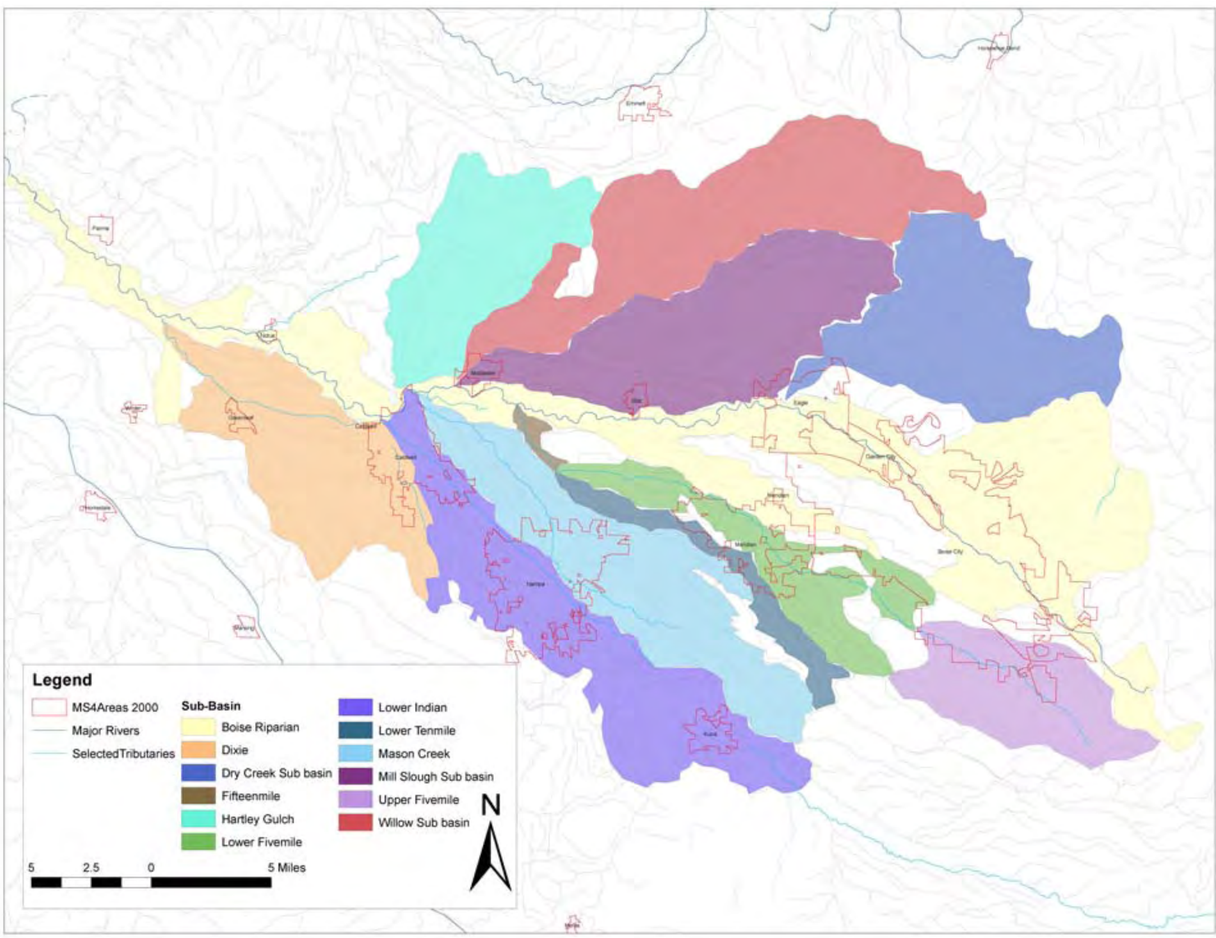

Figure 2. Delineation of Subbasins and Boise Riparian Areas

Combined with the physically complex hydrology are a rapidly growing population and rapid conversion of irrigated lands to urban-suburban uses. Approximately 1,800 acres of flood-irrigated agricultural land are converted to urban-suburban use annually (Appendix A). As a result of this conversion, wastewater and stormwater loads will increase while agricultural loads will decrease. This trend in loads is confirmed both by available empirical data and by recent USGS studies.

It is important to note that due to the extensive water development that has occurred in the lower Boise River watershed over the last 150 years, not all of the 1,290 square miles of the watershed drains to the lower Boise River. Portions of the watershed discharge to Lake Lowell (which is the subject of a separate planning process) or directly to the Snake River (Figure 3).

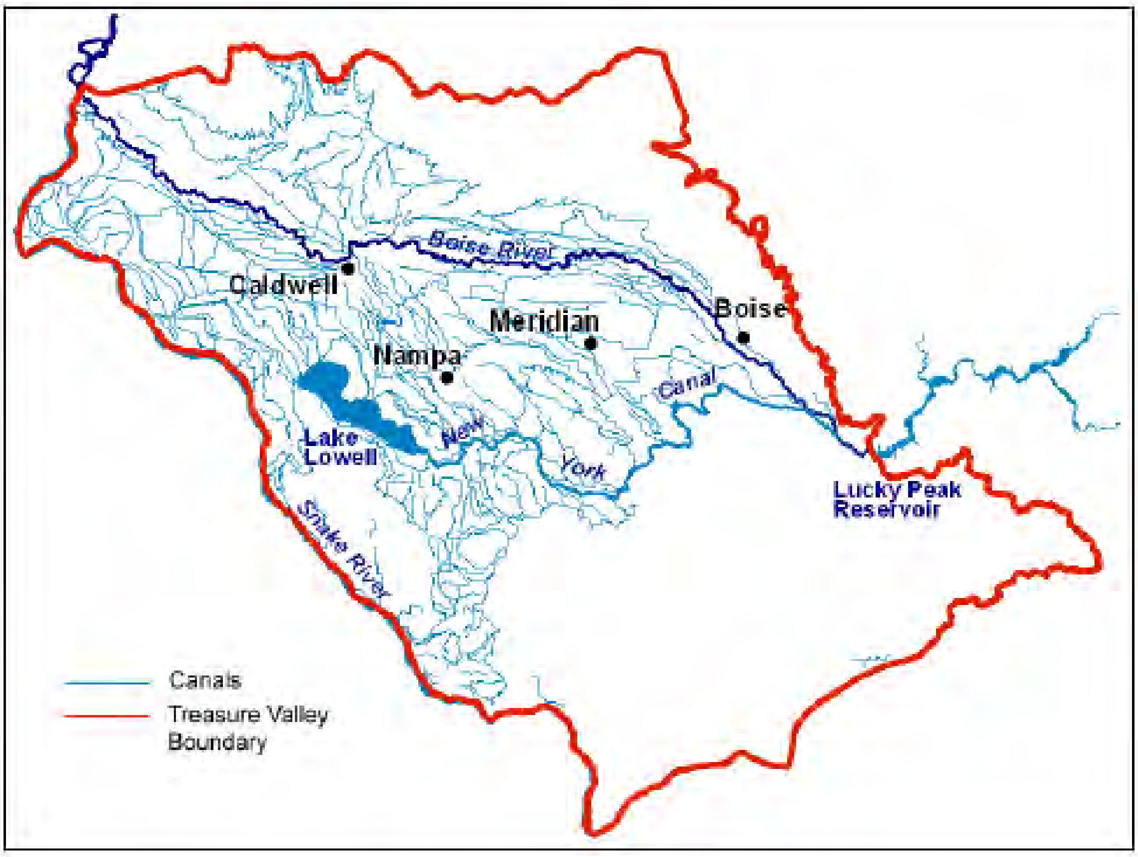

Figure 3. Major and Intermediate Canals in the Treasure Valley (from Urban 2004, p. 2-2)

2 Subbasin Summary– Water Quality Concerns and Status

The Lower Boise River Nutrient Subbasin Assessment (IDEQ, 1999) and analysis identified that nutrients are not impairing beneficial uses or aquatic life support in the Lower Boise River. IDEQ has determined that water quality in the Lower Boise River is not impaired due to nutrients. As such, IDEQ proposed to delist the Lower Boise River from the 303(d) list for nutrients in the 2008 Integrated Report. Supporting information can be found in the Lower Boise River Nutrient Subbasin Assessment (1999).

2.1 Nutrient 303(d) Listing Status

The proposal by IDEQ to delist nutrients is consistent with 40 CFR 130.7 (6), whereby the state shall provide documentation that supports the listing determination. The 1999 Lower Boise River Subbasin Assessment serves as the supporting documentation. Appendix E provides EPA's comments on the proposal to delist the Lower Boise River for nutrients and IDEQ's response.

2.2 Implications of the Snake River - Hells Canyon TMDL

Nutrients are not impairing beneficial uses in the lower Boise River. However, nutrient loads from the lower Boise River may contribute to the impairment of beneficial uses in the Snake River and Brownlee Reservoir. The Boise River discharges to the Snake River near Fort Boise. Sampling conducted by Idaho Power Company has shown that water column algae blooms develop in the Snake River just downstream from the mouth of the Boise River. Idaho Power Company found that the Boise River contributed from about 30% to 50% of the total orthophosphate entering the Snake River from Celebration Park to Porter's Island (Myers et al., 1997). Idaho Power Company has also shown that the nutrient and algae loads entering Brownlee Reservoir from the Snake River are primary causes of depressed dissolved oxygen (DO) concentrations in the metalimnion and epilimnion in the reservoir in summer months (Harrison and Anderson, 1997). Brownlee Reservoir has DO concentrations below applicable criteria every summer in some parts of the reservoir. During some years, depressed DO concentrations result in fish kills in the reservoir.

The final SR – HC TMDL approved by EPA in September 2004 (IDEQ/ODEQ 2004) allocated TP loads to point and nonpoint sources that discharge or drain directly to the SR – HC reach of the Snake River. The lower Boise River is one of five major tributaries discharging to the SR-HC reach that received a gross phosphorus allocation for the mouth of the river.

Of the 12 major tributaries that flow into the Boise River, four are on the 2002 303(d) list for nutrients. The 303(d)-listed tributaries that discharge to the river are Fivemile Creek, Tenmile Creek, Indian Creek, and Mason Creek. Nutrient TMDLs will be established for these tributaries if their respective subbasin assessments show that they are being impaired by nutrients.

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3 Subbasin Summary – Pollutant Source Inventory

3.1 Relative Contributions

Because of the complex plumbing of the lower Boise River watershed, water is diverted and often reused downstream from its original source. To assess the relative impact of sources on TP loads at Parma, the relative contribution of each source is shown in Table 1. The relative contribution for each source is the ratio of the predicted phosphorus load at Parma to the total load at the source. The relative contribution of each source was determined by removing all sources of phosphorus from the model and then sequentially replacing just one source at a time. The relative contribution values are based on the Summary of Participant Recommendations for a Trading Framework (Ross and Associates, 2000, p. 2). This framework was developed by Ross and Associates for IDEQ and provides information on the location ratios used to trade phosphorus in the Lower Boise River Effluent Trading Project.

Table 1. Relative Contributions to Total TP Load

Point Sources	Relative Contribution (%)	Nonpoint Sources	Relative Contribution
Lander Street WWTF	0.56		
West Boise WWTF	0.51		
Meridian WWTF	0.75		
IDFG-Nampa	0.20		
XL Four Star Beef	0.20	Fifteenmile Creek	0.75
Nampa WWTF	0.20		
IDFG-Eagle	0.67		
Middleton WWTF	0.75		
Star WWTF	0.75	Mill Slough	0.75
Caldwell WWTF	0.89	Willow Creek	0.75
Caldwell Housing	0.89		
Notus WWTF	0.95	Mason Creek	0.75
Boise	0.56	Hartley (combined)	0.80
Eagle	0.67	Indian Creek	0.89
Meridian	0.75	Conway Gulch	0.95
Star	0.75	Dixie Drain	0.96
Kuna	0.20	Boise Riparian #1	0.57
Caldwell	0.89	Boise Riparian #2	0.75
Nampa	0.20	Boise Riparian #3	1.00
Middleton	0.75	Background	0.11
Greenleaf	0.96	Ground water	0.77
Notus	0.95		
Wilder	0.33		

Stormwater includes urban-suburban stormwater that is currently regulated under the NPDES program, or is expected to be so within the implementation time frame.
Drainage District #3, Eagle Drain, Dry Creek, and Thurman Drain are all incorporated into either the Boise stormwater area, or Boise Riparian #1 or #2. Star Feeder, Long Feeder, and Watts Creek are all incorporated into Boise Riparian #2.
Background relative contribution (0.11) is based on a simple ratio of the load discharged from Lucky Peak to the Parma load. That is 89 Kg/day at the source and 9 Kg/day at Parma.
Ground water relative contribution is based on an average of the Boise Riparian relative contributions. That is 31 Kg/day at the sources and 24 Kg/day at Parma.
The relative contributions used in this document are those for median flows (1225 cfs). As more information becomes available concerning different flow regimes, it will be incorporated as appropriate.

Relative contributions reflect the influence that a single source of TP will have on the total concentration at Parma. A high relative contribution indicates that a large fraction of the TP discharged at the source will arrive at Parma. For example, because of the complexity of the irrigation and drainage network in the watershed, sources of TP closer to Parma tend to deliver a larger percentage of their load (that is, a higher ratio) to the compliance point at Parma. The relative importance of Dixie Drain, Conway Gulch, and Indian Creek is greater at the compliance point, in comparison with more upstream drains and tributaries such as Fifteenmile or Willow Creeks.

The major factor that affects relative contribution is the extensive amount of water that is reused within a tributary or drain. For example, only a portion of loads from upstream sources within Indian Creek (for example, Nampa) reach the mainstem, because the Riverside Canal diverts almost two-thirds of Indian Creek flow just upstream from its mouth at the mainstem. Thus, a large proportion of phosphorus that is carried down Indian Creek from upstream sources is diverted from reaching the mainstem lower Boise River via the Riverside Canal (and instead is reapplied into a portion of Dixie Slough that discharges to the Snake River) before reaching Parma.

This information is used to summarize existing source loads for each of the source groups below.

The Boise Riparian “tributaries” represent riparian areas that drain directly into the mainstem. Similar to the sediment TMDL (IDEQ 2000; Appendix L), the Boise Riparian subbasin (see Figure 2) was subdivided into three riparian “tributaries”: Boise Riparian #1 extends from Diversion Dam to Glenwood Bridge; Boise Riparian #2 extends between Glenwood Bridge and Middleton; and Boise Riparian #3 extends between Middleton and Parma (see Figure 2).

3.2 Point Sources – WWTFs

There are currently 12 existing WWTFs that discharge phosphorus directly to the lower Boise River watershed. (An additional two WWTFs [Eagle and Garden City] currently discharge to West Boise WWTF; both of these facilities may begin discharging directly to the lower Boise River watershed within the implementation period. Therefore, they are considered existing for the purposes of NPDES permitting, even though they are presented as “future sources” within the model [and summary tables herein] because their existing discharge needed to be accounted for under the West Boise WWTF load for model calibration.) All of these facilities are regulated under the NPDES and are awaiting updated permits based on the outcome of this implementation plan.

Pollutant loads for these existing facilities were calculated based on data provided from their monthly discharge monitoring reports (DMRs) that reflect actual flows and monitored effluent concentrations. These values are summarized in Table 2.

Table 2. Existing Wastewater Treatment Facility (WWTF) Flows and Concentrations

Source Name	NPDES Permit No.	Mainstem River Mile or Receiving Water Name	Mean Discharge (cfs)	Effluent TP Concentration Mean (mg/L)	Load (kg/day)
Mainstem					
Lander WWTF	ID-002044-3	49.9	22.2	2.25	122
West Boise WWTF	ID-002398-1	40.9	19.8	4.95	240
IDFG-Eagle	IDG–13–0000	32.4	33.1	0.05	4.3
Middleton WWTF	ID-002183-1	26.5	0.8	2.94	6.0
Caldwell WWTF*	ID-002150-4	19.7	12.2	1.22*	37
Tributary					
Star WWTF	ID-002359-1	Wilson Drain (Indian Creek)	0.7	5.0	8.8
Meridian WWTF	ID-002019-2	Fivemile Creek	5.5	2.55	34
XL Four Star Beef	ID-000078-7	Indian Creek	1.0	5.0	12
Nampa WWTF	ID-002206-3	Indian Creek	13.9	5.88	199
IDFG-Nampa	IDG–13–0000	Wilson Drain (Indian Creek)	33.1	0.05	4.3
Caldwell Housing	ID-002545-3	Conway Gulch	0.1	5.51	0.7
Notus WWTF	ID-002101-6	Conway Gulch	0.3	3.0	1.9
Wilder WWTF	ID-002026-5	Mammon Gulch	0.3	6.0	4.1
TOTAL LOAD					674

* Existing Caldwell WWTF loads are based on concentration data collected following implementation of BNR. For future trading, Caldwell's treatment improvements are eligible for trading at pre-BNR credit levels.

3.3 Point Sources – Stormwater Runoff

An overall TP (TP) reduction goal of 50% will be implemented by stormwater dischargers and applied to new development and substantial redevelopment. The 50% TP reduction from stormwater would be accomplished through establishing BMPs that target phosphorus reduction, and increased attention to on-site stormwater inspection, maintenance, and public education.

Table 3 summarizes estimated stormwater flows and applied concentrations for both existing and future municipal separate storm sewer system (MS4) areas. Stormwater point source allocations are composed of the following:

- MS4 wet weather annual loads
- MS4 dry weather load from agricultural irrigation
- ground water infiltration into the MS4 system

Increases in municipal stormwater loads due to land use conversion are expected from urban-suburban acreage increases, increases in ground water infiltration into the MS4, and dry weather loads from agricultural irrigation sources. These estimates are placeholders, and individual MS4 allocations are based on a kg/acre basis applied to applicable number of acres in the regulated permit area. Estimated flows and concentrations are derived from analysis and data, as summarized in Appendix B.

Table 3. Estimated Existing Stormwater Discharge and Concentration

Source Name	Receiving Water Name	Estimated Acres that Discharge to Lower Boise Watershed	Estimated Load (kg/day)
Boise	Boise River (Riparian #1 and #2), Fivemile Creek, Eagle Drain, Thurman Drain	35,310	19
Eagle	Boise River (Riparian #2), Dry Creek	15,965	8.3
Meridian	Boise River (Riparian #2), Fifteenmile Creek	18,687	10
Star	Boise River (Riparian #2), Mill Slough	6,521	3.4
Middleton	Mill Slough, Boise River (Riparian #2), Willow Creek	9,571	5.0
Kuna	Indian Creek	3,100	1.6
Nampa	Mason Creek, Indian Creek	31,720	17
Caldwell	Indian Creek, Dixie Slough	9,571	10
Notus	Boise River (Riparian #3)	984	0.5
Greenleaf	Dixie Drain	957	0.5
TOTAL ESTIMATED LOAD			79
NOTE: Documentation of discharge and concentrations is provided in Appendix B.			

3.4 Nonpoint Sources – Agricultural Discharges

Of the approximately 475,000 acres that drain to the lower Boise River, approximately162,000 of those are irrigated cropland (as defined by the Idaho State Department of Agriculture as encompassing agricultural parcels greater than 20 acres). These acres are located along the water conveyance system and contribute nonpoint loading of phosphorus. Within the watershed, TP is delivered from irrigated cropland and animal-related phosphorus sources (for example, unrestricted grazing and dairies/feedlots).

Total phosphorous loading data from agricultural lands in the Lower Boise River watershed do not exist. Furthermore, drainage flow data and drainage water quality data within the watershed are limited. Current TP loading from agricultural lands was therefore estimated using flow rate data and TP concentration data from five drains located in drainages where agricultural land use is predominant. Supporting documentation is provided in Appendix C.

Table 4 shows the contribution for existing nonpoint agricultural sources to tributaries.

Table 4. Estimated Existing Nonpoint Source Agricultural Loads

Source Name	Estimated Baseline Acres	Estimated Load (kg/day)
Fifteenmile Creek	12,391	61
Mill Slough	10,609	52
Willow Creek	4,873	24
Mason Creek	23,493	115
Hartley Gulch (Both)	10,546	52
Indian Creek	21,317	104
Conway Gulch	5,842	29
Dixie Drain	28,263	138
Boise Riparian #1	12,077	59
Boise Riparian #2	27,731	136
Boise Riparian #3	4,920	24
TOTAL EST. LOAD		**792**

The largest tributary nonpoint agricultural source loads are those from Mason Creek, Indian Creek, Dixie Drain, and Boise Riparian #2.

3.5 Nonpoint Sources – Background

Inflows at the upstream boundary of the lower Boise River originate from releases from Lucky Peak Dam (operated by the U.S. Army Corps of Engineers). In turn, Lucky Peak Reservoir inflows are controlled by two other upstream storage projects: Arrowrock Reservoir and Anderson Ranch Dam (operated by the Bureau of Reclamation). The TP data from this area were compiled to assess the impact of upstream sources on background conditions to the lower Boise River reach. For consistency, USGS data from the May through September period from 1999-2000 and Bureau of Reclamation monitoring data from Arrowrock Reservoir (April through September 1999 and 2001) are summarized in Figure 4.

Figure 4. Summary of Available Median Background TP Data (mg/L)

Figure 4 shows that TP concentrations above Arrowrock Reservoir are in the 0.01 mg/L range, values that are comparable to background condition values used in the SR-HC TMDL (0.02 mg/L) (IDEQ/ODEQ 2004). Within the Arrowrock Reservoir forebay, median TP concentrations do not appear to increase above input values (Bureau of Reclamation 2005). By the time water is discharged from Lucky Peak, TP concentrations are in the 0.019 mg/L to 0.033 mg/L range, depending on whether non-detect measurements are assigned one-half method detection value or the full method detection limit value. While using the full method detection value would be more conservative, because the target at the downstream boundary of the watershed is 0.07 mg/L, using 0.033 mg/L as the upstream boundary (background) uses almost 50% of the available loading capacity. On the other hand, assuming some value for non-detect measurements is more conservative than assuming a concentration of zero. Therefore, the value used in the mass balance model is 0.019 mg/L, which reflects an assumption of one-half the method detection value.[2] Observed TP concentrations at Veteran's Bridge (downstream from a number of diversions but upstream from any WWTF discharges) confirm that the background value that should be used is 0.018 mg/L-0.019 mg/L.

The resulting existing load from background is 89 kg/day (Parma-adjusted load of 9 kg/day).

3.6 Nonpoint Sources – Ground Water

It is known that the gaining or losing status of the mainstem lower Boise River varies both spatially and temporally (Urban 2004, pp. 2-6; Bureau of Reclamation 2006, pp. 61-63). In the original mass balance model used for the sediment TMDL, the exchange of ground water to and from the mainstem was

[2] It is only in this upstream segment that the issue of method detection limit arises because farther down in the system, almost all of the water samples tested for TP have detectable concentrations.

calculated based on hydrogeologic information known in 1998, when the model was first developed (Smith 1998).[3]

Since then, additional work has been conducted by USGS, the Idaho Department of Water Resources (IDWR), and others to better understand ground water inputs on the lower Boise River. Ground water phosphorus concentration data were collected at USGS monitoring wells along the mainstem of the lower Boise River in 2001 (MacCoy 2004, p. 75). A summary of these data is presented in Figure 5.

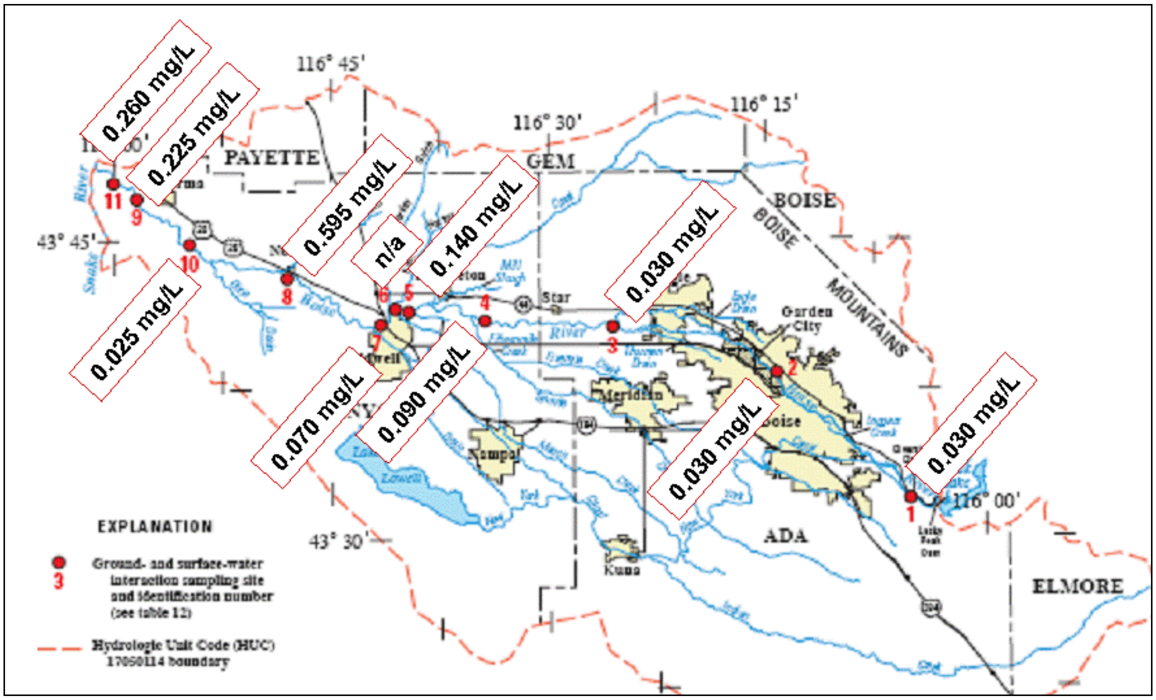

Figure 5. Summary of Available Mean Ground Water Dissolved Phosphorus Data (mg/L)

The data show that, upstream from Star, dissolved phosphorus[4] ground water concentrations are 0.03 mg/L[5]. Through the downstream reaches of the lower Boise River, dissolved phosphorus levels in ground water typically exceed 0.07 mg/L, with Parma levels exceeding 0.23 mg/L (MacCoy 2004, p. 75).

In addition to better-defined ground water concentration data, Bureau of Reclamation (2006) developed a more extensive accounting of ground water gains and losses along the mainstem. An annual summary is provided in Figure 6.

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[3] Smith (1998) predicted net exchange on a daily basis over each of three reaches (Lucky Peak to Glenwood Bridge, Glenwood Bridge to Middleton, and Middleton to Parma) for flows during the years 1990-1997.

[4] Total phosphorus data were not collected as part of the USGS study (MacCoy 2004, Appendix); dissolved phosphorus concentrations are used as a surrogate for TP concentrations.

[5] MacCoy (2004, p. 75) reports non-detect values for the uppermost sites; the USGS National Water Information System database (NWISWEB) indicates the method detection limit was 0.06 mg/L, which translates to a presumed concentration of 0.03 mg/L at one-half the method detection limit.

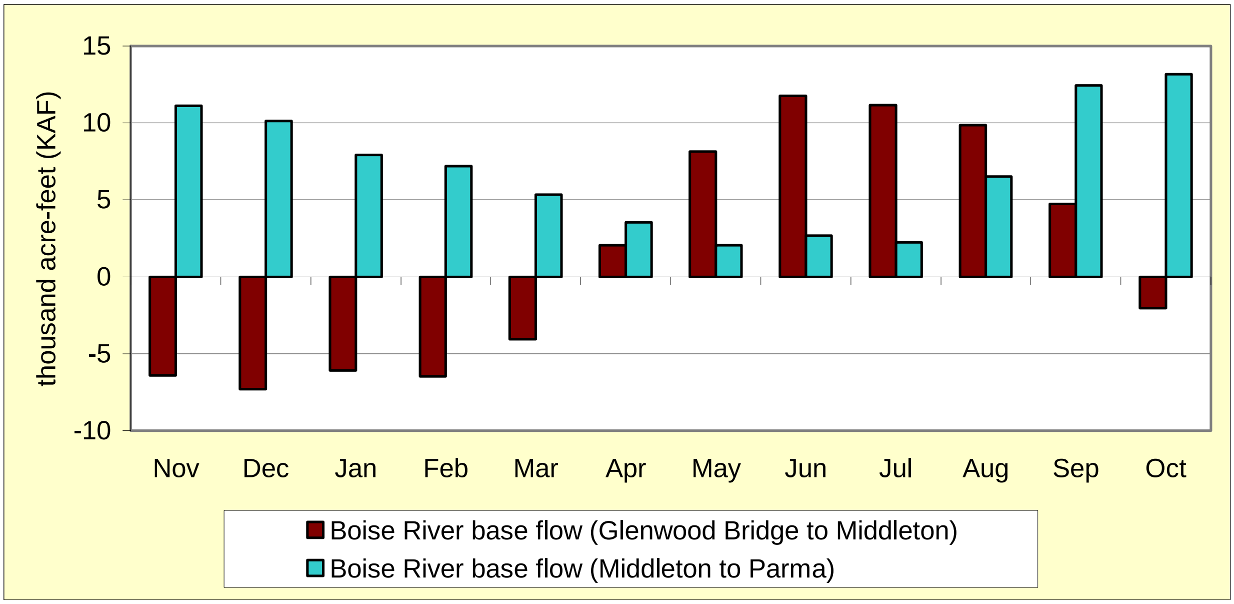

Figure 6. Average Monthly Base Flow to the Lower Boise River, Glenwood Bridge to Parma (from Bureau of Reclamation 2006, p. 63)

These data show that between May and September, the reach upstream from Middleton (in black) is a gaining reach (with a total of 46 thousand acre-feet [KAF]), and that the reach between Middleton and Parma (in green) is also a gaining reach, though to a lesser extent (total of 26 KAF). Previous studies by IDWR (Urban 2004, p. 21) indicate that between Lucky Peak and Glenwood Bridge, the lower Boise River is a losing reach during this same time frame (on the order of -46 KAF). These values translate into a seasonal net gain of 84 cubic feet per second (cfs). The resulting existing load from ground water is 31 kg/day (Parma adjusted load of 24 kg/day).

4 Subbasin Summary – Summary of Past and Present Pollution Control Efforts

The sediment and bacteria implementation plan for the lower Boise River was completed in December 2003. Information concerning pollution control efforts for WWTFs, urban and suburban storm drainage, agricultural nonpoint sources, and other nonpoint sources (including rural roads, septic systems, leaky sewer lines, and other rural issues [unregulated confined animal feeding operations/animal feeding operations]) can be found on pages 22-41 of the Implementation Plan for the Lower Boise River TMDL. While this plan was developed for the sediment and bacteria TMDLs, many of the practices used by nonpoint sources are similar. With regards to WWTFs, the City of Caldwell is currently achieving phosphorus concentrations of less than 0.4 mg/L in their effluent. The City of Star is set up for future phosphorus removal. The City of Boise's Lander Street facility is currently capable of removing more phosphorus than conventional wastewater plants by implementing some operational changes. The Sorrento Lactalis wastewater plant is also currently removing phosphorus in response to their NPDES permit limits of 0.07 mg/L.

The rest of this section contains information submitted by point source wastewater dischargers concerning how they intend to implement phosphorus removal at their facilities.

Public Works

Charles R. Mickelson, P.E.
Director

Boise City Hall
150 N. Capitol Boulevard

Mailing Address
P. O. Box 500
Boise, Idaho 83701-0500

Phone
208/384-3900

Fax
208/433-5650

TDD/TTY
800/377-3529

Web
www.cityofboise.org

April 11, 2008

Ms. Sherrill Doran
CH2M HILL
322 East Front Street
Suite 200
Boise, ID 83702-7359

Subject: Boise City Wastewater Treatment Facilities Phosphorus Reduction Initiatives

Dear Ms. Doran:

As requested in your email dated April 3, 2008, this letter summarizes completed and in progress activities by the City of Boise related to reduction of phosphorus from the effluent of our two wastewater treatment facilities: Lander Street WWTF and West Boise WWTF. Our plan for completing additional improvements necessary to meet a 200 micrograms of phosphorus per liter (ug-P/L) effluent limitation within three permit cycles (equivalent to 15 years) is also provided.

The City of Boise has proactively moved forward with actions to meet future phosphorus removal requirements, even though there has been and continues to be uncertainty in what the requirements will ultimately be. This has been balanced with a need for prudent management of fiscal resources. Adding phosphorus removal to the existing requirements of removing biochemical oxygen demand (BOD), ammonia, suspended solids and providing disinfection has significant technical and fiscal impacts. The City has undertaken numerous studies and implemented some modifications to the WWTFs to prepare for this additional treatment requirement. These efforts are summarized in Table 1 on page 2 of this letter. The total cost to date of these activities exceeds one million dollars.

Our plan for reducing Boise WWTFs effluent phosphorus concentrations to less than 200 ug-P/L, a 97 % reduction, involves multiple actions: source reduction, conversion to enhanced biological phosphorus removal (EBPR), addition of chemical feed facilities, and addition of effluent filtration. Please note that our plan is subject to adjustment as new information becomes available during the course of implementing the plan.

We have conducted a study to identify opportunities for reducing the quantity of phosphorus being discharged to the wastewater system in order to reduce the quantity of phosphorus that must be removed at the WWTF. We have and will continue to work with our customers to implement source reduction. However implementation of source reduction measures alone will not result in meeting the 200 ug-P/L limit.

Table 1: Boise City Phosphorus Removal Activities to Date

Phosphorus Removal Activity	Completion Date
Report: *Wastewater Facilities Plan 2020,* CH2M HILL. Decisions regarding phosphorus removal at Lander Street WWTF will be made in conjunction with this planning project.	In Progress
Project Design: West Boise WWTF Phosphorus Removal, CH2M HILL. Conceptual design and pilot testing is in progress, as the first phase of designing facilities to implement EBPR.	In Progress
Biosolids and Soils Special Phosphorus Testing and Analysis, City Staff and HDR. Special sampling and lab testing of biosolids and soils are being performed to better understand the impact of biosolids phosphorus on soils at the Twenty Mile South Biosolids Application Site (TMSBAS).	In Progress
Technical Memorandum: *FINAL: West Boise Process Optimization Report,* CH2M HILL. Provides results of operating the South Plant in the EBPR mode.	Sep-06
Technical Memorandum: *City of Boise, Lander Street Ferric Chloride Addition,* CH2M HILL. Summarizes results of process modeling to estimate chemical usage requirements to accomplish H2S reduction in digester gas, to prevent undesired struvite precipitation, and to accomplish chemically enhanced phosphorus removal.	Sep-05
Construction and Startup: West Boise WWTF Phase 3, Stage 2. The South Plant aeration basin underwent substantial modifications to convert it to a biological reactor that can be operated in an EBPR mode.	Feb-05
Technical Memorandum: *Lander Street WWTF 2003 EBPR Pilot Testing Results,* MWH. Summarizes results of pilot testing an innovative treatment process configuration for modification of the existing step feed with anoxic selector zones biological reactor to facilitate enhanced biological phosphorus removal.	Dec-03
Report (Draft): *City of Boise Effluent Filtration and Phosphorus Removal Study,* HDR.	Jul-03
Contract Documents: *West Boise Wastewater Treatment Facility Improvements, Phase 3 Stage 2,* CH2M HILL. Incorporates anaerobic and anoxic zones in the South Plant aeration basins to enable future EBPR.	May-03
Biosolids Phosphorus Management Technical Report, HDR. Evaluates impact of phosphorus in biosolids on soils at Twenty Mile South Biosolids Application Site.	Jan-03
Technical Memorandum: *West Boise WWTF - Filtrate Treatment Evaluation,* MWH. Evaluates alternatives for treatment of biosolids dewatering process filtrate to reduce impact of phosphorus and ammonia recycle on liquid process operated for phosphorus removal.	Dec-02
Technical Memorandum: *Evaluation of Reduction of Phosphorus into the Wastewater System through Pollution Prevention,* CH2M HILL	Dec-02
Technical Memorandum (Final Draft): *City of Boise, West Boise WWTF Phosphorus Studies,* CH2M HILL. Process model used to evaluate EBPR, primary sludge fermentation, chemical feed, and filtrate treatment options for meeting anticipated future phosphorus removal requirements.	Nov-02
Technical Memorandum: *West Boise WWTF - Phase 3, Stage 2 Process Refinement,* CH2M HILL. Evaluates options for conversion of the South Plant to an EBPR process.	Sep-01
Technical Memorandum: *Natural Treatment Systems and Feasibility for Use at the West Boise Wastewater Treatment Plant,* CH2M HILL. Includes evaluation of phosphorus removal capability of a wetland constructed to polish the effluent from the West Boise WWTF.	Sep-01
Report: *Lower Boise River Phosphorus Model Trade, Conceptual Design of a Combined Sediment Basin/Wetland System Technical Memorandum,* Brown & Caldwell	Nov-99

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We are currently in the conceptual design phase of modifying the West Boise WWTF to accomplish EBPR. This quite large and complicated project involves modifying the liquid process facilities and adding new facilities for primary sludge fermentation, biosolids dewatering filtrate treatment, and chemical trim. Use of EBPR technology is being implemented in lieu of chemical phosphorus removal due to lower life cycle cost and improved environmental sustainability. However the initial capital cost and implementation time for EBPR are more than if we were to just implement chemical phosphorus removal. The primary sludge fermentation process is needed to adjust the influent wastewater characteristics to facilitate the EBPR process. Biosolids dewatering filtrate treatment is necessary to minimize the return of phosphorus and ammonia from the solids processing portion of the plant back to the liquid treatment process. We are extensively evaluating use of an innovative process for filtrate treatment that utilizes precipitation of struvite (magnesium ammonium phosphate), which can be used as a fertilizer. Binding the phosphate up as struvite would be much more environmentally sustainable as compared to the common approach of forming aluminum or iron phosphate precipitates. However more time is needed for evaluation and implementation of the struvite treatment process. Addition of chemical feed facilities is planned to provide the ability to chemically remove phosphorus as needed to supplement the EBPR process in order to consistently meet future effluent phosphorus NPDES permit limitations. It is anticipated that this chemical feed process will seldom need to be used to meet the initial planned 1,000 ug-P/L effluent limitation.

Additional chemical feed facilities may need to be added in order to meet the 500 ug-P/L limit by the end of the second permit cycle. Operation of the treatment facilities modified during the first permit cycle to accomplish EBPR should be optimized prior to constructing additional chemical feed facilities.

Construction and operation of effluent filtration facilities are planned for meeting the 200 ug-P/L limit by the end of the third permit cycle. The EBPR with chemical feed treatment facilities should be operated for an extended time period to optimize performance prior to pilot testing and design of effluent filtration facilities. There are multiple effluent filtration technologies available with differing phosphorus removal capabilities and cost.

The plan for modifying the Lander Street WWTF to meet a 200 ug-P/L effluent limit is less certain at this time since the future utilization of the Lander Street WWTF is currently being evaluated in the Wastewater Facilities Plan 2020 project. A final decision should be made in about a year. I anticipate that it will be modified to provide EBPR with chemical trim and effluent filtration, similar to the West Boise WWTF; however a quite different approach may potentially be selected. To meet a 1,000 ug-P/L effluent limit by the end of the first permit cycle, I anticipate that a portion of the influent flow currently being treated at Lander Street WWTF will be shifted to the West Boise WWTF for treatment. Initially chemically enhanced primary treatment will probably be used at Lander Street WWTF in conjunction with a potential trade with the West Boise WWTF (if it can remove excess phosphorus) to meet Boise's overall effluent phosphorus limitations.

Table 2 provides our currently projected schedule for future actions to meet a 200 ug-P/L limit. This schedule is not an official declaration of the City of Boise since the City Council must approve future appropriations of funds. In spite of our best intentions this schedule is subject to potential slippage due to multiple factors, including:

- Resource limitations – City staff, consultant staffing, construction contractors, equipment suppliers. Design, construction and operation of wastewater treatment facilities are complicated and require specialized expertise. Some of these resources are in strong demand.
- Fiscal limitations – The currently estimated total capital cost of facilities to meet a 200 ug-P/L effluent limit is in the range of $60 million. The City of Boise may potentially need to borrow funds via a bond election process in order to fund some of the required improvements. This process can potentially cause substantial delay.
- Controversies – Controversies due to public concerns or disputes with vendors of goods and services can cause significant delay.

Table 2: Preliminary Schedule for Reducing WWTF Effluent Phosphorus to 200 ug-P/L[1]

Milestone	Projected Completion	
	Lander St WWTF	West Boise WWTF
Phase 1: Enhanced Biological Phosphorus Removal to Meet 1,000 ug-P/L Limit		
Project Definition Report	2010	2008
Final Design and Construction Contract Documents	2012	2010
Construction	2014	2012
Startup	2014	2012
Phase 2: Chemical Feed to Meet 500 ug-P/L Limit		
Project Definition Report	2014	2013
Final Design and Construction Contract Documents	2016	2015
Construction	2017	2016
Startup	2017	2016
Phase 3: Effluent Filtration to Meet 200ug-P/L Limit		
Project Definition Report	2018	2017
Final Design and Construction Contract Documents	2020	2019
Construction	2022	2021
Startup	2022	2021

Note 1: Subject to change, see discussion in text.

In conclusion the City of Boise is committed to reducing phosphorus discharges to the Boise River and intends to continue moving forward to accomplish this goal in an expeditious, environmentally sustainable and fiscally prudent manner.

Sincerely,

Bob Kresge

Robert E Kresge, P.E.
Environmental Engineer

C: John Tensen
SAR 551 2.3

MWH
BUILDING A BETTER WORLD

MEMORANDUM

TO:	Sherrill Doran, CH2M-Hill Lower Boise River WAG	DATE:	April 10, 2008
FROM:	Larry Bennett	REFERENCE:	1690811.01/3.1
SUBJECT:	Phosphorus Implementation Plan Caldwell WWTP		

In response to your April 3, 2008, e-mail request, the following provides more definitive information on the Implementation Plan for removing phosphorus at the Caldwell WWTP.

The City of Caldwell WWTP treats approximately 6 mgd (summer flow) of wastewater from domestic, commercial and industrial sources. The domestic and commercial sources are for approximately 41,000 population. Also, the WWTP receives septage from rural areas. The only significant industrial source is West Farm Foods. The industrial pretreatment program ensures that toxic or harmful constituents are not introduced.

The City of Caldwell WWTP process train includes headworks (pumping, screening, and grit removal), primary clarification, aeration basins for BOD removal and nitrification with final clarification, and ultraviolet light disinfection. The nitrification basin process includes a selector basin which has significantly reduced the effluent phosphorus since it was started in early 2000. The treated wastewater is discharged into the Boise River.

Solids are anaerobicly digested to meet Class B standards and are reused as agricultural amendment.

In response to your specific request for information:

1. What activities has the City completed/or are in progress for phosphorus control?

In 2000, the new nitrification process started operation. This process includes a selector basin for filamentous bacteria control (which has proven to be an effective phosphorus removal process). The following table shows the effluent phosphorus in 2006 and 2007:

YEAR	EFFLUENT TP (mg/l)
2006	0.24
2007	0.34

The City is currently expanding the WWTP to handle the recent and expected growth. In 2006, a new Headworks and new Primary Digester were completed. Another project under construction will double the capacity of the nitrification system to handle the increased loads.

2. How does the City plan to meet the 0.2 mg/l permit limit within three permit cycles?

If the limit is 0.2 mg/l TP on a seasonal value (average month or average day), the City will proceed with expansion of the WWTP. Under this scenario, in the first permit cycle, since the WWTP effluent already is less than the 1 mg/l limit, only a redundant selector basin will be constructed. The project schedule will take about three years to complete (budgeting 1 year; final design 1 year; construction 1 year).

During the second permit cycle, chemical facilities will be added to provide chemical precipitation of phosphorus in both the primary clarifiers and in the final clarifiers. Also, chemicals will be feed to the drying bed supernatant to precipitate phosphorus. The project schedule will take about three years to complete (budgeting 1 year; predesign and final design 1 year; construction 1 year).

During the third permit cycle, filtration with chemical addition will be constructed to reduce suspended solids and phosphorus. The design of the Phase 1 facilities (constructed in 1998-2000) include sufficient hydraulic head for filters to be installed between the final clarifiers and disinfection without additional pumping. The project schedule will take about five years to complete (budgeting 1 year; predesign 1 year, final design 1 year; construction 2 years).

If the limit is a daily limit of 0.2 mg/l or lower, then other options may be implemented.

cc: Gilbert Sanchez, Veolia Water/Caldwell WWTP
Larry Osgood, Caldwell Interim Public Works Director

T E C H N I C A L M E M O R A N D U M **CH2M**HILL

City of Meridian Phosphorus Implementation Plan

PREPARED FOR: Sherrill Doran, CH2M-HILL

PREPARED BY: Daniel Ayers, CH2M HILL

COPIES: Clint Dolsby, City of Meridian

DATE: April 14, 2008

In response to your April 3, 2008 e-mail request, the following provides more definitive information on the Implementation Plan for removing phosphorus at the Meridian WWTP.

The City of Meridian treats approximately 6.9 mgd (maximum day flow) of wastewater from domestic, commercial and industrial sources. The domestic and commercial sources are for approximately 70,000 population. The WWTP does not accept septage and only light industrial wastewater is received at the plant. The industrial pretreatment program ensures no toxic or harmful constituents are introduced to the sewer system.

The City of Meridian WWTP process train includes headworks (screening, pumping, and grit removal) primary clarification, aeration basins for BOD, TSS, and biological nutrient removal, secondary clarification, tertiary filtration, and UV disinfection. Solids are anaerobically digested and dewatered to meet Class B standards and are either reused as agricultural amendment or landfilled.

In response to your specific request for information:

1. What activities have the City completed or are in progress for phosphorus control?

In 2007, the City placed the biological nutrient removal system on-line. This has removed phosphorus down to approximately 1.57 mg/l. In addition, Chemically Enhanced Primary Treatment is being pilot-tested and when optimized, will stabilize the BPR system and further reduce phosphorus. This is part of the plant optimization plan. Also with filtration, the plant can meet IDEQ Class A reuse standards and plan to reuse part of the effluent for turf irrigation in the summer months.

2. How does the City plan to meet the 0.2 mg/l permit limit within three permit cycles?

If the limit is 0.2 mg/l TP average month or average day on a seasonal basis, the City will install chemical feed facilities upstream of the tertiary filters to achieve this limit. This would be done in the third permit cycle.

MWH

BUILDING A BETTER WORLD

MEMORANDUM

TO:	Sherrill Doran, CH2M-Hill Lower Boise River WAG	DATE:	April 10, 2008
FROM:	Larry Bennett	REFERENCE:	1690800.01/3.1
SUBJECT:	Phosphorus Implementation Plan Nampa WWTP		

In response to your April 3, 2008, e-mail request, the following provides more definitive information on the Implementation Plan for removing phosphorus at the Nampa WWTP.

The City of Nampa WWTP treats approximately 10 mgd of wastewater from the domestic, commercial and industrial sources in and adjacent to the City of Nampa. The domestic and commercial sources are for approximately 81,000 population. Also, the WWTP receives over 3 million gallons per year of septage from rural areas. The industrial sources include Simplot Potato, The Amalgamated Sugar Company (TASCO), and several smaller industrial sources. The industrial pretreatment program ensures that toxic or harmful constituents are not introduced.

The City of Nampa WWTP process train includes headworks (pumping, screening, and grit removal), primary clarification, trickling filters with secondary clarification, aeration basins for BOD removal and nitrification with final clarification, disinfection and post aeration. Solids are anaerobicly digested to meet Class B standards. The treated wastewater is discharged into Indian Creek where most of the effluent is reused for agricultural irrigation prior to reaching the Boise River.

In response to your specific request for information:

1. What activities has the City completed/or are in progress for phosphorus control?

The City is currently having a Facility Plan Update prepared. This FP Update is comparing treatment at the WWTP (biological, chemical, or a combination) with other alternatives. The other alternatives include reuse as Class A in the City's pressure irrigation system, Class B on golf courses, Class C on City owned farmland, Class C water in irrigation canals, and discharge to Indian Creek with wetlands polishing, among other options. These options are considering both seasonal and the potential for year-round limits on phosphorus. The Facility Plan Update will be completed by early fall, 2008.

In the 2004 to 2009 period, the City has or will have invested over $24 million in the WWTP. This money was used to expand the WWTP with a new final clarifier and RAS pump station and a new primary clarifier. The RAS piping was arranged to allow for the future selector basin. The City has also retrofit the old two final clarifiers and one old primary clarifier. The City is currently doubling the capacity of the nitrification system to handle the increased nitrogen loads and is designing another primary anaerobic digester to handle the higher solids loads. The City has also constructed more biosolids drying beds and purchased a Brown

Bear and GeoTubes ™ (biosolids dewatering bags) to assist in dewatering the biosolids which increases the WWTP solids handling capacity.

2. How does the City plan to meet the 0.2 mg/l permit limit within three permit cycles?

If the limit is 0.2 mg/l TP on a seasonal value (average month or average day), the City will probably proceed with expansion of the WWTP. Under this scenario, in the first permit cycle, one of the existing trickling filters will be demolished to provide space for additional facilities. A selector basin, two additional nitrification basins, and a blower building will be constructed in the location of the demolished trickling filter. The Secondary Effluent Pump Station will be replaced with a larger pump station and another final clarifier will be constructed. These facilities should reduce the effluent phosphorus to approximately 1 mg/l. The project schedule will take about five years to complete (budgeting 1 year; predesign 1 year, final design 1 year; construction 2 years).

During the second permit cycle, chemical facilities will be added to provide chemical precipitation of phosphorus in both the primary clarifiers and in the final clarifiers. Also, chemicals will be feed to the belt press filtrate and drying bed supernatant to precipitate phosphorus. The project schedule will take about three years to complete (budgeting 1 year; predesign and final design 1 year; construction 1 year).

During the third permit cycle, filtration with chemical addition will be constructed to reduce suspended solids and phosphorus. The project schedule will take about five years to complete (budgeting 1 year; predesign 1 year, final design 1 year; construction 2 years).

If the limit is a daily limit of 0.2 mg/l or lower, then other options may be implemented.

cc: Greg Pearce, Nampa WWTP
Andy Tiller, Nampa WWTP
Michael Fuss, Nampa Public Works Director

Electronic Mail

FROM: tburgess@civilsurvey.net

TO: sherrill.doran@ch2m.com

SUBJECT: Phosphorous Implementation Plan Information

Sherrill,

Here is the requested information regarding The Cliffs.

1. This is a new facility utilizing MBR technology. We are planning to reuse all of our effluent on site for irrigation of common areas during the growing season and groundwater recharge during the non growing season. The Boise River discharge is for redundancy and will only be used if necessary.
2. We will meet the 200 ug/L permit limit under the first permit cycle.
3. Schedule
   1 – Studies and Conceptual Design – Completed
   2 – Final Design – Completed
   3 – Construction – Begin Fall 2008
   4 – Completion – Spring 2010

Timothy A. Burgess, PE
Civil Survey Consultants, Inc.
1400 E. Watertower St., Suite 100
Meridian, ID 83642
Tel (208)888-4312
Fax (208)888-0323

April 9, 2008

Chris Lammer, P.E.
Environmental Manager
(208) 378-7100 x-7114
chris.lammer@darigold.com

Sherrill Doran
CH2M Hill
322 East Front Street
Boise, Idaho 83702

Re: Implementation Plan for Phosphorus

Dear Ms. Doran,

This letter outlines our plans to achieve compliance with the proposed new limits on phosphorus discharges to the Boise River. Our milk plant in Caldwell, Idaho discharges water evaporated from milk to the Boise River under NPDES Permit ID-002495-3. This water contains low concentrations of phosphorus. Typically, the total phosphorus concentration is below the proposed new limit of 200 micrograms per liter. However, the concentration exceeds this limit at times.

Measures we have completed to date include minimizing use of any phosphate-based cleaning compounds and reviewing our operational practices to minimize any carry-over of milk into the evaporated water. We expect that these measures will suffice to assure compliance with the interim limit on phosphorus proposed for the next permit cycle.

Longer term, we are likely to either have to divert the evaporated water to the municipal wastewater treatment plant or construct a treatment facility to reduce the phosphorus concentration in our discharge. The former option is not likely to be successful because the City of Caldwell also faces the same phosphorus limits.

A critical concern related to construction of a treatment facility is room. We cannot treat wastewater in the same areas as used for food product manufacturing, and our plant is surrounded by other businesses on all sides. Of course, the cost of constructing and operating a wastewater treatment facility is also a serious concern for us. We expect that, during the coming permit cycle, we will evaluate treatment alternatives with these factors (space and cost) as primary criteria. There has been quite a bit of development in phosphorus treatment technology over the past few years; we are hoping that more satisfactory treatment alternatives become available as we work toward identifying a specific solution for our treatment needs.

Sherrill Doran, Page 2

Please feel free to contact me if we can provide any additional information.

Sincerely,

Chris Lammer, P.E.
Environmental Manager

cc: Dennis Agenbroad – Caldwell Plant Manager
Wayne Salvador – Caldwell Plant

PHARMER ENGINEERING

www.pharmereng.com
1998 W. Judith Lane
Boise, ID 83705
Phone: 208-433-1900
Fax: 208-433-1901

October 23, 2008

Craig Shepard
Watershed Manager
Idaho Department of Environmental Quality, Boise Regional Office
DEQ Boise Regional Office
1445 N. Orchard Boise, ID 83706

RECEIVED
OCT 24 2008
DEPARTMENT OF
ENVIRONMENTAL QUALITY
BOISE REGIONAL OFFICE

Re: Lower Boise River Implementation for Plan Total Phosphorus
City of Wilder Phosphorus Allocation

Dear Mr. Craig Shepard:

The Idaho Department of Environmental Quality has recently completed the final draft of the Lower Boise River Implementation Plan: Total Phosphorus (Implementation plan) dated July 2008. All but one of the municipalities which discharge wastewater to the Lower Boise River were identified as point source dischargers of total phosphorus. These municipalities were given a phosphorus wasteload allocation from the Lower Boise River Total Maximum Daily Load (TMDL). The City of Wilder was not identified in the Implementation plan as a point source discharger of phosphorus to the Lower Boise River and therefore not awarded any phosphorus load allocation. The City of Wilder discharges wastewater to the Wilder Ditch Drain which seasonally flows to the Lower Boise River. After discussion with the United States Environmental Protection Agency Region 10 Representative Bill Stewart it was clear that the City of Wilder would require a phosphorus allocation to be included in the Implementation plan.

The Wilder Ditch Drain flows north from the City of Wilder until it enters the Reese East End Drain. The Reese East End Drain is controlled by a head gate which either allows the flow to enter the Lower Boise River or the flow is routed to adjacent farm fields for irrigation use. If the flow is diverted for irrigation use, the water does not reach the Lower Boise River. The Reese East End Drain typically does not flow to the Lower Boise River during the May-September phosphorus control period identified by the Implementation plan. Although the Reese East End Drain does not typically flow to the Lower Boise River during the phosphorus control period, the head gate is controlled by an irrigation district water master and not the City of Wilder Wastewater Treatment System operators. Because the city does not have complete control of the water reuse, a waste load allocation for the City of Wilder will need to be included in the Implementation plan to ensure the Lower Boise River is able to meet its seasonal, instream total phosphorus concentration goal of 0.07 mg/L at the City of Parma. In order to protect the Snake River – Hells Canyon reach as a resource, the phosphorus wasteload from the City of Wilder will need to be included as a point source load to the Lower Boise River.

[Double-click and then single-click **here** and type the recipent's name]
October 23, 2008
Page 2

The current effluent flow from the Wilder Wastewater Treatment facility is 0.18 mgd with a daily effluent phosphorus load of 9 lbs/day. The projected effluent flow and loads developed in the City of Wilder Wastewater Treatment Facilities Plan approved October 11, 2007 are listed below.

- 2006 – 0.18 mgd, 9 lbs/day of total phosphorus
- 2011 – 0.28 mgd, 14 lbs/day of total phosphorus
- 2026 – 0.85 mgd, 42.5 lbs/day of total phosphorus

We would like to request that the Idaho Department of Environmental Quality review the wasteload allocation request and provide a written letter of decision regarding the required wasteload allocation. This wasteload allocation is necessary to ensure the target goal of instream phosphorus concentration can be met by the Implementation plan. If additional information is required for a decision to be made feel free to contact us regarding the matter.

Sincerely,

Robert Pharmer, P.E.

Enclosures: As noted

Copy: Mayor John Bechtel, City of Wilder, Idaho

KELLER associates
131 SW 5th Avenue, Suite A • Meridian, ID 83642
208.288.1992 phone • 208.288.1999 fax • www.kellerassociates.com

November 18, 2008

RECEIVED
NOV 2 1 2008
DEPARTMENT OF
ENVIRONMENTAL QUALITY
BOISE REGIONAL OFFICE

Mark Mason, P.E.
Department of Environmental Quality
Boise Regional Office
1445 North Orchard
Boise, ID 83706

Re: **Star Sewer and Water District Lower Boise River Implementation Plan Total Phosphorus -Flow Project Discrepancy**

Keller Associates is writing this letter as the qualified licensed professional engineer representing the Star Sewer and Water District (District). Keller Associates recently became aware of the Lower Boise River Implementation Plan Total Phosphorus dated July 2008. Table 12. *WWTF Wasteload Allocations (Year 10-15, Stage 3)*, includes a 10-15 year flow projection for the District of 1.3 cfs which correlates to 0.84 MGD. Please recognize this letter as notice that this flow projection is a severe underestimate of the wastewater flows expected over the next 10-15 years for the District. This summer, the District recorded daily flows that were around 0.8 MGD. The 2004 Wastewater Facility Planning Study for the wastewater treatment plant reflected a 2025 max month flow projection of 1.4 MGD and a max day flow projection of 1.8 MGD. We request that Table 12 be modified to reflect more realistic flow projections consistent with the DEQ approved facility planning study. Please call me at 288-1992 with any questions.

Very truly yours,

KELLER ASSOCIATES, INC.

Justin Walker

Justin Walker, P.E.
District Engineer

JLK/cw
cc: SSWD
Barry Brunell (DEQ)
Sherrill Doran-CH2M Hill (email: sherril.doran@ch2m.com)
Craig Shepard (DEQ)

207128/2/08-890

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5 Allocations

The SR-HC TMDL assigned a load allocation to the Boise River to meet the 0.07 mg/L TP target at its confluences with the Snake River. The SR-HC TMDL (IDEQ/ODEQ 2004, p. 447) explains the instream SR-HC target:

> The SR-HC TMDL target for total phosphorus for each tributary is a concentration of less than or equal to 0.07 mg/L total phosphorus as measured at the mouth of the tributary and applies from May through September. Because the total phosphorus target is concentration-based, actual allowable tributary load allocations under the TMDL are dependant on actual tributary flow and will fluctuate year to year. The total phosphorus load allocations listed in this table are based on averaged tributary flows measured in 1979, 1995 and 2000, which were average Snake River flow years, not necessarily average tributary flow years. Therefore they do not necessarily represent the calculated load allocations for any specific year or different series of years.

To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a May 1 to September 30 instream TP (TP) target of 0.07 mg/L in concert with a mean growing season limit for chlorophyll *a* of 14 ug/L (nuisance threshold of 30 ug/L with exceedance threshold of no greater than 25%) for the SR-HC reach upstream from Brownlee Reservoir. To meet this target, the SR-HC TMDL allocates TP loads to point sources and nonpoint sources discharging directly to the SR-HC reach and treats tributaries to the reach "as discrete, nonpoint sources for the purposes of loading analysis and allocation within this TMDL" (IDEQ/ODEQ 2004, pp. 21, 235, 439, 447). The SR-HC TMDL assigned target concentrations of 0.07 mg/L to the mouths of each of the SR-HC reach tributaries as the basis for determining tributary loading that will attain the SR-HC reach instream TP target (IDEQ/ODEQ 2004, p. 447).

5.1 Design Conditions

Design conditions specified in the EPA-approved SR-HC TMDL are based on Snake River flows (IDEQ/ODEQ 2004, Figure 2.3.4, p. 103). Flow data used in this analysis were primarily provided by the United States Geological Survey (USGS) and were supplemented by flow data collected by Idaho Power Company for the years from 1997-2002. Figure 7 presents a comparison of the discharge (Q) at Parma used as an illustration in the SR-HC and the discharge at Parma represented by this allocation.

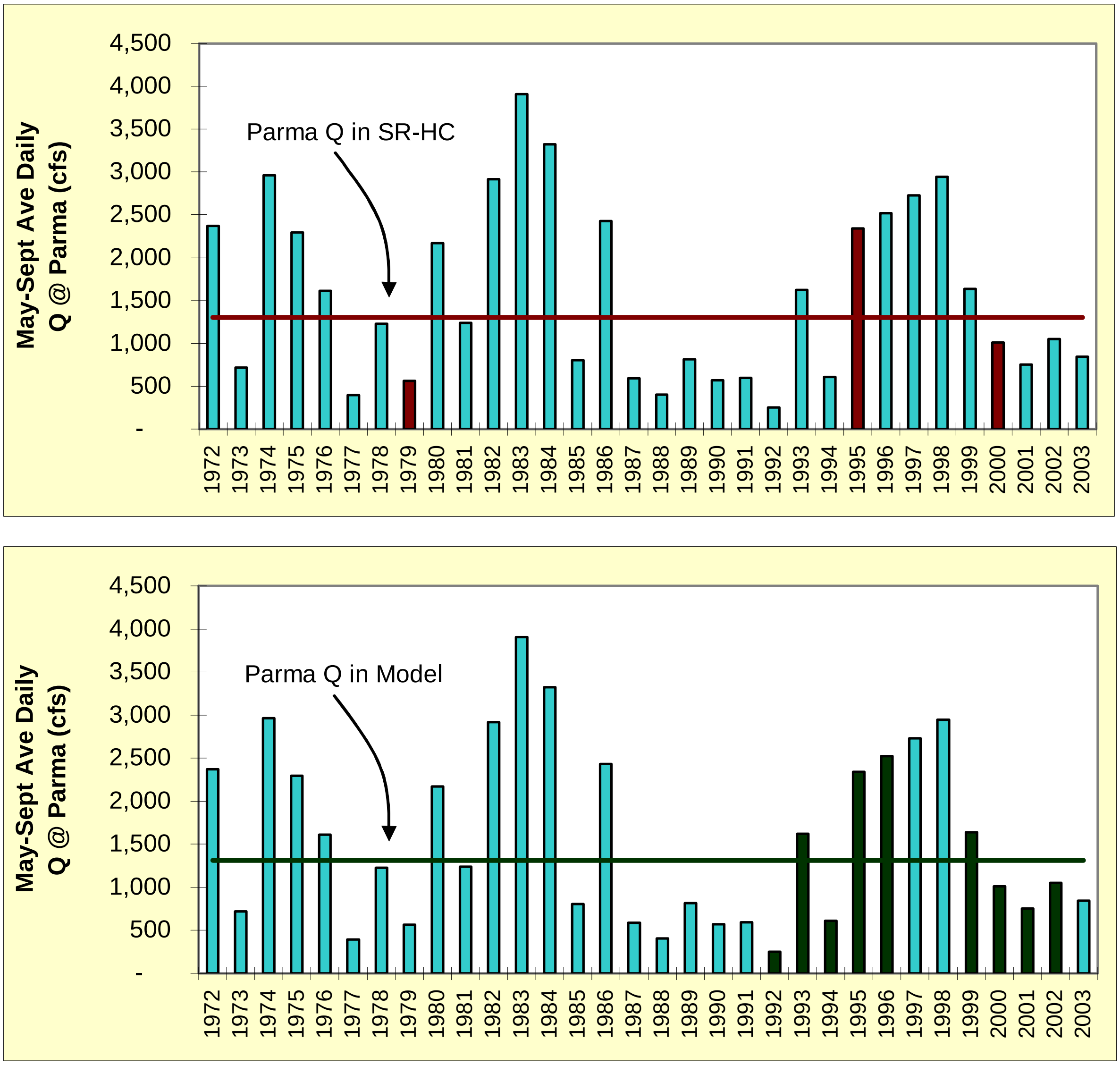

Figure 7. Seasonal Sum of Flows at Parma (1972-2003)

Flows in the lower Boise River model (lower part of Figure 7) were chosen originally (in 2004) to be consistent with conditions specified in the SR-HC TMDL. An analysis was performed to determine which flow years in the lower Boise River basin should be selected for the allocation process. The sum of average daily flows at Parma from May 1 to September 30 was used to rank water years on record (1972-2003). The top of figure 7 highlights the three flows years used to develop the SR – HC TMDL. The bottom of figure 7 highlights the flow years used in the lower Boise River model (USGS discharge data for the Boise River at Parma).

Initially, flows from 2000 (medium-flow year) and 2001 (low-flow year) were used to model allocation scenarios to determine which flow-type would be more limiting (and thus, conservative). The concern was that during low-flow periods (such as that observed in 2001) when TP concentrations are generally higher, there could potentially be a larger negative effect on downstream waterbodies. However, when assessed in the context of loads, average-flow years carry a higher relative load than low-flow years because loads are controlled more by flow than by concentration (Table 5).

Table 5. Comparison of Loads Between 2000 and 2001 (LOADEST Output; Donato and MacCoy 2004 [model output files])

Year	USGS Average Q (cfs)	LOADEST Average TP (mg/L)	TP Average Load (lbs/day)
2000 (medium-flow)	977	0.289	1,489
2001 (low-flow)	427	0.322	726
Note: The predicted concentration at Parma in 2001 (low-flow year) is 1.11% of the predicted concentration at Parma in 2000 (medium-flow year).			

Thus, much larger flows outweigh relatively small changes in TP concentrations. For 2 years modeled by USGS (Donato and MacCoy 2004 [model output files]), flows more than double when comparing low-flow to medium-flow years, but the TP concentrations only increase by 11%.

In other situations where runoff and pollutant loading is driven by storm events and subsequent runoff, determining tiered allocation targets based on varying flows is common. It is not a typical approach to apply that concept to this system, where summer flows are completely regulated and not natural, summer storms represent only 20% of the annual precipitation input, and nearly half of the summer events are less than 0.1 inch. Instead, a load-duration curve was developed for Parma based on the available USGS phosphorus monitoring data collected between 1990 and 2005 (Figure 8).

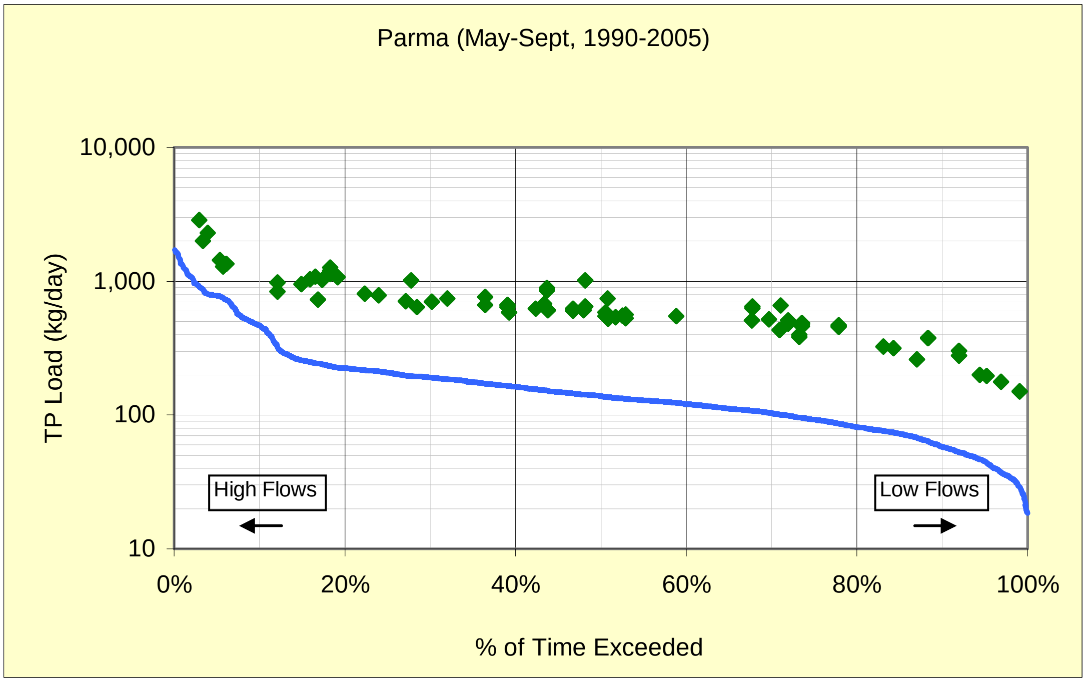

Figure 8. Load Duration Curve for Parma (1990-2005)

The blue line represents the target load, given the range of flows observed during this period and the target concentration of 0.07 mg/L. The green diamonds are actual loads observed during the same time period. This graph is another way to demonstrate the reductions in concentrations that would be required over a range of flows. See Table 7 for approximate TP loads with mean monthly discharges for the months May through September. Table 6 summarizes these reductions (expressed for both concentration and load at Parma).

Table 6. Summary of Reductions Required Under Varying Flows

	% of Time Exceeded				
	0-20%	**20-40%**	**40-60%**	**60-80%**	**80-100%**
	<-- High Flows				**Low Flows -->**
Concentration					
Average Observed C (mg/L)	0.26	0.27	0.33	0.36	0.36
Average Reduction Required	73%	74%	79%	80%	80%
Load					
Average Observed Load (kg/day)	1291	727	668	500	307
Average Target Load (kg/day)	548	190	138	101	57
Average Reduction Required	58%	74%	79%	80%	82%
Based on USGS monitoring data for Parma May-Sept from 1990-2005 (shown in Figure 7).					

The percent load and percent concentration reductions under medium- and low-flow conditions are essentially comparable, which reinforces the LOADEST[6] results predicted by USGS (that is, that load fluctuations are more sensitive to flows than to concentration). Thus, it appears that the allocations developed based on average-year conditions to meet the Parma target should be protective over a critical range of flows at Parma.

5.2 Load Capacity

Table 7 shows the loads in the Boise River from mean annual monthly discharges and loads that equate to the target of 0.07 mg/L at Parma.

Table 7. Discharge and Total Phosphorus Loads and Concentrations at Parma

Month	Mean monthly Discharge 1971-2006 (cfs)	Total Phosphorus Load Capacity (Kg/day)	Target Total Phosphorus Concentration (mg/L)
May	3,008	517	0.07
June	2,028	349	0.07
July	967	166	0.07
August	791	136	0.07
September	982	169	0.07

[6] LOADEST stands for Load Estimator, a software program available from the USGS for estimating constituent loads in streams and rivers (http://water.usgs.gov/software/loadest/).

The 90th percentile flow duration interval (90% of flows exceed) for May – September (379 cfs at Parma) was considered as an appropriate low flow scenario. Based on projected nonpoint source loads after full implementation and land use conversion and with total removal of wastewater effluents from the river, a less than or equal to target concentration of 0.07 mg/L total phosphorous in the Boise River at Parma is not achievable during low flow scenarios such as these, though TP loads to the Snake River would be expected to be significantly reduced during low flows. The use of low flow conditions, however, may not reflect critical flow conditions relative to nuisance aquatic growth in the Snake River. Idaho and Oregon DEQs determined that low flow conditions did not consistently drive the poorest water quality conditions in the Snake River as much as average flow conditions. For this reason, in the SR-HC TMDL, the DEQs used average flows to describe allocations. Therefore, the success of the reductions in the Implementation Plan in achieving beneficial use support in the Snake River cannot be judged solely by low flow conditions. DEQ's reexamination of the Lower Boise TP target will include consideration of flow conditions relative to nuisance aquatic growth. As seen in Table 8, when loads are based on mean flows, a seasonal average concentration of 0.07 mg/L in the Boise River at Parma is achievable.

Table 8 shows the predicted loads and concentrations in the Boise River with WWTFs discharging 0.2 mg/L TP.

Table 8. Boise River with WWTFs discharging 0.2 mg/L Total Phosphorus

Month	Mean monthly Discharge 1971-2006 (cfs)	Total Phosphorus Load (Kg/day)*	Total Phosphorus Concentration at Parma (mg/L)
May	3,008	274	0.037
June	2,028	238.5	0.047
July	967	199.5	0.084
August	791	193	0.1
September	982	200	0.083
Seasonal Average			0.07

* All other sources at 70 year target loads

Total phosphorus TMDLs, based on an average TP target, have been approved by EPA Region 10 for the following watersheds: Mid Snake River (0.075 mg/L), Portneuf River (0.075 mg/L). Blackfoot River (0.075 mg/L), Bear River (0.050 mg/L), Lake Walcott (0.080 mg/L), Big Wood River (0.05 mg/L), Cascade Reservoir (0.025 mg/L), and the Snake River: King Hill to CJ Strike (0.075 mg/L). One reason for this is that plant growth, including macrophytes, do not respond to instantaneous or a daily maximum phosphorus concentration, rather plant growth is reflective of average phosphorus concentrations over the life of the plant.

Based on known river dynamics, including assimilation, distance, and detention time in Brownlee Reservoir, the scenario represented in Table 8 will improve water quality in the Snake River and the reservoir.

The concept of nutrient spiraling by Newbold et al. (1981) describes variability in nutrient uptake, processing, and retention in streams and rivers. This concept has been examined in a number of subsequent studies, where abiotic and biotic interactions have been observed to control nutrient cycling rates (Thomas et al. 2005; Mulholland et al. 2001). The irrigation system in the Lower Boise River, with its numerous canals and ditches, effectively increases stream channel, stream bank, and riparian zone ratios. This in turn provides more opportunity for processing/assimilation via hyporheic exchanges and aquatic plant (algae, macrophytes) and animal (macroinvertebrates, bacteria) growth. MacCoy (2004) suggests this in her study of the Lower Boise River when she noted, "The tributaries contributed 1,290 lb/d [pounds per day], primarily as ortho-phosphorus, and 350 lb/d was lost, probably owing to withdrawals or plant uptake." She also noted this in the main Boise River, "…and 1,450 lb/d was lost, probably owing to irrigation withdrawals or plant uptake." This would suggest that phosphorus is attenuated in the Lower Boise River during the irrigation/growing season.

In Brownlee Reservoir, given its short retention time (34 days on average), phosphorus moves rapidly through the reach (IDEQ/ODEQ 2004, p. 316). However, this is dependent on season, water year, and tributary input. It should also be noted that the largest biomass of algae occurs in May and June, coinciding with spring runoff, and begins to taper off in July, August, and September (IDEQ/ODEQ 2004, figure 3.2.20). This suggests that phosphorus coming into Brownlee Reservoir in those months from the Lower Boise River would not contribute to significant algae blooms.

5.3 Estimates of Existing Pollutant Loads

Regulations allow that load allocations "...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading" (Water quality planning and management, 40 CFR § 130.2(g)). Given the information discussed above regarding river dynamics, retention times, and the timing of algae growth, DEQ believes the allocations and reductions contained in the Implementation Plan, including the achievement of 0.20 mg/L total phosphorous effluent limits by the WWTFs, are consistent with the assumptions underlying the SR-HC TMDL and the goal of reducing algae growth to levels that support beneficial uses in the Snake River. However, as noted in Section I, DEQ believes the SR-HC TMDL target for the Boise River needs to be reexamined, and if necessary, modified to clarify this issue. An estimate must be made for each point source. Nonpoint sources are typically estimated based on the type of sources (land use) and area (such as a subwatershed), but may be aggregated by type of source or land area. To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads.

Relative current point source contributions from WWTFs are broken down further in Table 9. This table relies on the "relative contribution" factor discussed in section 5.2 to determine the "adjusted contribution."

Table 9. Existing Wastewater Treatment Facility (WWTF) Loads

Source Name	Absolute Load (kg/day)	Relative Contribution (%)	Parma-Adjusted Load (kg/day)
Mainstem			
Lander WWTF	122	0.56	68
West Boise WWTF	240	0.51	122
IDFG-Eagle	4.3	0.67	2.9
Middleton WWTF	6.0	0.75	4.5
Caldwell WWTF*	37	0.89	33
Tributary			
Star WWTF	8.8	0.75	6.6
Meridian WWTF	34	0.75	26
XL Four Star Beef	12	0.20	2.3
Nampa WWTF	199	0.20	40
IDFG-Nampa	4.3	0.20	0.9
Caldwell Housing Authority	0.7	0.89	0.6
Notus WWTF	1.9	0.95	1.8
Wilder WWTF	4.1	0.33	1.3
TOTAL	674		310

*Caldwell WWTF loads are based on concentration data collected following implementation of BNR (see Table 2).

Table 10 summarizes estimated stormwater loads. This table relies on the "relative contribution" factor discussed previously to determine the "adjusted contribution."

Table 10. Estimated Existing Stormwater Loads

Source Name	Estimated Load (kg/day)	Relative Contribution (%)	Parma-Adjusted Load (kg/day)
Boise	19	0.56	10
Eagle	8.3	0.67	5.6
Meridian	10	0.75	7.3
Star	3.4	0.75	2.5
Middleton	5.0	0.75	3.7
Kuna	1.6	0.20	0.3
Nampa	17	0.20	3.3
Caldwell	10	0.89	8.8
Notus	0.5	0.95	0.5
Greenleaf	0.5	0.96	0.5
TOTAL EST. LOAD	79		46

SW: Urban-suburban stormwater not yet regulated under the NPDES program.
NOTE: Documentation of discharge and concentrations is provided in Appendix B.

Table 11 summarizes estimated agricultural loads. This exhibit relies on the "relative contribution" factor discussed previously to determine the "adjusted contribution."

Table 11. Estimated Existing Agricultural Loads

Source Name	Absolute Load (kg/day)	Relative Contribution (%)	Parma-Adjusted Load (kg/day)
Fifteenmile Creek	61	0.75	45
Mill Slough	52	0.75	39
Willow Creek	24	0.75	18
Mason Creek	115	0.75	86
Hartley Gulch (Both)	52	0.80	41
Indian Creek	104	0.89	93
Conway Gulch	29	0.95	27
Dixie Drain	138	0.96	133
Boise Riparian #1	59	0.57	34
Boise Riparian #2	136	0.75	102
Boise Riparian #3	24	1.00	24
TOTAL	792		642

5.4 Allocation Approach

5.4.1 SR-HC Hybrid

The SR-HC hybrid approach incorporates available information about future build-out and funding conditions. It is contained in Appendix I to the EPA-approved SR-HC TMDL (IDEQ/ODEQ 2004).

EPA and state guidance identify a number of factors, including technical feasibility, cost effectiveness, relative contributions, equity, and the likelihood of success, to develop the most effective allocation strategy (EPA, 1991, 2001; ODEQ 2001). Additionally, there are a number of technical considerations that allocations must or should consider, including but not limited to seasonality, margin of safety, future growth, time to meet standards, and innovative approaches (for example, trading). For these reasons, the LBWC recommended adoption of the SR-HC hybrid allocation approach, which is discussed in more detail below.

5.4.1.1 Overview

This implementation plan is a case where it is important to establish the load reductions now, while at that same time recognizing that these reductions will only be achieved as nonpoint source agricultural land uses convert to point source urban land uses over a long-term time frame. In addition, although the lower Boise River may appear to be data-rich relative to many other Idaho watersheds, there remain key data gaps that directly affect the development and implementation of pollutant reductions. Key information gaps include but are not limited to acreages and rate of long-term land use conversion, changes in water use and routing for converted lands, stormwater runoff quantity and quality, ground water loading, and the rate at which ground water quality recovers to background concentrations.

A summary of the overall load reduction approach is as follows:

- Significant reduction of phosphorus in effluent from WWTFs within three NPDES permit cycles. The proposed approach consists of three steps with an ultimate 15-year time frame for WWTF controls: 1) 1 mg/L, 80+% reduction, via enhanced biological phosphorus removal (EBPR) or equivalent within the first permit cycle; 2) 0.5 mg/L, 90-92% reduction, within the second permit cycle; and 3) 0.200 mg/L, 96-97% reduction, within the third permit cycle.
- An overall TP reduction goal of 50% will be implemented by stormwater dischargers and applied to new development and substantial redevelopment. The 50% TP reduction from stormwater would be accomplished through establishing best management practices (BMPs) that target phosphorus reduction, and increased attention to on-site stormwater inspection, maintenance, and public education.
- Voluntary BMP implementation on agricultural lands, contingent on available funding levels and previously-developed implementation plans. This analysis assumes 50% BMP effectiveness, which is lower than the 68% achieved in the Rock Creek Project (IDEQ/ODEQ 2004, Appendix I). Reductions in TP discharges from irrigated lands greater than 50% will require conversion to sprinkler irrigation, zero discharge, and other treatment methods that may be feasible in certain locations, but cannot be applied broadly due to financial constraints, hydrology, crop requirements, and other factors affecting BMP implementation.
- Conversion of agricultural land to other land uses is a critical assumption in meeting the TP load target at the mouth of the Boise River. Urban land has a lower phosphorus loading rate, on a per acre basis, than agricultural land. Thus, as agricultural land is converted to urban land use, there will be a subsequent reduction in phosphorus loading. Load allocations are based on actual land use conversion rates consistent with adaptive management identified in the SR-HC TMDL.

Given the combination of point and nonpoint sources in the watershed and their associated loads, all sources must be considered together to achieve the TP target of 0.070 mg/L at Parma. Under median flow conditions in the Boise River (1,225 cfs), the loading at Parma that achieves this concentration is 210 kg/day. (The SR-HC TMDL allocates 242 kg/day for the Boise River. However, this is based on median flows in the Snake River.)

Subsequent loading of phosphorus will also change, for the better, in the form of lower overall phosphorus loading on a per-acre basis. As discussed in detail in Appendix B, in this watershed phosphorus loads from urban-suburban lands are lower than phosphorus loads from agricultural lands (MacCoy 2004, p. 34). As more urban-suburban acres fall under NPDES MS4 regulations, this trend is expected to continue.

Thus, the improvement in loading resulting from land use conversion from agricultural to urban land uses is critical to the reduction of total phosphorus in the watershed. Given the complexity of the watershed (under existing and future conditions), given the load at complete implementation of controls on point and nonpoint sources, it has been determined that it is not possible to meet the SR-HC TMDL concentration target for TP under certain low flow scenarios. As discussed above, however, low flow conditions may not reflect critical conditions for nuisance aquatic growth in the Snake River, and therefore cannot alone be used to judge the success of the Implementation Plan in supporting beneficial uses in the Snake River. As seen in previous tables and text, when loads are based on mean flows, a seasonal average concentration of 0.07 mg/L in the Boise River at Parma is attainable. DEQ believes attainment of a seasonal average concentration of 0.07 mg/L is consistent with the assumptions underlying the SR-HC TMDL and the goal of reducing algae growth to levels that support beneficial uses in the Snake River. Future monitoring will determine the status of beneficial use support. Because this information is based on the best information today, which may be different in the future, an adaptive management approach is necessary.

5.4.2 Allocations

5.4.2.1 Point Source Wasteload Allocations – WWTFs

Because the implementation plan has been developed to meet a concentration target at Parma, projected WWTF effluent treatment concentrations govern the development of wasteload allocations (WLAs) for WWTFs. The WLAs illustrated herein are based on the following elements:

- Effluent concentration targets as stipulated in the staged implementation approach
- Projected design flows (based on input from existing facility plans and engineering estimates)
- Projected loads on a seasonal basis

Permit limits based on WLAs will be mass-based defined by the effluent concentration target in the Plan and the facility design discharge for the applicable permit cycle. If permit limits are to be applied to any period other than seasonal (e.g., monthly), the seasonal limit will be translated to other periods using appropriate statistical guidance.

As permits are developed for these facilities, WLAs will be governed by the effluent concentration targets and design flows contained in facility-specific permit applications, which are expected to be more robust, since they will be based on more complete information than is available currently. Thus, WLAs contained herein are a placeholder for better design flow information expected to be generated in subsequent permit application cycles.

The adaptive implementation approach for Year 15+ (beyond Stage 3) recognizes that future WWTF capacity may be needed anywhere in the watershed and should not be limited either to existing facilities or to new greenfield facilities that are anticipated based on today's information. Thus, a lumped reserve for growth has been developed to accommodate future WWTF needs anywhere in the watershed.[7] The reserve for growth assumes that between Year 15+ and final plan attainment (assumed to be Year 70), WWTF reuse will increase to an ultimate level of 50% for sources that come online during that time.

This reserve for growth is contingent on the reduced loading resulting from land use conversion and must be monitored carefully over the long-term adaptive management time frame. If the reserve for growth is depleted (either because less load is available than is currently estimated, or that estimated reserve is consumed), new facilities would only be able to come online if they provide 100% reuse during the summer period (May-September) or meet end-of-pipe concentrations that are equivalent to the Parma target.

Table 12 lists the point source flows and concentrations used to estimate WLAs for future build-out (Year 10-15, Stage 3).

Table 12. WWTF Wasteload Allocations (Year 10-15, Stage 3)

Source Name	Projected Flow (cfs)	Total Phosphorus Concentration (mg/L)	Wasteload Allocation (kg/day)	Relative Contribution	Parma-Adjusted Load (kg/day)
Existing					
Mainstem					
Lander Street WWTF	23.5	0.20	11.5	*0.56*	6.4
West Boise WWTF	21.0	0.20	10.3	*0.51*	5.2
IDFG-Eagle	33.1	0.05	4.3	*0.67*	2.9
Middleton WWTF	1.1	0.20	0.5	*0.75*	0.4
Caldwell WWTF	13.7	0.20	6.7	*0.89*	6.0
Tributary					
Star WWTF	2.2	0.20	1.1	*0.75*	0.8
Meridian WWTF	6.7	0.20	3.3	*0.75*	2.5
XL Four Star Beef	1.0	0.20	0.5	*0.20*	0.1
Nampa WWTF	14.7	0.20	7.2	*0.20*	1.4
IDFG-Nampa	33.1	0.05	4.3	*0.20*	0.9
Caldwell Housing	0.1	0.20	0.03	*0.89*	0.02
Notus WWTF	0.3	0.20	0.2	*0.95*	0.1
Wilder WWTF	0.3	0.20	0.2	*0.33*	0.1
Existing WWTF Total	**150.8**	**- -**	**50**	**- -**	**26.8**
Reserve					
Year 0-15 – Reserve Needed*	21.0	0.20	10.1	*0.61**	6.2
Reserve Allocated After 50% Reuse	**- -**	**- -**	**5.0**	***0.61****	**3.1**
TOTAL	**171.8**	**- -**	**55**	**- -**	**30**

[7] Reserves for growth are shown in Tables 12 and 13.

* Reserve loads can be allocated to either existing facilities that require more capacity than these estimates, or to new facilities so long as the overall total WWTF load is not exceeded.
**Based on average relative contribution for WWTFs

An additional two WWTFs (Eagle and Garden City) currently discharge to West Boise WWTF; both of these facilities are expected to begin discharging directly to the lower Boise River watershed within the implementation period. Therefore, they are considered existing for the purposes of NPDES permitting.

The lumped growth reserve allocation for new facilities between Years 0-15 is based on population projections and WWTF capacity that will be required to meet that growth within the next 10 to 15 years. Projected growth to year 70 and wasteload allocations are shown in Table 13.

Table 13. WWTF Wasteload Allocations (Year 70)

Source Name	Projected Flow (cfs)	Total Phosphorus Concentration (mg/L)	Wasteload Allocation (kg/day)	Relative Contribution	Parma-Adjusted Load (kg/day)
Existing					
Mainstem					
Lander Street WWTF	28.4	0.20	13.9	*0.56*	7.8
West Boise WWTF	25.4	0.20	12.4	*0.51*	6.3
IDFG-Eagle	33.1	0.05	4.3	*0.67*	2.9
Middleton WWTF	2.0	0.20	1.0	*0.75*	0.7
Caldwell WWTF	19.1	0.20	9.3	*0.89*	8.3
Tributary					
Star WWTF	3.5	0.20	1.7	*0.75*	1.3
Meridian WWTF	11.1	0.20	5.4	*0.75*	4.1
XL Four Star Beef	1.0	0.20	0.5	*0.20*	0.1
Nampa WWTF	17.7	0.20	8.6	*0.20*	1.7
IDFG-Nampa	33.1	0.05	4.3	*0.20*	0.9
Caldwell Housing	0.1	0.20	0.03	*0.89*	0.02
Notus WWTF	0.5	0.20	0.3	*0.95*	0.2
Wilder WWTF	0.4	0.20	0.24	*0.33*	0.1
Existing WWTF Total	**175**	**- -**	**61.9**	**- -**	**34.4**
Reserve					
Year 0-15 – Reserve Needed**	98.1	0.20	47.8	*0.61**	29.2
Reserve Allocated After 50% Reuse	**- -**	**- -**	**24.0**	***0.61****	**14.6**
TOTAL WWTF WLA	**273**	**- -**	**86**	**- -**	**49**

5.4.2.2 Point Source Wasteload Allocations – Stormwater Runoff

EPA (2002) issued guidance indicating that NPDES-regulated stormwater discharges to water-quality-impaired reaches should be treated as point sources. Thus, EPA requires that NPDES-regulated stormwater discharges must be assigned numeric WLAs. However, associated NPDES permits should:

- be consistent with the assumptions and requirements of the WLA
- express water-quality-based effluent limits (WQBELs) as non-numeric BMPs
- recognize that if WQBEL-based BMPs meet the WLA, no additional controls are necessary.

Thus, although this plan assigns numeric WLAs to urban-suburban runoff, numeric limits should not be incorporated into NPDES-regulated stormwater permits. This is consistent with EPA's expectation that "most WQBELs for NPDES-regulated municipal and small construction stormwater discharges will be in the form of BMPs and that numeric limits will only be used in rare instances" (EPA 2002, p. 2).

Table 14 lists the flows and concentrations used to develop WLAs for future build-out (Year 70).

Table 14. Estimated Stormwater Wasteload Allocations (Year 70, Stage 3+)

Source Name	Estimated Acres that Will Discharge to Lower Boise Watershed	Estimated Wasteload Allocation (kg/day)	Relative Contribution	Parma-Adjusted Load (kg/day)
Boise	47,444	24.3	*0.56*	13.7
Eagle	18,756	9.3	*0.67*	6.2
Meridian	22,706	11	*0.75*	8.3
Star	11,915	5.2	*0.75*	3.9
Middleton	12,472	6.0	*0.75*	4.5
Kuna	4,529	2.1	*0.20*	0.4
Nampa	33,590	17	*0.20*	3.4
Caldwell	21,282	11	*0.89*	10
Notus	1,201	0.6	*0.95*	0.6
Greenleaf	1,037	0.5	*0.96*	0.5
TOTAL STORM WLA	**174,933**	**87**		**51**

* Appendix B contains detailed information regarding assumptions and anticipated treatment levels.

In addition to the allocations presented for stormwater, stormwater associated with construction activities is also regulated. The Clean Water Act (CWA) requires operators of construction sites to obtain permit coverage to discharge stormwater to a water body or to a municipal storm sewer. In Idaho, EPA has issued a general permit for stormwater discharges from construction sites. If a construction project disturbs more than 1 acre of land (or is part of larger common development that will disturb more than 1 acre), the operator is required to apply for permit coverage from EPA after developing a site-specific Stormwater Pollution Prevention Plan (SWPPP). The operator must document the erosion, sediment, and pollution controls they intend to use, inspect the controls periodically, and maintain the BMPs through the life of the project.

In general, if construction activities are conducted consistent with NPDES MS4 requirements of the community in which the activity occurs and/or NPDES Construction General Permit (CGP) requirements, they are considered to be in compliance with the provisions of these allocations.

Sites regulated under the CGP that are located within MS4 permit boundaries are included in the current and future WLAs. Similarly, existing industrial facilities regulated under the Multi-Sector General Permit (MSGP) that are located within MS4 permit boundaries are included in the estimate of total developed acres and receive the same per-acre WLAs as given to the current MS4 areas. Future MSGPs receive the same WLA as future MS4 areas. All MSGP facilities are expected to implement SWPPPs that include BMPs to meet a phosphorus reduction goal of 50%. MSGP-impacted facilities outside of MS4 permit boundaries are expected to implement SWPPPs that are consistent with stormwater management programs required for facilities within an MS4 area.

Industrial facilities that are located outside MS4 permit boundaries are included in the estimate of total acres used to develop nonpoint agricultural source load allocations and are converted from the agricultural load allocation.

5.4.2.3 Nonpoint Source Load Allocations – Agricultural Sources

Future nonpoint agricultural loads, including permitted wastewater reuse sites, will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production.

As agricultural lands are converted to urban-suburban land uses, agricultural loads continue to be estimated based on applying a 50% BMP effectiveness rate on remaining agricultural acres, depending on a number of factors, including funding as discussed in detail in Appendix C.

Table 15 shows the contribution for existing nonpoint agricultural sources on tributaries. As a reminder, the large percentage load reductions are primarily due to land use conversion over the implementation period.

Table 15. Estimated Nonpoint Source Agricultural Load Allocations (Year 70)

Source Name	Estimated Remaining Ag Acres	Load Allocation (kg/day)	Relative Contribution	Parma-Adjusted Load (kg/day)
Fifteenmile Creek	1,709	4.2	*0.75*	3.1
Mill Slough	1,463	3.6	*0.75*	2.7
Willow Creek	672	1.6	*0.75*	1.2
Mason Creek	3,240	7.9	*0.75*	5.9
Hartley Gulch (Both)	1,455	3.6	*0.80*	2.8
Indian Creek	2,940	7.2	*0.89*	6.4
Conway Gulch	806	2.0	*0.95*	1.9
Dixie Drain	3,898	9.5	*0.96*	9.2
Boise Riparian #1	1,666	4.1	*0.57*	2.3
Boise Riparian #2	3,825	9.4	*0.75*	7.0
Boise Riparian #3	679	1.7	*1.00*	1.7
TOTAL AG LA	**22,354**	**55**		**44**

Existing and future nonpoint agricultural loads may include permitted wastewater reuse sites within each of the above watersheds.

5.4.2.4 Nonpoint Source Load Allocations – Background

Background loads are expected to remain constant over the implementation period. Therefore, the load allocation to this background is the same as the existing load: 89 kg/day (Parma adjusted load 9 kg/day).

5.4.2.5 Nonpoint Source Load Allocations – Ground Water

In the future, as agricultural lands convert to urban-suburban land uses, ground water levels are expected to recover. However, to be conservative, no rate of recovery was assumed for future projections. The resulting load from ground water is the same as the existing load: 31 kg/day (Parma adjusted load 24 kg/day).

5.4.2.6 Summary of Wasteload and Load Allocations

The allocations presented above achieve a seasonal average at Parma of 0.07 mg/L. Table 16 presents a summary of how this is achieved over the implementation period by Year 70.

Table 16. Long-term Prediction of a Seasonal Average of 0.07 mg/L

	Year															
Estimated Load at Parma (kg/day)	**Baseline**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**% Change*** **
WWTF Load	310	112	63	30	31	33	35	37	38	40	42	44	45	47	49	-84%
Stormwater Load *	46	47	49	51	53	54	56	58	60	61	63	65	67	68	70	54%
Agriculture Load **	642	542	506	418	387	311	283	219	195	143	123	104	84	64	44	-93%
*Ag reductions due to land use conversion ** *	0	40	79	119	158	198	237	277	316	356	395	435	474	514	553	-86%
*Ag reductions due to BMPs ** *	0	60	56	105	97	133	121	146	130	143	123	104	84	64	44	-7%
Background	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	0%
Ground water	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	0%
Parma Load	1030	735	652	532	504	432	407	347	327	278	262	245	229	213	**197**	-81%

NOTES:

* Increases in stormwater loads due to land use conversion that is expected to add urban-suburban acreage.

** Reductions in agricultural loads include two elements: reductions due to loss of agricultural lands (due to land use conversion 59%) and reductions due to BMP effectiveness (34%).

*** % Change represents % difference between baseline and estimated long-term (Year 65) loads. Numbers are based on estimated future acreage (land use conversion rates).

Figure 9 provides a summary of the recommended improvement approach over the implementation period compared to the achievement time frame established by the SR-HC TMDL (IDEQ/ODEQ 2004, p. 448).

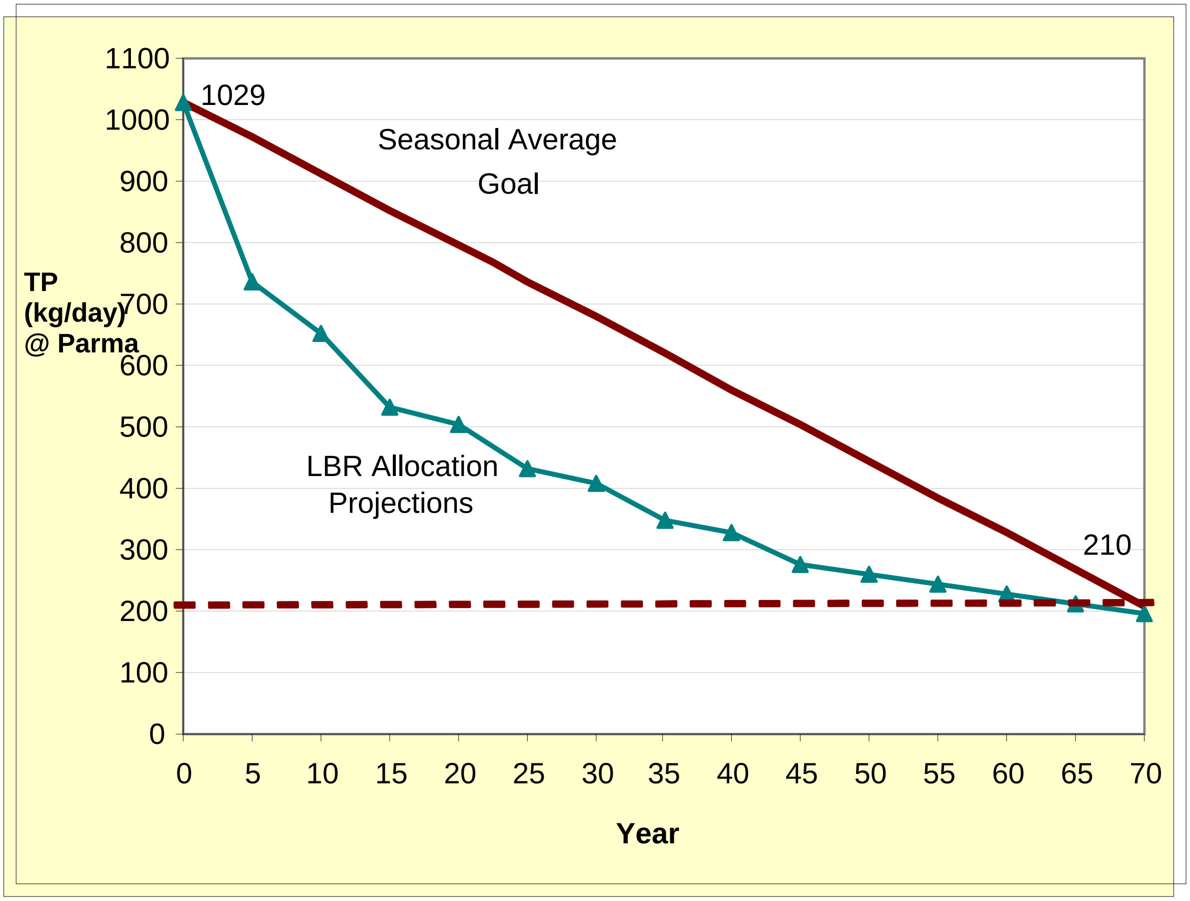

Figure 9. Summary of TP Concentration Improvement at Parma

The SR-HC TMDL (IDEQ/ODEQ 2004, p. 448) states that "a timeframe of approximately 50 to 70 years will be required to implement all necessary control strategies and fully attain SR-HC TMDL targets… This does not mean, however, that Snake River water quality will not improve until the TMDL targets are fully attained. ... Water quality will consistently improve as treatments are applied to point and non-point discharges. To ensure measurable, consistent progress, interim, 10-year objectives (corresponding to 0.01 mg/l reductions in instream phosphorus concentrations) will be established."

Applying this approach to the lower Boise River, reductions in concentrations should be achieved at a minimum of 0.03 mg/L every 10 years. Thus, Figure 9 also shows the expected lower Boise River improvements compared to the SR-HC reduction objectives. The allocation approach herein is consistent with the SR-HC TMDL in that "generally the initial phases of implementation result in the most substantial reductions. Starting implementation as soon as possible, in a manner that will address the areas of greatest concern first and then work toward the areas of lower priority will allow substantial improvements in the water quality to occur in a shorter period of time than that described by the total implementation timeframe. While these initial improvements will most likely not result in meeting water quality targets all the time, everywhere, all at once, they will undoubtedly result in substantial, consistent improvement in water quality conditions throughout the reach" (IDEQ/ODEQ 2004, p. 449).

Table 17 provides a summary of WLAs and load allocations by source (represented at Year 70).

Table 17. Summary of Wasteload and Load Allocations (Year 70)

Source Name	Source Allocation (kg/day)	Parma Load (Kg/day)
WASTELOAD ALLOCATIONS		
WWTFs	62	49
Growth Reserve*	24	
Stormwater	116	70
LOAD ALLOCATIONS	202	119
Agricultural**	55	44
Background	89	9
Ground water	31	24
TOTAL	**376**	**197*** **

* The growth reserve is estimated based on future WWTF build-out flows, but could be divided between all point sources as needs arise during the long-term implementation period.

** Land use conversion accounts for most of the overall agricultural load reduction over the long-term implementation time frame. The remaining agricultural load reduction is predicted to come from agricultural BMPs.

***Load Capacity at 1,225 cfs is 210 kg/day.

This approach results in considerable improvement of phosphorus levels throughout the watershed in a manner that is equitable and consistent with stakeholder needs.

5.4.3 Allocation Discussion

Recognizing that there are multiple uncertainties in projecting achievement of the target over a long-term (70-year) period, the critical uncertainties include:

- actual rate of land use conversion over a 70-year period,
- effects of that land use conversion on runoff and infiltration,
- urban stormwater runoff concentrations (wet- and dry-weather),
- effectiveness of stormwater BMPs,
- effectiveness of agricultural BMPs,
- ability of ground water phosphorus levels to recover in converted areas, and
- future drainage and water management policies.

A major component of this load decrease is the improvement in point source loads. The accelerated schedule for meeting the SR-HC TMDL goal (Figure 9) is primarily the result of the proposed phased allocation and associated capital improvement schedules for the municipal WWTFs. During the initial 25-year period, the decrease is due to improved treatment and cleaner effluent. After that period, build-out flows (and increasing loads) are kept in check by anticipated wastewater reuse.

Agricultural loads also decrease, both as a function of land use conversion (there will be less agricultural land is producing phosphorus loads) and from increasing BMP effectiveness on those remaining agricultural acres.

The load associated with MS4 areas increases over time, but at a relatively slow rate. This slow rate is primarily associated with the conversion of lands and empirical data, which show that urban lands produce lower loads than agricultural lands on a per-acre basis. This slow rate of MS4 load growth is also due to the combination of on-site detention/retention policies and improvements in runoff quality from application of stormwater BMPs on new and substantially redeveloped urban-suburban areas.

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6 Implementation Strategies

In the case of the lower Boise River, adaptive management is the appropriate classification of this implementation plan. The lower Boise River adaptive management strategy builds on the immediate action of initially reducing wastewater treatment discharges of phosphorus, combined with an array of long-term actions/trends that will result in additional and substantial nutrient load reductions (including stormwater management programs, agricultural BMPs, and land use conversion). IDEQ will evaluate progress made toward improved water quality in the Snake River and Brownlee Reservoir. (See section 6.5.5, Monitoring Strategy.)

Staged implementation will occur consistent with current federal and Idaho laws and guidance. Accordingly, the approach contained in the EPA-approved SR-HC TMDL and carried forward in this process requires effective SR-HC compliance monitoring (in continued cooperation with the USGS), routine 5-year benchmark assessments, and water quality trading. New data obtained during implementation will help ensure water quality goals are achieved (either through SR-HC target attainment or beneficial use attainment) through the wise use of available resources.

6.1 Time Frame

The time frame for improving water quality will depend on the rate of land use conversion, the available funding that can be applied to nonpoint agricultural BMPs, and the recovery rate of ground water as land uses are converted. Thus, it is expected that IIDEQ and other designated agencies and/or entities will continue to assist in the development and implementation of the source-specific implementation plans. This implementation includes help with identifying possible funding mechanisms and working with stakeholders to implement reasonable and cost-effective BMP projects. For example, one potential component that may increase funding for agricultural nonpoint BMPs is an evolving Farm Bill approach that relies on crop subsidies for green farming practices.

Figure 9 presents the expected improvement time frame as a result of short-term point source controls (WWTF treatment levels and improved stormwater management), as well as other nonpoint source trends. The long-term time frame may be shortened if funding for non point source control is increased substantially and quickly, and/or significant technological breakthroughs occur in nonpoint source control technology.

The estimated implementation schedule for point source phosphorus removal specifies achievement of 0.200 mg/L seasonal average discharge within three permit cycles, as described in Section 5.4.1 and Table 12. Anticipated progress for each of the larger wastewater facilities is detailed in the letters included in Section 4.0. Any compliance scheduled developed by EPA for NPDES permitting should follow this schedule.

6.2 Approach

This implementation plan is designed to be flexible within an adaptive management framework. The Federal Clean Water Act and the Idaho Water Quality Standards (IDAPA 58.01.02) indicate that in general, actions taken should achieve the highest attainable use through the implementation of point and nonpoint source control programs.

The concept of adaptive management as it applies to implementation plans allows for on-the-ground implementation to proceed where uncertainty exists about how and when reduction targets will be met. The adaptive management approach acknowledges that beneficial uses may not be restored for a long period of time, but provides a short-term pathway by which to gauge progress toward that goal.

It may take some period of time to fully implement the appropriate management practices, particularly in this watershed, because of the rapidly changing land use patterns. Many producers are reluctant to commit to financing long-term pollutant management activities because of the rapid land use transitions that are occurring. IDEQ also recognizes that even after full implementation has been accomplished, water quality goals may not be reached immediately. It is possible that after application of all reasonable BMPs, the associated targets and surrogates may not be achieved as originally established.

All of these reasons indicate that an adaptive management approach to implementation is appropriate. The stakeholders involved in developing the lower Boise River Implementation Plan remain committed to ensuring implementation and continue toward meeting the water quality goals.

The last aspect of adaptive management is to recognize that as progress on the lower Boise River and SR-HC TMDLs is assessed on a periodic basis (typically on a 5-year schedule), the appropriateness of the initial target of 0.07 mg/L should also be revisited. Given that this target was set to protect beneficial uses in the Snake River, as additional information becomes available either regarding existing or attainable uses in that water body, the applicability and appropriateness of the target should be reevaluated.

6.3 Responsible Parties

Responsible parties are summarized in Table 18.

Table 18. Responsible Parties for Implementation

Source	Responsible Parties
WWTFs	Municipalities, Industry
Stormwater	MS4 Communities
Agricultural	Idaho State Department of Agriculture, Idaho Soil Conservation Commission, Natural Resources Conservation Service, Individual Landowners
Background	U.S. Army Corps of Engineers, Bureau of Reclamation
Ground Water	n/a

6.4 Responsible Agencies

The states have responsibility under Section 401 of the CWA to provide water quality certification. Under this authority, the states review projects to determine applicability to local water quality issues. The State of Idaho water quality standards refer to other programs whose mission is to control nonpoint pollution sources. Some of these programs and responsible agencies are listed in Table 19.

Table 19. State Regulatory Authority for Nonpoint Pollution Sources.

Citation	Idaho Responsible Agency
Rules governing forest practices	Idaho Department of Lands
Rules governing solid waste management	Idaho Department of Environmental Quality / Health Districts
Rules governing subsurface and individual sewage disposal systems	Idaho Department of Environmental Quality / Health Districts
Rules and standards for stream channel alteration	Idaho Department of Water Resources
Rules governing exploration and surface mining operations	Idaho Department of Lands
Rules governing placer and dredge mining	Idaho Department of Lands
Rules governing dairy waste	Idaho Department of Agriculture

If instream monitoring indicates an increasing pollutant concentration trend (not directly attributable to environmental conditions) or a violation of standards despite use of approved BMPs or knowledgeable and reasonable efforts, then BMPs for the nonpoint source activity must be modified by the appropriate agency to ensure protection of beneficial uses. This process is known as the “feedback loop” in which BMPs or other efforts are periodically monitored and modified if necessary to ensure protection of beneficial uses. With continued instream monitoring, the allocation process will initiate the feedback loop process and will evaluate the success of BMP implementation and its effectiveness in controlling nonpoint source pollution.

It is expected that a voluntary approach will be able to achieve needed load allocations. Public involvement, along with the commitment of the agricultural community, has demonstrated a willingness to implement BMPs and protect water quality. In the past, cost-share programs have provided the agricultural community technical assistance, information and education, and the cost share incentives to implement BMPs. The continued funding of these projects will be critical for the load allocations to be achieved.

6.5 Trading

6.5.1 What is Pollutant Trading?

Pollutant trading (also known as water quality trading) is a contractual agreement to exchange pollution reductions between two parties. Pollutant trading is a business-like way of helping to solve water quality problems by focusing on cost-effective, local solutions to problems caused by pollutant discharges to surface waters. Pollutant trading is voluntary. Parties trade only if both are better off as a result of the trade. Trading allows parties to decide how to best reduce pollutant loadings within the limits of certain requirements. The appeal of trading emerges when pollutant sources face substantially different pollutant reduction costs. Typically, a party facing relatively high pollutant reduction costs compensates another party to achieve an equivalent, though less costly, pollutant reduction.

Pollutant trading is recognized in Idaho’s Water Quality Standards at IDAPA 58.01.02.054.06. Currently, IDEQ’s policy is to allow for pollutant trading as a means to meet TMDLs, thus restoring water-quality-limited water bodies to compliance with water quality standards. The Pollutant Trading Guidance document sets forth the procedures to be followed for pollutant trading.

6.5.2 Trading Components

The major components of pollutant trading are trading parties (buyers and sellers) and credits (the commodity being bought and sold). Additionally, ratios are used to ensure environmental equivalency of trades on water bodies covered by a TMDL. All trading activity must be recorded in the trading database through the Idaho Clean Water Cooperative, Inc.

Both point and nonpoint sources may create marketable credits. Credits are a reduction of a pollutant beyond a level set by a TMDL. Point sources create credits by reducing pollutant discharges below NPDES effluent limits, which are set initially by the waste load allocation. Nonpoint sources create credits by implementing approved BMPs that reduce the amount of pollutant runoff. Nonpoint sources must follow specific design, maintenance, and monitoring requirements for that BMP, apply discounts to credits generated if required, and provide a water quality contribution to ensure a net environmental benefit. The water quality contribution also ensures the reduction (the marketable credit), is surplus to the reductions that the TMDL assumes the nonpoint source is achieving to meet the water quality goals of the TMDL.

6.5.3 Watershed Specific Environmental Protection

Trades must be implemented so that the overall water quality of the water bodies covered by the TMDL is protected. To do this, hydrologically-based ratios are developed to provide that trades between sources distributed throughout the TMDL water bodies result in environmentally equivalent or better outcomes at the point of environmental concern. In addition, localized adverse impacts to water quality are not allowed.

6.5.4 Trading Framework

It is currently DEQ policy to allow pollutant trading to meet TMDLs. After adoption of an EPA-approved TMDL, IDEQ must develop, in concert with the WAG, a pollutant trading framework document as part of an implementation plan for the watershed that is the subject of the TMDL. The elements of a trading document are described in IDEQ's Pollutant Trading Guidance (currently November 2003 Draft) available on the IDEQ Web site at http://www.deq.idaho.gov/water/prog_issues/waste_water/pollutant_trading/pollutant_trading_guidance_entire.pdf.

The SR-HC TMDL encourages pollutant trading and provides that the Lower Boise River trading framework should be modified for the SR-HC TMDL process. The SR-HC TMDL states that pollutant trades could occur either in the SR-HC watershed or on any of the tributaries to the SR-HC watershed. As noted above, a pollutant trading framework already exists for the Lower Boise River. http://www.deq.state.id.us/water/prog_issues/waste_water/pollutant_trading/overview.cfm

6.5.5 Monitoring Strategy

During the period of adaptive management, focused monitoring will continue to be important. Monitoring should take place at three scales:

1) SR-HC Reach. IDEQ has committed to monitoring this reach. As stipulated in the SR-HC TMDL (IDEQ/ODEQ 2004, p. 479-480) (emphasis added):

> *"A rigorous monitoring plan and schedule is critical to the SR-HC TMDL. There is no way to determine progress, define trends, fill data gaps or enlarge understanding without an understanding of the changes occurring in the system. The State of Idaho includes a monitoring plan in all TMDL implementation plans prepared in the state. By including this plan in the implementation plan, it allows greater opportunity for ground-truthing and interagency participation. It also allows the monitoring plan to be constructed with a better understanding of the implementation activities that will be undertaken, and where and when these activities will occur so that monitoring can be tailored to the needs of the system as*

well as tracking the improvements that will be made."

ROUTINE PROGRESS MONITORING

Constituents:
• *Phosphorus, nitrogen, dissolved oxygen, chlorophyll* a*, sediment, temperature*

Locations:
• *Monitoring points located upstream and downstream in the defined TMDL segments, namely Upstream Snake River (RM 409 to 335), the Reservoir Complex (RM 335 to 247), and Downstream Snake River segments (RM 247 to 188). As Brownlee Reservoir (RM 335 to 285) acts not only as the source water for the downstream reservoirs, but also as the recipient of upstream waters where water quality objectives will have a noticeable influence if attained, it is expected that a greater level of monitoring will be focused on Brownlee Reservoir than on Oxbow or Hells Canyon reservoirs.*
• *Monitoring of major tributaries at their inflow to the SR-HC TMDL reach*

Schedule:
• *Routine monitoring frequency is projected to occur monthly or (at minimum) seasonally as water quality needs require.*
• *Monitoring of major tributaries at their inflow to the SR-HC TMDL reach on a monthly or (at minimum) a seasonal basis to determine loading trends.*

In addition to the conditions stipulated in the SR-HC TMDL, an equally important monitoring objective is to assess whether beneficial uses are being attained, especially as related to the phosphorus loading and progress toward the target.

2) Lower Boise River Reach. Continued monitoring at key monitoring locations in the lower Boise River (Glenwood, Middleton, and Parma) and at the mouth of key tributaries will provide an indication of how well point and nonpoint source improvements are performing. This monitoring will be conducted at a minimum in accordance with IDEQ's five year review cycle. However, as point sources upgrade their facilities to remove phosphorus and additional BMPs are implemented by nonpoint sources, more frequent monitoring will occur to verify water quality improvements.

3) BMP Effectiveness Monitoring. Monitoring effectiveness will be conducted to:

- evaluate specific treatment to verify BMPs are properly installed, maintained, and working as designed
- evaluate the effectiveness of implementation actions for reducing pollutant loading to the lower Boise River and its tributaries
- gather information to fill data gaps to more accurately determine pollutant loading in the lower Boise River
- make effectiveness monitoring results available to the public.

For nonpoint sources, BMP-specific monitoring will be included as part of specific treatment projects to verify that the BMPs are properly installed, maintained, and working as designed. Source groups constructing BMP projects should include budget allowances for a monitoring program. The results of the monitoring program will be used to recommend or discourage similar projects in the future.

Stormwater BMP Monitoring. The Phase I monitoring and reporting requirements are identified in the NPDES permit. Among other items, co-permittees are required to report on the status of the stormwater management BMP implementation, proposed changes to the stormwater management plan or assessment of controls, a summary of the data accumulated throughout the reporting year, and an identification of water quality improvements or degradation. Water quality monitoring required by the permit includes wet weather storm event monitoring for event mean concentrations for identified parameters and annual and seasonal pollutant loads. Additional monitoring requirements include stormwater catch basin sediment/decant sampling, floatables (litter) sampling, and dry weather discharges.

For Phase II stakeholders, monitoring of BMPs may be conducted on a voluntary basis as part of a public outreach and education effort, but it is not required.

Agricultural BMP Monitoring. IDAPA 58.01.02.054.07 refers to the Idaho Agricultural Pollution Abatement Plan, which provides direction to the agricultural community for approved BMPs. If landowners agree to cost-share funds and develop conservation plans, implementation monitoring will consist of a variety of methods to perform spot checks, periodic project reviews, and photographic documentation to demonstrate that pollution reduction measures have been properly installed, are being properly maintained, and are performing as designed. Implementation monitoring methods have been summarized in more detail in the appropriate agricultural appendixes.

Any BMPs installed through a water quality and conservation program will be inspected annually as per the approved conservation plan or the contract agreement with the landowner. The National Resources Conservation Service (NRCS) and Soil Conservation Commission (SCC) can perform these inspections to ensure the BMPs are properly maintained by the landowner/operator throughout the length of the contract. BMP effectiveness monitoring typically consists of a visual inspection and operator recordkeeping. Some BMPs or projects will also have a quantitative monitoring component as a means to better analyze the benefit in sediment or bacteria reduction. SCC annual reports of contracted agricultural projects and BMPs will be available to IDEQ and the public.

Current and future BMP projects funded through water quality and conservation programs should include budget allowances for a monitoring program. Federally-funded agricultural projects will include effectiveness and maintenance monitoring as a component of the grant or loan. The data gathered from these projects will be reviewed by the NRCS and the SCC to access their collective benefit and to recommend or discourage similar projects in the future.

4) IDEQ will evaluate the relative contributions used in this document. This will be accomplished by selecting one of the several large diversions in the watershed and attempting to calculate the fate of the water after it is withdrawn from the river.

6.5.6 Reevaluation of the SR – HC TMDL Target

When the point sources in the lower Boise River have implemented phosphorus removal technologies and the nonpoint sources have made progress in attaining their allocations in approximately 15 years, IDEQ will evaluate progress made toward meeting the target set in the SR – HC TMDL. If after reviewing the available data, it does not appear that the target can be achieved, IDEQ will consider reopening the SR – HC TMDL. This could involve revising the target to something achievable by the tributaries and could also involve reexamining the modeling used to establish the target.

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Appendix A: Land Use and Water Balance Issues

Land Use Conversion

In developing this plan, it became apparent that as land uses convert from agricultural to urban-suburban land uses, the rate of that change and the impact on how water is used under both types of land use would have a direct impact on the watershed's ability to meet the target at Parma. Certainly, this is an area that lacks robust data, and predictions about the future always carry a level of uncertainty.

The Treasure Valley is one of Idaho's most rapidly urbanizing areas. The conversion of agricultural lands into urban uses affects the contributing load, as well as the fate and transport complexity of TP to the lower Boise River. In the Implementation Plan for the lower Boise River sediment and bacteria TMDL (IDEQ 2003), IDWR land uses from 1994 and 2000 were used to determine the relative rate of urbanization within the watershed. This information suggested that agricultural lands in the watershed were converted to urban-suburban uses at a rate of 1.4 percent per year (IDEQ 2003, p. 48). The plan also presented the results of an extensive on-the-ground inventory of agricultural land uses conducted by the ISCC in 2000-2001. This information suggested that the rate of urbanization was much greater than previously believed (on the order of 2.0 percent per year).

During 2005, this inventory was updated using National Agricultural Imagery Program aerial photographs taken in Spring 2004 (Koberg 2005). The results of the updated inventory indicate that agricultural lands are being lost at an average rate of 2.1 percent per year. Because the ISCC inventories represent the most accurate information regarding agricultural land uses in the watershed, this information, on the following pages, was used to project future land uses in the model.[8]

[8] As described in more detail in Appendix B, this 2005 rate was slightly lowered to reflect an anticipated decrease in land use conversion over the long-term implementation period.

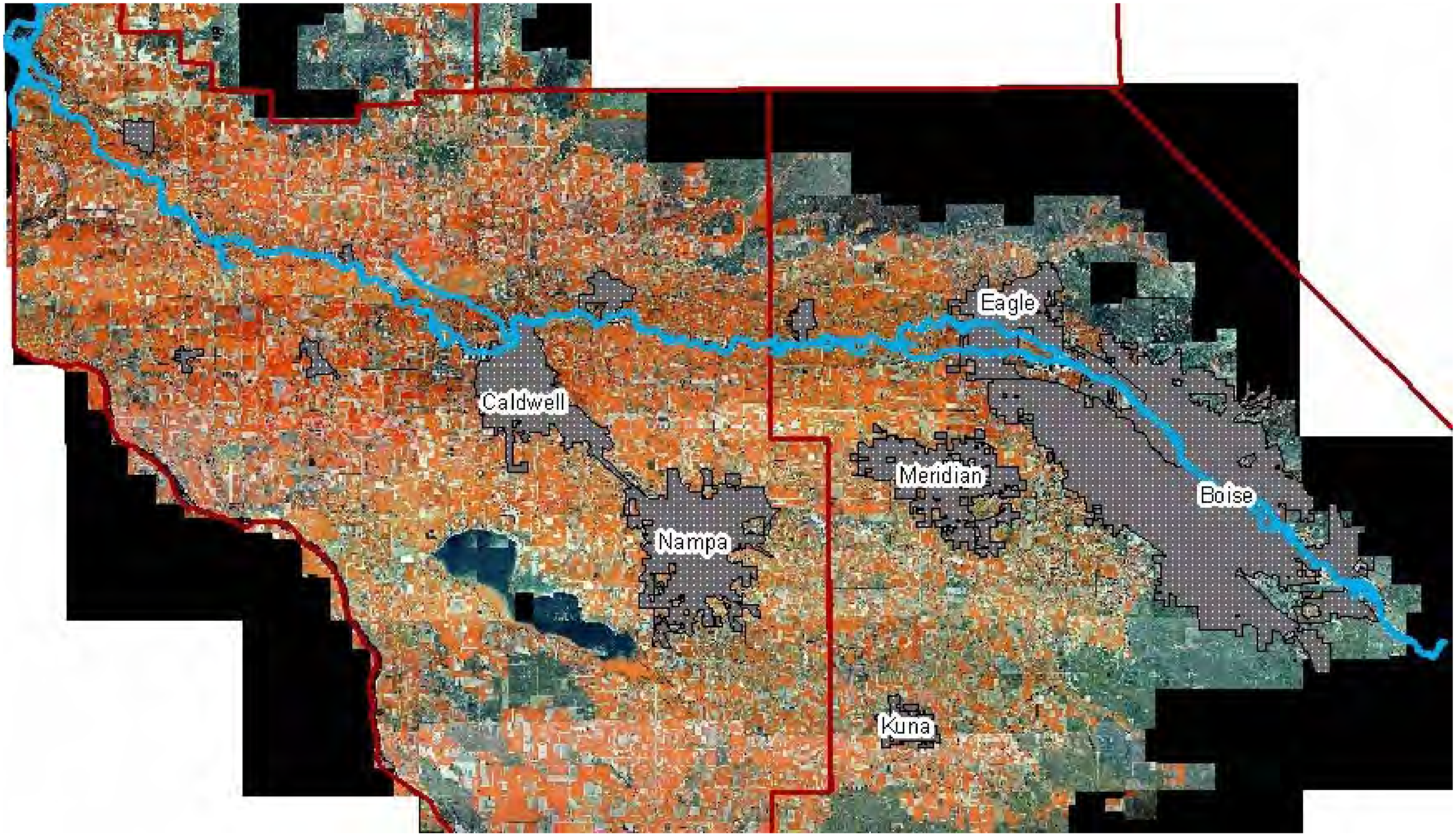

Figure 10. Original infrared aerial photography (IDWR 1996) used to complete 2001 inventory.

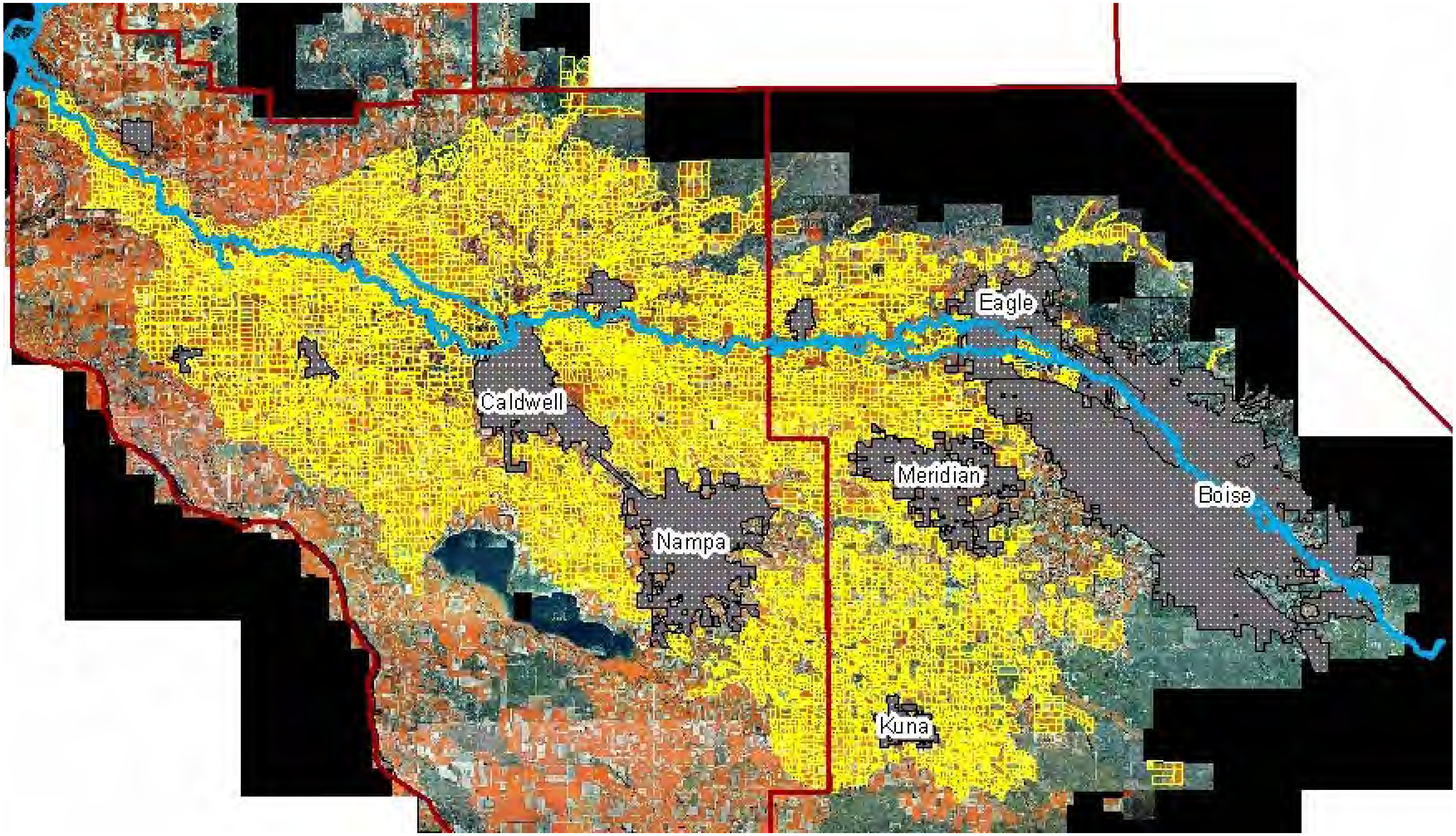

Figure 11. Original infrared aerial photography (IDWR 1996) used to complete 2001 inventory with field validated agricultural land (IASCD/ISCC 2001)

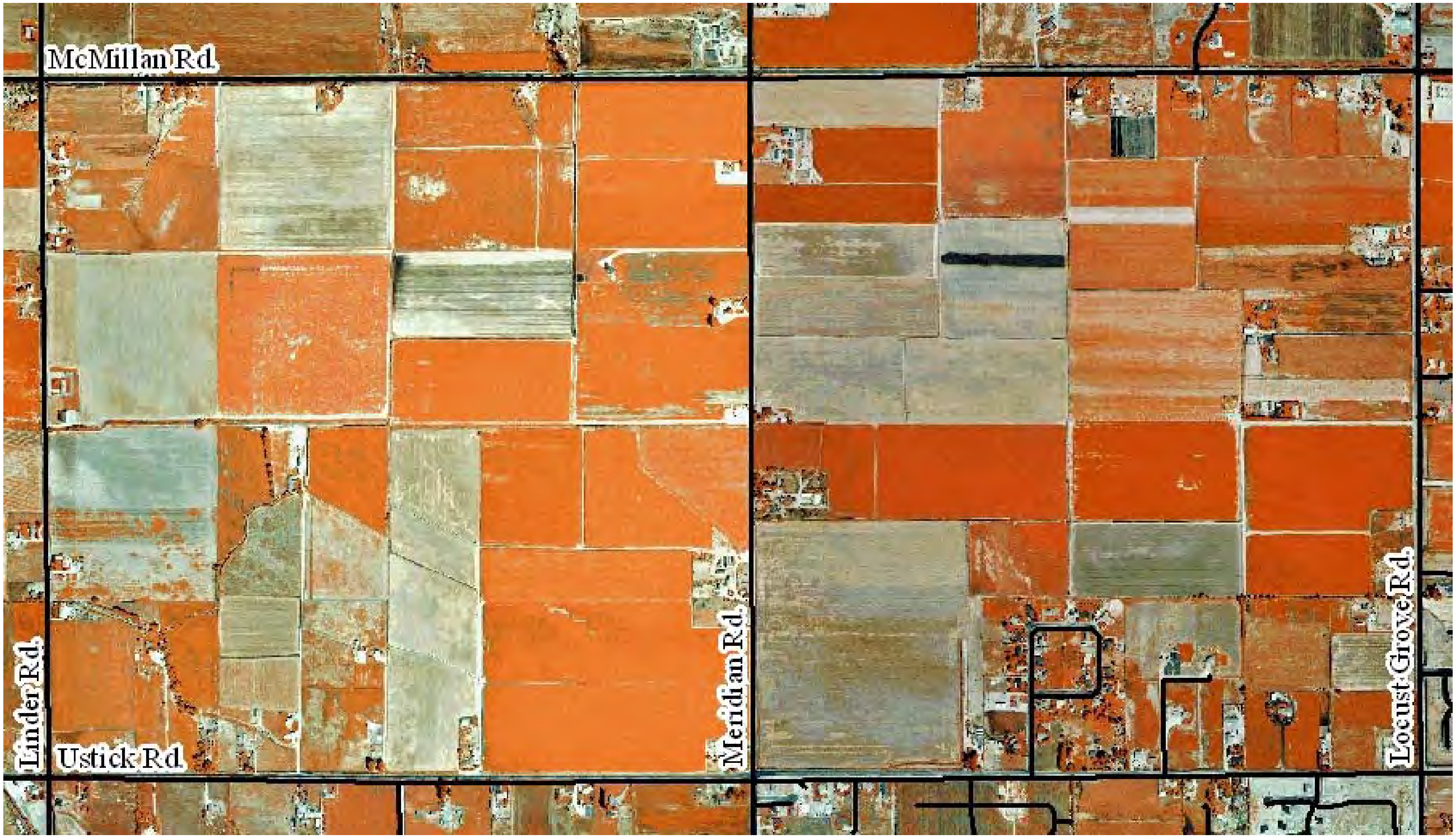

Figure 12. Two square mile clip of original infrared aerial photography (IDWR 1996) used to complete 2001 inventory

Figure 13. Two square mile clip of original infrared aerial photography (IDWR 1996) used to complete 2001 inventory with field validated agricultural land (IASCD/ISCC 2001)

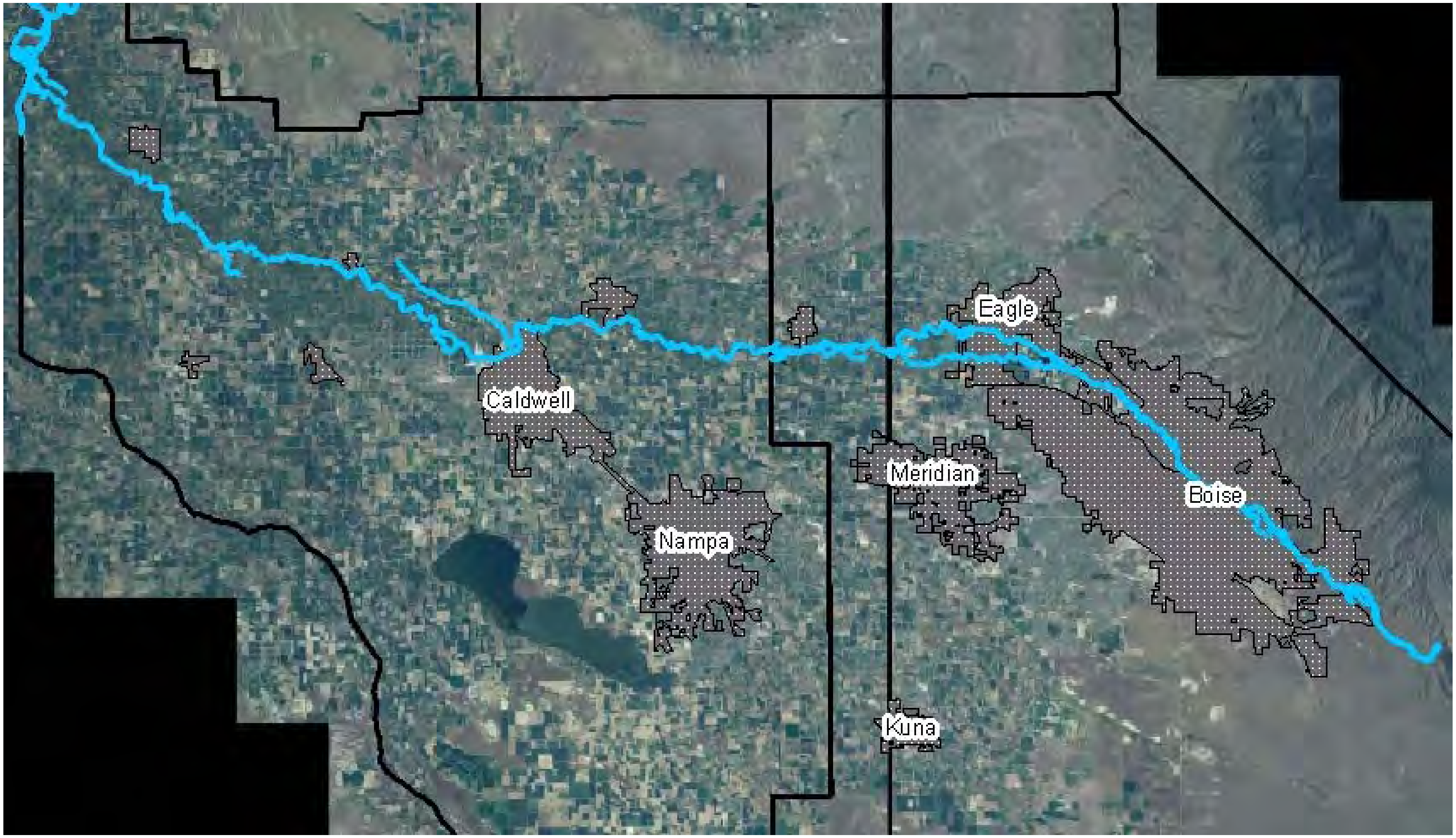

Figure 14. Updated aerial photography (NAIP 2004) used to complete June 2005 "in-office flyover" inventory

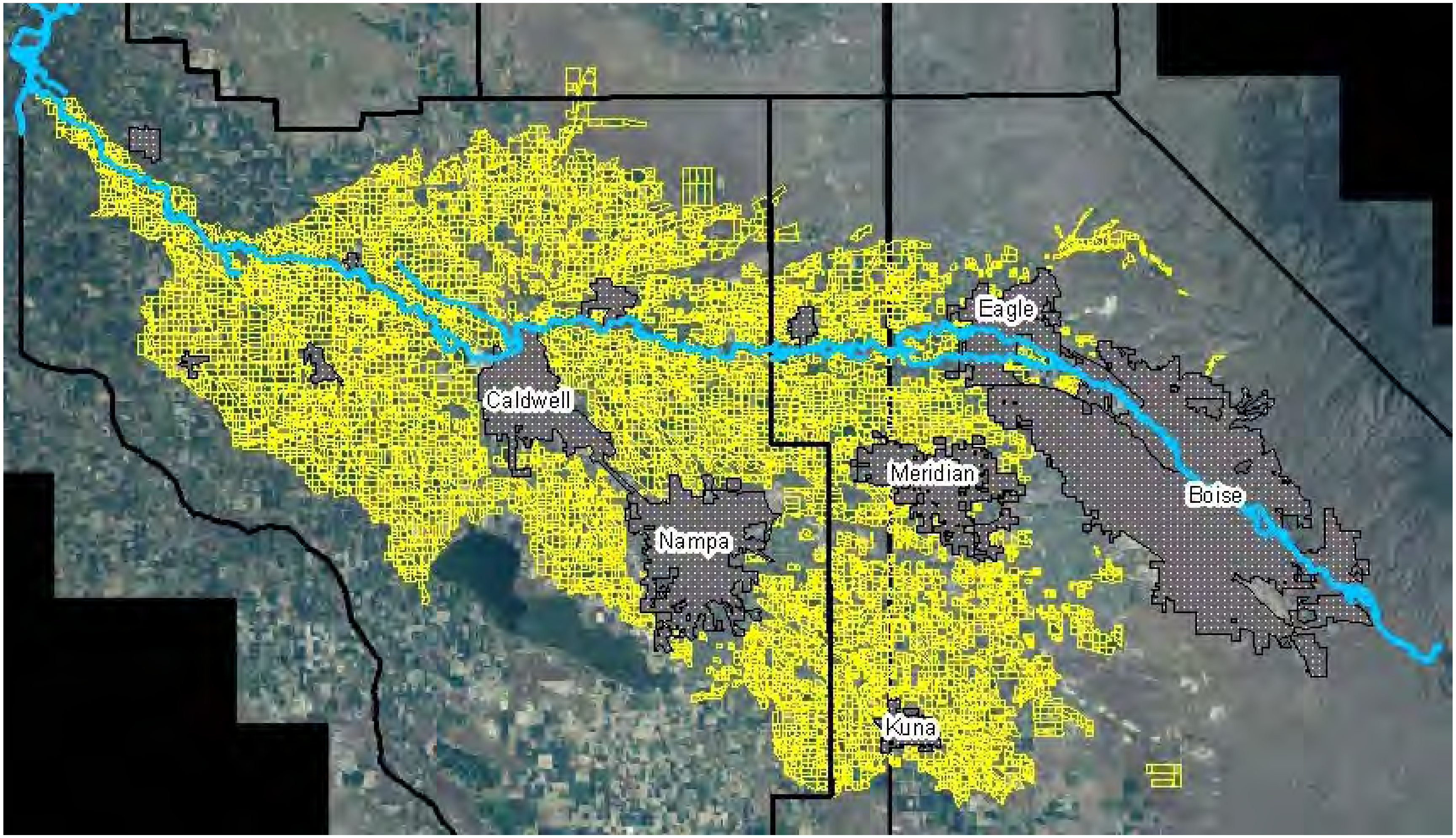

Figure 15. Updated aerial photography (NAIP 2004) used to complete June 2005 "in-office flyover" inventory with field validated agricultural land (IASCD/ISCC 2001)

Figure 16. Two square mile clip of updated aerial photography (NAIP 2004) used to complete June 2005 "in-office flyover" inventory

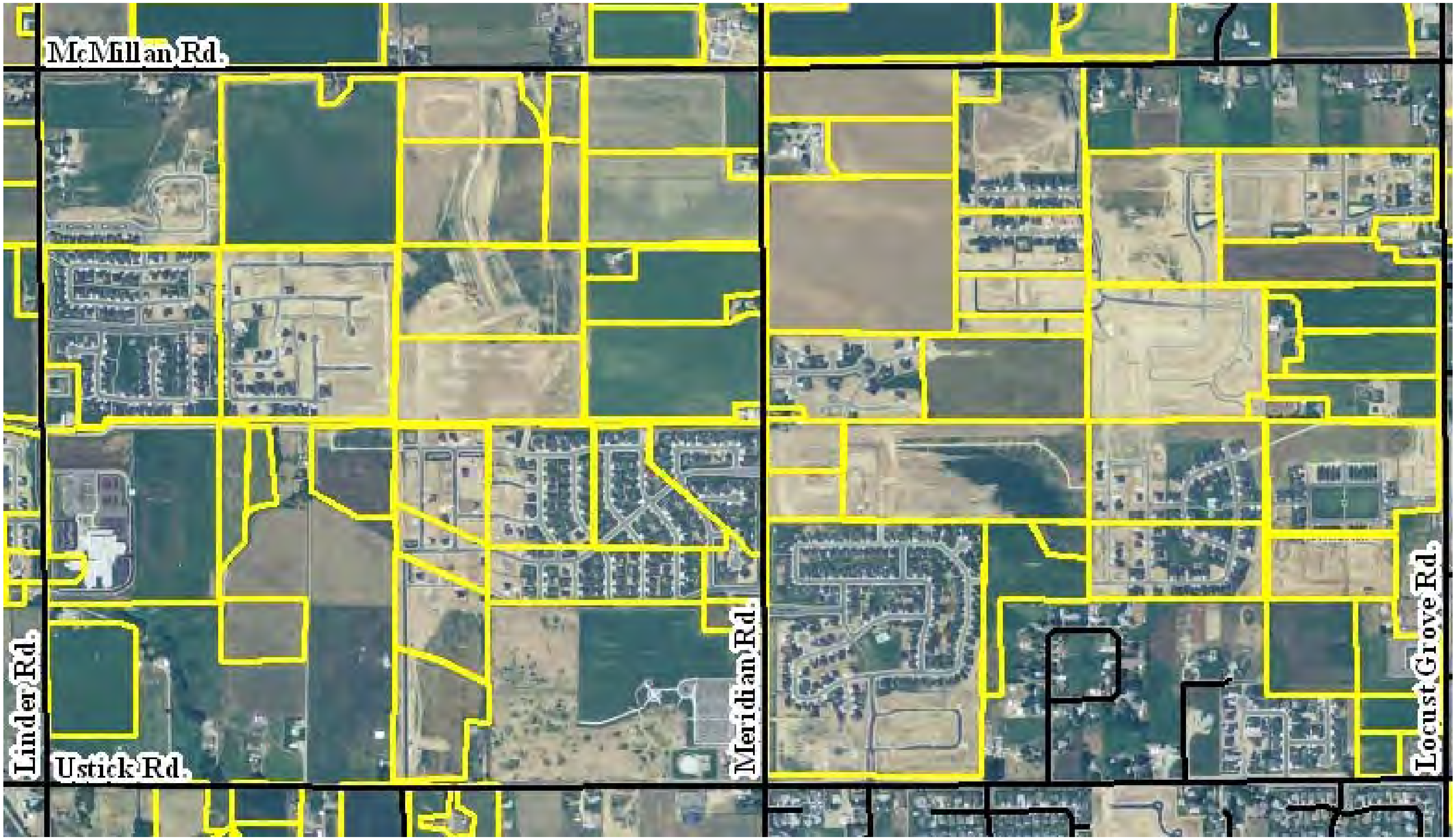

Figure 17. Two square mile clip of updated aerial photography (NAIP 2004) used to complete June 2005 "in-office flyover" inventory with field validated agricultural land (IASCD/ISCC 2001)

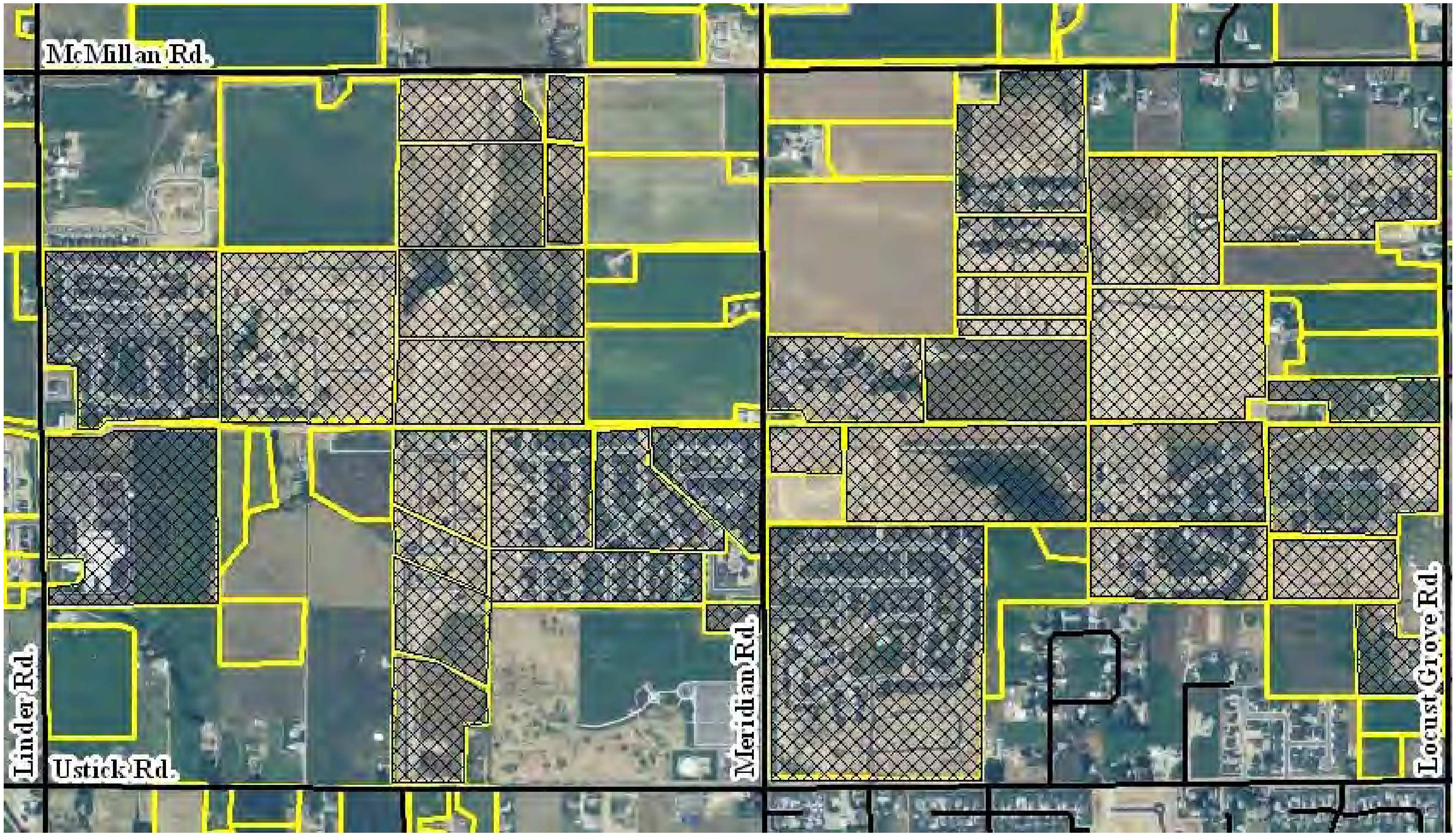

Figure 18. Two square mile clip summary (cross-hatched fields no longer ag land). 2001 inventory – 57 agricultural fields totaling 870.7 acres. 2005 inventory – 22 agricultural fields totaling 225.0 acres

Results

- 2001 inventory confirmed 163,270 ag acres
- 2005 inventory confirmed 152,340 ag acres
- Loss of 878 ag fields and 10,930 ag acres within the watershed
    - Tier 1 = 1343.4
    - Tier 2 = 947.6
    - Tier 3 = 6369.4
    - Pasture = 1529.7
    - Sprinkler = 739.6

Conclusions

- Much more agricultural land than anticipated was converted to other uses from 2001-2004 (over 17 square miles)
- Top 5 subwatersheds with most agricultural acreage lost:
    - Indian Creek
    - Boise River riparian
    - Mason Creek
    - Fifteen Mile Creek
    - Mill Slough

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Appendix B: Analysis Supporting Stormwater Allocations

This framework is intended to establish total phosphorus reduction goals and WLA recommendations for implementation by stormwater dischargers in the lower Boise River watershed including Municipal Separate Storm Sewer Systems (MS4), Construction General Permit (CGP), and Multi-Sector General Permit (MSGP) (but excluding agricultural non-point source). These load reduction goals and recommendations can provide a foundation for development of stormwater NPDES permits per Section 402(p) (3) (B) of CWA that requires:

> "…controls to reduce the discharge of pollutants to the maximum extent practicable (MEP), including management practices, control techniques and systems, design and engineering methods, and such other provisions as the administrator or the state determines appropriate for the control for such pollutants."

Foundational concepts for this document include the following:

- Approvable WLAs consistent with requirements and guidance provided by EPA (Nov 22, 2002)
- Meets applicable Idaho water quality standards (i.e., designated uses and criteria)
- Fair, equitable and cost effective within a basin-wide framework and for all stakeholders

NPDES permit conditions must be consistent with state water quality standards, including the assumptions and requirements used to develop available WLAs contained within EPA-approved TMDLs. Existing Lower Boise stormwater management programs were developed to meet sediment and bacteria water quality requirements, and may not achieve nutrient management needed to meet allocations. Specifically:

- The stormwater analyses and allocations for TSS and bacteria loads were wet-weather flows, not dry-weather flows.
- The existing stormwater management programs may not treat all forms of phosphorus prior to discharge (for example, dissolved phosphorus loading via groundwater infiltration).
- At this time, water quality management in the basin has included increased awareness of dry-weather flows and their relative influence on urban-suburban MS4 permitted stormwater discharges.

In general, the proposed stormwater nutrient WLAs are to be achieved within existing or modified BMP-based stormwater management programs. However, the LBWC understands that the sediment and bacteria TMDLs will need to be revised to include additional allocation for future growth (i.e., stormwater system expansion) due to land use conversion and for loads associated runoff (i.e., groundwater and dry-weather irrigation cross-connections) of future MS4 lands. And, until those documents can be updated to reflect more current information, this framework provides a WLA that accommodates current treatment needs and future growth.

Stormwater Reduction Goals

An overall total phosphorus (TP) non-point source reduction goal of 50% will be implemented by stormwater dischargers and applied to new development and substantial redevelopment. The 50% TP reduction from stormwater would be accomplished through establishing BMPs that target phosphorus reduction, and increased attention to onsite stormwater inspection, maintenance, and public education.

The TP reduction goal is consistent with stormwater treatment literature and other stormwater reduction goals as have been applied in dry weather climates (Appendix B, Attachment 1). For many areas in the watershed, this phosphorus reduction level will require implementation of a treatment train approach to stormwater management (Urbonas and Roesner 1992, Minton 2005, WDOE 2004). It is a higher level of treatment than currently required for total suspended solids (TSS) reductions designed to meet goals of 80% TSS removal (WDOE 2004).

Recommendations for MS4 allocations in the lower Boise River watershed:

- Current waste loads from existing MS4 facilities subject to "no significant increases" based on measured stormwater loads; implement 50% reduction goal during redevelopment
- Future MS4 wasteloads from new urban-suburban areas and redevelopment subject to 50% reduction
- Allocations based on measured stormwater source loads after consideration of current treatment (i.e., treatment implemented since 1996)
- MS4 BMP-framework to include allowance for WLA trading or land use conversion tradeoffs
- Urban/residential lands not in MS4 areas receive load allocation as percentage of agricultural load.

Recommendations for industrial and construction stormwater (MSGP and CGP) allocations in the lower Boise River watershed:

- Existing MSGP discharges receive the same mass per acre waste load allocations as established for MS4s under this WLA trading framework
- Future MSGP waste loads allocations set the same mass per acre as the established for MS4s under this WLA trading framework or set by land use conversion tradeoffs
- Assume WLA for CGP regulated activities based on current permit requirements

Implementation Timeframe

The reduction goals would be implemented as new development and redevelopment occurs. As discussed below, the lower Boise River watershed is rapidly developing. As agricultural land is converted and included into the MS4 areas, additional load allocation will be added on a per acre basis.

MS4 Areas

Regulated Stormwater Sources

There are three regulated stormwater sources in the lower Boise River watershed: MS4s; construction sites disturbing 1 acre or more (CGP); and industrial activities covered by the MSGP. The Environmental Protection Agency (EPA) Region 10 has issued one Phase I permit to the Boise and Garden City MS4 area. Phase II permits are anticipated in 2008 for four MS4 areas: Eagle, Meridian and urbanized Ada County; Caldwell and urbanized Canyon County; Nampa and urbanized Canyon County; and Middleton and urbanized Canyon County. Construction sites and industrial facilities are regulated primarily under general permits that are issued by EPA Region 10. A summary of the MS4 permit areas located in the lower Boise River watershed and the co-permittees or applicants associated with these MS4 areas are displayed in Table 20.

Table 20. Lower Boise River Urbanized Areas and MS4 Co-permittees and/or Applicants (EPA Region 10)

Idaho County	U.S. Census Bureau Urbanized Area (2000)	Place Name	MS4 Co-Permittees	MS4 Applicants
Ada	Boise	Boise-Garden City	ACHD City of Boise City of Garden City ITD District #3 Ada County Drainage District #3 Boise State University	
		Eagle Meridian Urbanized Ada County*		Ada County Highway District ITD District #3
Canyon	Nampa	Caldwell Urbanized Canyon County*		City of Caldwell Housing Authority of the City of Caldwell Notus-Parma Highway District
		Nampa Urbanized Canyon County*		City of Nampa Nampa Highway District
		Middleton Urbanized Canyon County*		City of Middleton Canyon Highway District

* These areas are unincorporated but meet urbanized area definition of a population density of 1000/mile^2.

The current Boise Area MS4 area covers approximately 52,208 acres. Mapping results of the Boise Area MS4 conducted by ACHD during the years of 1999-2003 indicate that approximately 35,150 acres drain directly to the Boise River or a tributary of the Boise River. The other lands discharge to groundwater except during extreme runoff events (e.g., greater that 25-yr rainfall events).

Development within the Lower Boise River Watershed

The current trend in the lower Boise River watershed is rapid population growth and a rapid conversion of irrigated lands to urban-suburban uses. Population growth is expected to increase at a slightly higher rate in Ada County compared to Canyon County (Table 21).

Table 21. Estimated Current and Future Populations in Lower Boise River urbanized areas (COMPASS, 2007)

City Impact Areas	2005 Population	Est. 2020 Population	% Increase 2005-2020
Boise	236,076	267,742	13.41%
Meridian	62,997	97,172	54.25%
Eagle	19,124	28,262	47.78%
Star	3,336	8,479	154.18%
Kuna	11,919	24,999	109.73%
Garden City	10,763	12,557	16.67%
Unincorporated Ada County	12,803	68,508	435.09%
Ada County Total	**357,018**	**507,719**	**42.21%**
Caldwell	38,716	49,193	27.06%
Nampa	83,648	96,859	15.79%
Middleton	4,336	7,418	71.08%
Greenleaf	1,219	1,480	21.34%
Melba	1,310	2,103	60.53%
Notus	636	855	34.43%
Parma	1,583	2,159	36.39%
Wilder	1,693	1,953	15.35%
Unincorporated Canyon County	34,747	57,243	64.74%
Canyon County Total	**167,888**	**219,262**	**30.60%**
Ada and Canyon Total	**524,906**	**726,981**	**38.50%**

The COMPASS (2007) population growth trends between current conditions and 2030 are variable, but declining (Figure 19). On average, long-term (LT) rates over a >25-year timeframe are expected to increase at a lower rate of 1.3%.

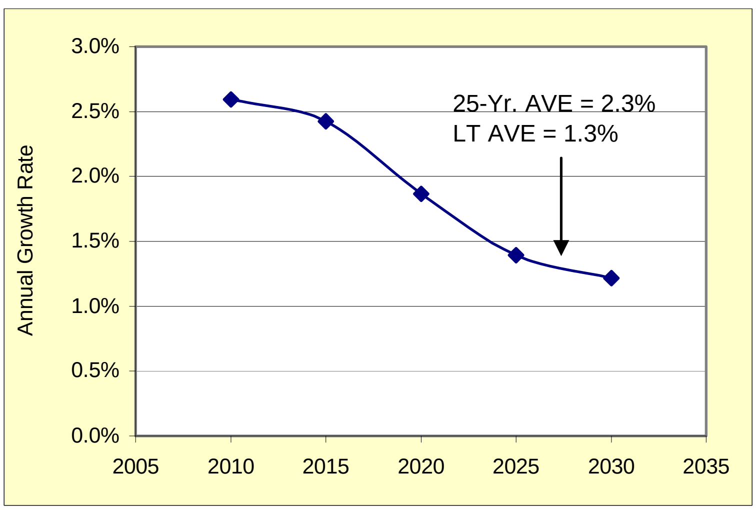

Figure 19. Population Growth Projections (COMPASS 2007)

Note: LT AVE = Long-term Average.

As growth occurs, flood-irrigated agricultural lands are converted to urban-suburban use. In the past, approximately 3,500 acres was converting annually (Koberg, 2005)[9]. As a result of this conversion, stormwater loads are expected to increase while agricultural loads should decrease. Impact areas, as reported by COMPASS (2007), are indicative of where cities plan to grow in the near future (Table 22).

Table 22. City impact areas in Ada and Canyon Counties

City Impact Areas	2005 Impact Area (ac)	Percent of County Area (2005)
Boise	75,592	13%
Meridian	26,695	5%
Eagle	22,807	4%
Star	9,316	2%
Kuna	4,428	1%
Garden City	3,407	1%
Unincorporated	445,980	76%
Ada County Total	**588,226**	**100%**
Caldwell	27,161	7%
Nampa	45,314	12%
Middleton	13,673	4%
Greenleaf	1,367	0%
Melba	2,468	1%
Notus	1,406	0%
Parma	5,076	1%
Wilder	2,555	1%
Unincorporated	348,352	94%
Canyon County Total	**447,372**	**100%**
Ada and Canyon Total	**1,035,597**	

A simple proportion based on population projections was used to estimate future MS4 acreages:

Future MS4 Acres= (Future Population x Current MS4 Acres) / Current Population

A summary of MS4 acres is shown below for current (2005) and projected increase over the next 15 years (Table 23). The respective long-term growth rates for the impact areas (e.g. Table 21) are used to adjust individual MS4 areas. For example, the Caldwell MS4 area is adjusted upward annually by 0.8%, not by the watershed average of 1.3%.

[9] As discussed above, short-term rapid population growth rates and land use conversion rates have been adjusted downward to reflect a more realistic long-term (>25 years) picture of relative source loading.

Table 23. Current (2005) and projected Year 15 MS4 acreages based on projected population growth

MS4 ACRES	2005	Year 15
Boise	75,592	80,142
Garden City	3,407	3,665
Eagle	22,807	26,794
Meridian	26,695	32,437
Star	9,316	17,021
Kuna	4,428	6,470
Inc. Ada	142,245	166,529
Unin. Ada	445,980	421,696
SUM Ada	588,225	588,225
Caldwell	27,161	30,403
Nampa	45,314	47,986
Middleton	13,673	17,817
Greenleaf	1,367	1,481
Melba	2,468	2,674
Notus	1,406	1,716
Parma	5,076	6,311
Wilder	2,555	2,953
Inc. Canyon	99,020	111,341
Unin. Canyon	348,352	336,031
SUM Can	447,372	447,372

For projecting long-term (Year 70) increase in MS4 area, an annual average growth rate of 1.3% is applied to estimated urban-suburban acres based on the impact areas (Table 24). This is the same growth rate that is applied to wastewater discharges recognizing that population growth affects both types of source loads.

Table 24. Current (2005) and projected Year 70 MS4 acreages based on projected population growth

MS4 ACRES	2005	Year 70
Boise	75,592	96,823
Garden City	3,407	4,609
Eagle	22,807	41,413
Meridian	26,695	53,493
Star	9,316	45,274
Kuna	4,428	13,960
Inc. Ada	142,245	255,572
Unin. Ada	445,980	332,653
SUM Ada	588,225	588,225
Caldwell	27,161	42,292
Nampa	45,314	57,782
Middleton	13,673	33,009
Greenleaf	1,367	1,899
Melba	2,468	3,428
Notus	1,406	2,854
Parma	5,076	10,840
Wilder	2,555	4,414
Inc. Canyon	99,020	156,518
Unin. Canyon	348,352	290,854
SUM Can	447,372	447,372

These projected acres are further refined for the purposes of the TP model. First, not all of the surface water from these acres drain to (provide load to) the lower Boise River. For example, Parma is located within the Sand Hollow drainage, which drains directly to the Snake River. Second, not all of these acres are developed. While the number of undeveloped acres is uncertain, it is perhaps on the order of ~30% (that is, 70% of the acres in the area of impact are developed and produce MS4 runoff). So, the projections above are reduced to reflect these two refinements (Table 25). Note that undeveloped acres in the MS4 areas would contribute load and be considered part of agricultural area until they are developed.

These calculations show that estimated baseline acreages that produce runoff and contribute to current MS4 load are 151,233. By the Year 2020 (15 years after the baseline), MS4 acres are projected to grow to 174,933, an increase of 16% over the number of baseline MS4 acres. By the Year 2065 (60 years after the baseline), MS4 acres are projected to grow to 261,831, an increase of 73% over the number of baseline MS4 acres.

Table 25. Current and Projected MS4 Acreages (Shows Reductions for Area Not Draining to lower Boise River and Percent Undeveloped)

MS4 ACRES	Baseline 2005	Drain to LBR	70% Developed	Projected 2020	Drain to LBR	70% Developed		Projected 2070	Drain to LBR	70% Developed	
Boise	75,592	60,474	42,332	80,142	64,113	44,879		96,823	77,459	54,221	
Garden City	3,407	3,407	2,385	3,665	3,665	2,565		4,609	4,609	3,226	
Eagle	22,807	22,807	15,965	26,794	26,794	18,756		41,413	41,413	28,989	
Meridian	26,695	26,695	18,687	32,437	32,437	22,706		53,493	53,493	37,445	
Star	9,316	9,316	6,521	17,021	17,021	11,915		45,274	45,274	31,692	
Kuna	4,428	4,428	3,100	6,470	6,470	4,529		13,960	13,960	9,772	
Inc. Ada	142,245	127,127	88,989	166,529	150,501	105,351	18.4%	255,572	236,207	165,345	85.8%
Unin. Ada	445,980	445,980		421,696				332,653			
SUM Ada	588,225	573,107		588,225				588,225			
Caldwell	27,161	27,161	19,013	30,403	30,403	21,282		42,292	42,292	29,605	
Nampa	45,314	45,314	31,720	47,986	47,986	33,590		57,782	57,782	40,448	
Middleton	13,673	13,673	9,571	17,817	17,817	12,472		33,009	33,009	23,107	
Greenleaf	1,367	1,367	957	1,481	1,481	1,037		1,899	1,899	1,329	
Melba	2,468	0	0	2,674	0	0		3,428	0	0	
Notus	1,406	1,406	984	1,716	1,716	1,201		2,854	2,854	1,998	
Parma	5,076	0	0	6,311	0	0		10,840	0	0	
Wilder	2,555	0	0	2,953	0	0		4,414	0	0	
Inc. Canyon	99,020	88,921	62,245	111,341	99,403	69,582	11.8%	156,518	137,836	96,486	55.0%
Unin. Canyon	348,352	348,352		336,031				290,854			
SUM Can	447,372	437,273		447,372				447,372			
SUM Incorp.			151,233			174,933	15.7%			261,831	73.1%

Estimated Stormwater Loads

In the desert climate of lower Boise River, stormwater runoff from urban-suburban areas can be divided into wet and dry weather discharges. Wet weather runoff can occur during rainfall events. On average there are 50 rainfall events during the year that exceed 0.05-inches (HDR 1998) and 39 events that exceed 0.1-inches (WRCC 2007). During the period of May through September (period of record 1940-2006), there are 11 events that exceed 0.1-inches (Attachment 2). Dry weather discharges measured in the Boise Area MS4 area appear to be more continuous in nature, and are potentially influenced by many different sources such as groundwater and surface water from irrigation and overflows. Other more intermittent urban-suburban dry weather sources could include car washing, side walk cleaning, and construction related activities.

Stormwater data has been collected by USGS (1994), USBR (2001) and ACHD (as part of the MS4 NPDES Phase 1 permit program). These data were used to estimate wet weather (event based) total phosphorus loads (Figure 20). The wet weather loads (i.e., the first 3 groups of data) are for rainfall events of various sizes and assume the runoff volume occurred over 24 hours (Attachment 3). Dry weather loads (i.e., the last group of data shown), are based on samples collected twice a week for the period July 20, 2006 through September 27, 2006 (Attachment 4). While the dry weather loads are generally smaller, they flow continually and therefore produce a higher annual load compared to the wet weather discharges.

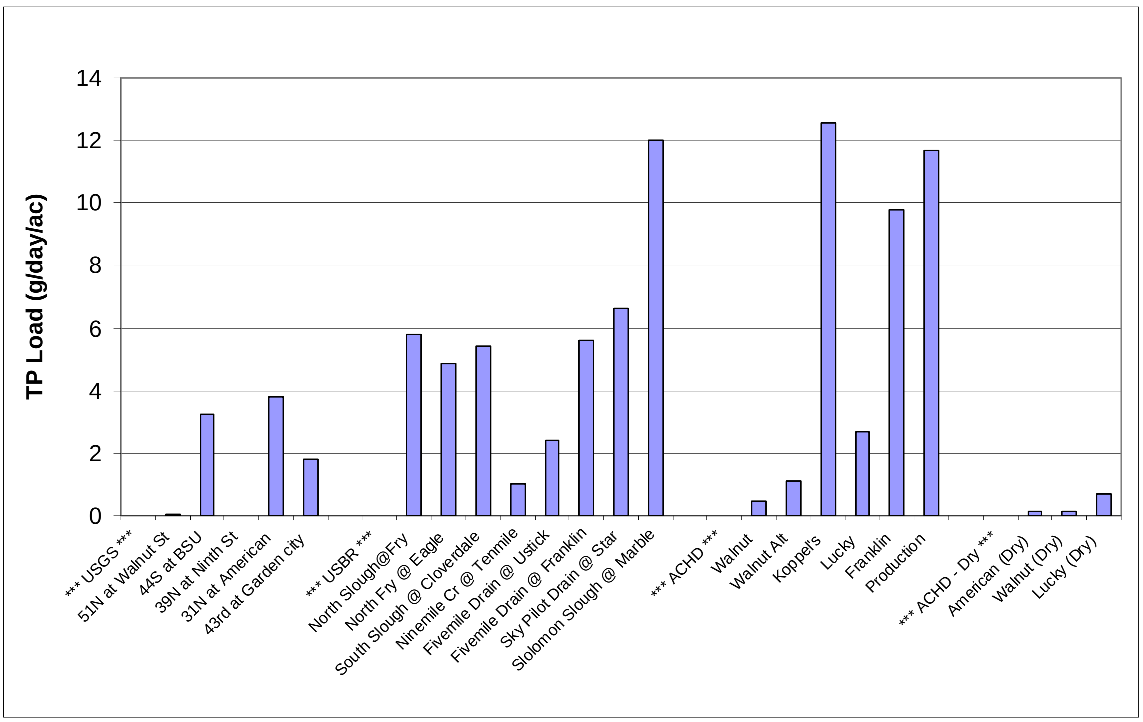

Figure 20. Measured Stormwater Wet and Dry Weather Total Phosphorus Loads

ACHD Wet Weather Loads

ACHD stormwater data is provided in Attachment 3, along with graphs showing event loads measured in each month. Using these data, stormwater total phosphorus loads for the Boise Area MS4 have been estimated and reported annually to EPA. Annual wet weather loads are based on total rainfall inches per year (recorded at Boise National Weather Service Boise Airport), location specific runoff coefficients, and location specific storm event mean concentrations averaging (Attachment 3). The NPDES reported loads were used to estimate average annual "per acre" loads (Table 26) based on existing land uses and including some level of stormwater treatment.

Table 26. Annual wet weather total phosphorous loads for Ada County as estimated for NPDES permit reporting

Year	Conc.	Volume	Load	
	(mg/L)	(million ft^3)	(lb/ac/yr)	(g/ac/day)
2001	0.41	2.48	0.09	0.11
2002	0.62	1.79	0.10	0.12
2003	0.52	2.28	0.11	0.13
2004	0.49	3.14	0.14	0.17
2005	0.55	3.30	0.16	0.20
2006	0.50	3.23	0.14	0.17
Average				**0.15**

Limited stormwater data are available during most of the May through September period (i.e., no data in July, August and September; Attachment 3). For this reason, average annual loads are used to estimate current wet weather allocation loads for MS4 areas. These average annual loads are based on event mean concentrations and annual runoff volumes estimated for each year (Attachment 3). For comparison, ACHD wet weather event based loads average over 6 g/ac/day. This represents the average load that would be generated during each storm event and distributed over a one-year period.

ACHD Dry Weather Loads

Dry weather urban-suburban data were collected twice a week for the period July 20, 2006, through September 27, 2006 (Appendix B, Attachment 4). General observations for each of the dry weather sampling location are given below:

- The Americana storm drain system collects drainage from approximately 615 acres. Surface flows from the foothills drainage Hulls Gulch, overflows from the Boise City Canal, and groundwater are known sources of water in the Americana system.
- The Walnut storm drain system conveys drainage from approximately 369 acres in the dry season. The Walnut system is influenced by a headgate that diverts water from the Boise City Canal. Groundwater is also a significant source of flow in this system.
- The Lucky Dry site collects drainage from approximately 233 acres. Flows appear to be composed primarily of groundwater and influences from the Farmers Union Canal and Boise Valley Canal are suspected.

The dry weather data were used to estimate dry weather loads for each of the monitoring locations (Table 27).

Table 27. Dry Weather Flows, Concentrations, and Loads

Americana		
TP	Flow	Load
(mg/L)	(cfs)	(kg/d)
0.15	0.37	0.16
Area (ac)		615
Load (g/ac/day)		0.26
Walnut		
TP	Flow	Load
(mg/L)	(cfs)	(kg/d)
0.03	0.87	0.06
Area (ac)		369
Load (g/ac/day)		0.16
Lucky Dry		
TP	Flow	Load
(mg/L)	(cfs)	(kg/d)
0.16	0.44	0.16
Area (ac)		233
Load (g/ac/day)		0.70

The dry weather data were averaged and used as a "placeholder" estimate for the stormwater dry weather WLAs (Table 28). Further investigations of dry weather flows are needed to delineate the proportion of flow attributed to groundwater and the specific surface water sources, and better define areas that contribute to flow and loads.

Table 28. Average Dry Weather Flows, Concentrations, and Loads

AVERAGE		
TP	Flow	Load
(mg/L)	(cfs)	(kg/d)
0.11	0.56	0.13
Area (ac)		406
Load (g/ac/day)		0.37

One component of dry weather flows not fully accounted for are loads associated with surface water irrigation and overflows from upgradient (above MS4 boundaries) agricultural runoff. Loads associated with these discharges would tend to increase in the western end of the watershed as the phosphorus concentration of surface water and groundwater increases.

Measured data (Table 29) from a Lake Lowell irrigation return drain water quality study (Campbell 2003) shows irrigation source water can have phosphorus concentrations 10 to 100 times greater than the background levels measured in the Boise area (i.e., 0.020 mg/L). The drain data (Table 29) were used to estimate additional dry weather discharges related to irrigation of urban-suburban lands (Appendix B, Attachment 5). An estimated load of over 1 g/ac/day could discharge to surface or groundwater assuming 90% of the irrigation water applied to urban-suburban is consumptively used (i.e., 10% is returned to the hydrologic system as surface or groundwater). This additional load could more than double the average dry weather loads measured in the Boise Area (Table 30).

Table 29. Summary of Average TP Measured in Return Flows for Lake Lowell Study (from Campbell 2003)

Sample Location	TP (mg/L)
DM-1	0.17
LS-1	0.89
LS-2	1.07
Average	**0.71**

This issue will be further evaluated as part of Adaptive Implementation.

Stormwater Wasteload Allocations

Current federal requirements and guidance for developing stormwater WLAs (EPA 2002) include the following key points:

- "NPDES-regulated stormwater discharges must be addressed by the wasteload allocation component. See 40 C.F.R. § 130.2(h)."
- "Stormwater discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component. See 40 C.F.R. § 130.2(g)."
- "EPA expects TMDL authorities to make separate allocations to NPDES- regulated stormwater discharges (in the form of WLAs) and unregulated stormwater (in the form of LAs)."

Stormwater data has been collected in the Boise Area MS4 and used for NPDES permit reporting since 2000. This data is used to estimate current stormwater loads for Ada County. (IDEQ recently approved the Lindsay Creek TMDL (IDEQ 2006) with a WLA for future MS4 areas in the Lewiston area based on percent of area in watershed. This approach was used because stormwater data was not available. While a similar approach could be applied to Canyon County where stormwater data is lacking, representatives of Canyon County stormwater areas indicated a preference for receiving a WLA based on ACHD stormwater data.)

Current Estimated Stormwater Wasteload Allocation

Stormwater WLA for current stormwater area is estimated as the sum of the wet and dry weather loads (Table 30). The sources of dry weather loads for the three monitoring locations, while not fully determined at this time, include groundwater, irrigation runoff and overflow, and other urban-suburban related discharges (i.e., multiple sources). While the data may include limited dry weather discharge loads associated with upgradient surface water irrigation and overflows (inflows to the MS4 system), the amounts that can be attributed to each source are not known.

Table 30. Stormwater Wasteload Allocation for Existing MS4 Areas

	Current Load		
	Boise Area MS4	**Watershed Aggregate MS4**	**Per Acre**
	(kg/day)	**(kg/day)**	**(g/ac/day)**
Wet Weather			
Average Annual – Surface water	5.5	23	0.15
– Groundwater	n/a	n/a	n/a
Dry Weather			
Surface water irrigation/overflows	n/a	n/a	n/a
Multiple sources	13.1	56	0.37
Total Seasonal	18.5	79	0.52
Acreage	35,150	151,233	1

n/a: Data not available

Preliminary analysis (Attachment 5) has indicated that upgradient surface water irrigation and overflows (inflows to the MS4 system) could contribute substantial loads in MS4 areas, especially in the western end of the basin. In Ada County, surface water overflows would likely lead to concentration dilution, but still add to overall loads. In Canyon County, less dilution would occur and more load would be contributed. This is considered to be a substantial data gap, and dry weather data will be collected in the future to provide the basis for estimating whether and how to include this component of the dry weather load.

The wet weather data indicate average loads during rainfall events can exceed 6 g/ac/day, which is in the range of daily loads estimated for agriculture. A stormwater daily allocation would be much higher if event loads (i.e., 6 g/ac/day) were used to estimate the allocations. Use of a seasonal average load (Table 30) for WLAs implies that during a rain event, the allocation (as expressed on a daily basis) would likely be exceeded, even though the allocation over the season would not. EPA, the stormwater permitting agency, has acknowledged this concern and indicated the need to state this assumption used in the stormwater allocation.

Future MS4 Wasteload Allocation

The stormwater WLA for future MS4 areas is given in Table 31. This per-acre allocation is the sum of the measured wet and dry weather load per acre with a 50% reduction from untreated levels. The untreated load was estimated using the current TP load (Table 30) and assuming a current treatment level of 30% (Table 31).

Table 31. TP Loads per acre for untreated, current and future conditions

	Treatment Level (%)	**Load (g/ac/day)**
Untreated	0%	0.68
Current	30%	0.52
Future	50%	0.34

This average load is considered to be representative of Ada County wet and dry weather loads. As previously stated, the average load based on ACHD data is also used to allocate loads for Canyon County stormwater. One difference is that current levels of stormwater BMPs in Canyon County may be considerably lower compared to the Boise Area MS4 area. Potentially more important, source water for irrigation is likely lower quality, and therefore dry weather runoff and groundwater infiltration would contribute more load.

CGP and MSGP Wasteload Allocations

As previously stated, there are three regulated stormwater sources in the lower Boise River watershed: MS4s; construction sites disturbing 1 acre or more are required to have a Construction General Permit (CGP); and industrial activities covered by the Multi-Sector General Permit (MSGP). Allocations for stormwater associated with CGP and MSGP activities are discussed below.

CGP

The CWA requires operators of construction sites to obtain permit coverage to discharge stormwater to a water body or to a municipal storm sewer. In Idaho, EPA has issued a general permit for stormwater discharges from construction sites. If a construction project disturbs more than 1 acre of land (or is part of larger common development) that will disturb more than 1 acre, the operator is required to apply for permit coverage from EPA after developing a site-specific Stormwater Pollution Prevention Plan. The operator must document the erosion, sediment, and pollution controls they intend to use, inspect the controls periodically, and maintain the BMPs through the life of the project. In general, if construction activities are conducted consistent with NPDES MS4 requirements of the community in which the activity occurs and/or NPDES CGP requirements, they are considered to be in compliance with the provisions of these allocations.

Sites regulated under the Construction General Permit (CGP) that are located within MS4 permit boundaries are included in the current and future WLAs. Construction sites disturbing 1 acre or more and located outside the MS4 permit boundaries are expected to implement SWPPPs that are consistent with existing stormwater management programs for stormwater discharges, and are converted from the agricultural load allocation.

MSGP

Existing industrial facilities regulated under the Multi-Sector General Permit (MSGP) that are located within MS4 permit boundaries are included in the estimate of total developed acres and receive the same per-acre WLAs as given to the current MS4 areas. Future MSGP receive the same WLA as future MS4 areas. All MSGP facilities are expected to implement SWPPPs that include BMPs to meet a phosphorus reduction goal of 50%.

MSGP impacted facilities outside of MS4 permit boundaries are expected to implement SWPPPs that are consistent with stormwater management programs required for facilities within MS4 areas. Industrial facilities that are located outside MS4 permit boundaries are included in the estimate of total acres used to developed non-point agricultural source load allocations and are converted from the agricultural load allocation.

Other Issues

Not all members of the stormwater workgroup agree on the methodology used to estimate stormwater loads during both dry-weather and wet-weather conditions, particularly given the relative lack of stormwater monitoring data and a better understanding what that monitoring data actually represent. As part of the Adaptive Implementation process set forth in the SR-HC TMDL, the stormwater WLAs set forth in this framework will be evaluated as additional data are collected and assessed. Issues that have been raised in the workgroup are part of the record and can be further assessed once additional data and information are collected and become available to inform the implementation process.

Stormwater Load Estimate Information: List of Attachments

Attachment 1 – Information Supporting the 50% Reduction Goal

Attachment 2 – Boise Airport Precipitation Summary

Attachment 3 – MS4 Stormwater Monitoring Locations, Data, Graphs and Calculation Method

Attachment 4 – ACHD Dry Weather Data

Attachment 5 – Phosphorus Return Flow Loads

Attachment 6 – Comments Received on Stormwater Framework

Attachment 1 – Information Supporting the 50% Reduction Goal

Literature supports a stormwater (load or concentration) treatment goal of 50% reduction.

Following are some examples showing the variability in TP and TSS removal efficiencies for various BMPs. Due to this variability, a treatment goal of no more than a 50% reduction is appropriate. Note that some of the removal rates may not account for loads discharged to the groundwater.

Urbonas and Roesner (1992) summarized phosphorus removal rates reported in studies for various types of stormwater treatments systems (Table 32). The variability in treatment levels, as originally compiled in a study for the Denver area, are related to site-specific conditions of each study.

Table 32. Total suspended sediment (TSS) and total phosphorus (TP) removal rates for various types of stormwater treatment systems as reported in studies (Urbonas and Roesner, 1992).

Type of System	Removal Rates	
	TSS	TP
Porous pavement	85-95	65
Infiltration	0-99	0-75
Percolation trench	99	65-75
Retention ponds	91	0-79
Extended detention	50-70	10-20
Wetlands	41	9-58
Sand filters	60-80	60-80

EPA (1999) states removal efficiencies for sand filters (following a small sediment basin) as 70 and 33 percent for TSS and TP, respectively.

Minton (2005, pg 259) in his book called *Stormwater Treatment,* states that infiltration basins and trenches can reduce TSS by 80%, but goals for TP are lower. Minton (2005, pg 133), also presented phosphorus treatment for various systems. Wet basins were shown to remove 45 to 80 percent of TP. Studies of extended detention basins showed removal varies from 20 to 40 percent.

Caraco (2001b) shows how phosphorus loads in a watershed increase in response to more impervious cover and the impact of better site design and stormwater treatment on reducing phosphorus loads. The document also shows that implementation of stormwater treatment practices (STPs) and better site design (BSD) will reduce loads by about 50 percent.

Attachment 2 – Boise Airport Precipitation Summary

BOISE WSFO AIRPORT, IDAHO

Period of Record General Climate Summary - Precipitation

Station:(101022) BOISE WSFO AIRPORT														
From Year=1940 To Year=2006														
	Precipitation											Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	1.42	3.87	1970	0.12	1949	1.13	18/1953	12	5	0	0	6.3	21.4	1964
February	1.11	3.70	1986	0.18	1997	0.92	04/1951	10	4	0	0	3.3	25.2	1949
March	1.23	3.46	1989	0.17	1992	1.60	20/1981	10	5	0	0	1.5	11.9	1951
April	1.21	3.04	1955	0.09	1949	1.27	06/1969	8	4	0	0	0.5	8.0	1967
May	1.30	4.40	1998	0.00	1992	1.77	29/1990	8	4	1	0	0.1	4.0	1964
June	0.85	3.41	1941	0.01	1960	1.91	12/1958	6	3	0	0	0.0	0.0	1940
July	0.27	1.62	1982	0.00	1942	0.94	30/1960	2	1	0	0	0.0	0.0	1940
August	0.28	2.37	1968	0.00	1943	1.61	13/1979	3	1	0	0	0.0	0.0	1940
September	0.57	2.93	1986	0.00	1943	1.73	11/1976	4	2	0	0	0.0	0.0	1940
October	0.78	2.59	2000	0.00	1952	0.90	12/2000	6	3	0	0	0.1	2.7	1971
November	1.34	3.36	1988	0.14	1976	0.78	26/1971	10	5	0	0	2.0	18.6	1985
December	1.40	4.23	1983	0.09	1976	1.03	23/1955	11	5	0	0	5.5	26.2	1983
Annual	11.76	18.77	1983	6.64	1966	1.91	19580612	89	39	3	0	19.5	46.5	1964
Winter	3.93	6.45	1969	1.31	1977	1.13	19530118	33	14	1	0	15.2	43.3	1949
Spring	3.74	7.11	1980	0.83	1992	1.77	19900529	26	12	1	0	2.2	11.9	1951
Summer	1.40	4.13	1941	0.08	1966	1.91	19580612	11	4	1	0	0.0	0.0	1940
Fall	2.69	4.99	1940	0.40	1952	1.73	19760911	20	9	1	0	2.1	18.6	1985

Table updated on Apr 24, 2007
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

Western Regional Climate Center, wrcc@dri.edu

Attachment 3 – MS4 Stormwater Monitoring Locations, Data, Graphs and Calculation Method

Attachment 3a – Summary of Stormwater Sampling Locations

Wet weather stormwater total phosphorus loads for the Boise Area MS4 have been estimated and reported to EPA annually based on data collected at the sampling locations shown below. Also shown are dry weather sampling locations and catchment areas.

Station	Site Type	Land Use	Catchment Area (acres)	Receiving Water
Walnut	Wet/Dry	57.6% low-density residential	536/396	Boise River
		10% high-density residential		
		32% open space		
		0.4% commercial/industrial		
Walnut Alt.	Wet	32% open space	534	Boise River
		57% low-density residential		
		10% high-density residential		
Koppel's	Wet	61% commercial/industrial	14	Boise River
		39% transportation		
Koppel's Alt.	Wet	67% commercial/industrial	10.9	Boise River
		33% transportation		
Lucky	Wet/Dry	99.7% low-density residential	105/233	Eagle Drain
		0.3% transportation		
Franklin	Wet	52% low-density residential	17	Ridenbaugh Canal
		48% transportation		
Production	Wet	100% commercial/industrial	19.6	Five Mile Creek
Americana	Dry	34% Commercial/Industrial	615	Boise River
		66% High density residential		

Attachment 3b – ACHD Stormwater Monitoring Results

Plot Date	Date	Sample Type	Station	TP	DOP	Storm Type	Total Precip. (inches)	Duration (hours)	Antecedent dry period (hours)	Total Precip in previous 72 hrs. (inches)	Volume (ft3)	TP g	DOP g	Plot date	TP g/ac/event
				76	**Total count**										
	Franklin		**17 ac**	**17**	**Count**										
15-Jan	**22-Jan-03**	SamplerComp	Franklin	**1.13**	**0.0532**	Rain	0.12	19	183	0.03	2,034.00	65.2	3.1	15-Jan	3.83
15-Feb	**19-Feb-05**	SamplerComp	Franklin	**0.342**	**0.073**	Rain	0.19	30		0	3,503.94	34.0	7.3	15-Feb	2.00
15-Feb	**16-Feb-04**	SamplerComp	Franklin	**0.552**	**0.0453**	Rain	0.51	15	225	0.05	15,962.65	249.9	20.5	17-Feb	14.70
15-Mar	**19-Mar-05**	SamplerComp	Franklin	**0.464**	**0.1018**	Rain	0.11	7	651	0	5,929.50	78.0	17.1	15-Mar	4.59
15-Mar	**7-Mar-02**	SamplerComp	Franklin	**0.477**	**0.0637**						4,119.92	55.7	7.4	17-Mar	3.28
15-Apr	**21-Apr-04**	SamplerComp	Franklin	**0.89**	**0.236**	Rain	0.19	19.62	552	0.05	3,139.02	79.2	21.0	15-Apr	4.66
15-Apr	**3-Apr-03**	SamplerComp	Franklin	**0.46**	**0.0615**	Rain	0.16	63	135.37	0	2,938.00	38.3	5.1	17-Apr	2.25
15-Apr	**9-Apr-02**	SamplerComp	Franklin	**0.307**	**0.0638**	Rain	0.15	5	360	0	1,710.56	14.9	3.1	19-Apr	0.88
15-May	**19-May-06**	SamplerComp	Franklin	**0.477**	**0.1185**	Thundershowers	0.21	7.97	280.03	0	2,576.10	34.9	8.7	15-May	2.05
15-Jun	**13-Jun-06**	SamplerComp	Franklin	**0.398**	**0.1521**	Thundershowers	0.43	6	256	0	5,532.00	62.4	23.9	15-Jun	3.67
15-Nov	**3-Nov-05**	SamplerComp	Franklin	**0.391**	**0.1645**	Rain	0.21	8	784	0.03	2,686.26	29.8	12.5	15-Nov	1.75
15-Nov	**3-Nov-04**	SamplerComp	Franklin	**0.248**	**0.0928**	Rain	0.12	7	84	0	3,965.34	27.9	10.4	17-Nov	1.64
15-Nov	**29-Nov-03**	SamplerComp	Franklin	**0.203**	**0.117**	Rain	0.27	14	293	0.02	5,000.00	28.8	16.6	19-Nov	1.69
15-Nov	**8-Nov-02**	SamplerComp	Franklin	**0.472**	**0.1684**	Rain	0.8	43	374	0.01	6,166.00	82.5	29.5	21-Nov	4.86
15-Dec	**1-Dec-05**	SamplerComp	Franklin	**0.616**	**0.0407**	Snow/Rainshowe	0.38	24	114	0.05	14,939.52	261.0	17.2	15-Dec	15.35
	Updated data														
	4/19/2001	Manual Comp	Franklin	0.303	0.113						1,360.03	11.7	4.4	21-Apr	0.69
	10/11/2001	SamplerComp	Franklin	0.707	0.1172						4,635.00	92.9	15.4	15-Oct	5.47
	Data collection did not meet sampling protocol														
	7/30/2001	SamplerComp	Franklin	0.696	0.326	Rain	0.03	10	792	0	975.13	19.3	9.0	15-Jul	1.13
	Koppels		**14 ac**	**14**	**Count**										
15-Jan	**22-Jan-03**	SamplerComp	Koppels	**0.5**	**0.0358**	Rain	0.12	19	183	0.03	1,376.00	19.5	1.4	15-Jan	1.39
15-Feb	**19-Feb-05**	SamplerComp	Koppels	**0.281**	**0.6106**	Rain	0.19	30		0	2,149.92	17.1	37.2	15-Feb	1.22
15-Mar	**25-Mar-06**	SamplerComp	Koppels	**0.58**	**0.0678**	Thundershowers	0.25	3	400	0	19,135.98	314.8	36.8	15-Mar	22.49
15-Mar	**19-Mar-05**	SamplerComp	Koppels	**0.362**	**0.113**	Rain	0.11	7	651	0	3,792.00	38.9	12.2	17-Mar	2.78
15-Mar	**7-Mar-02**	SamplerComp	Koppels	**0.217**	**0.06**						7,327.94	45.1	12.5	19-Mar	3.22
15-Apr	**25-Apr-03**	SamplerComp	Koppels	**0.36**	**0.0834**	Rain	0.29	6	432.73	0.08	1,376.00	14.1	3.3	15-Apr	1.00
15-Apr	**9-Apr-02**	SamplerComp	Koppels	**0.37**	**0.1313**	Rain	0.15	5	360	0	483.29	5.1	1.8	17-Apr	0.36
15-May	**27-May-04**	SamplerComp	Koppels	**0.269**	**0.0741**	Rain	0.2	4	90	0.07	3,908.32	29.8	8.2	15-May	2.13
15-Oct	**17-Oct-04**	SamplerComp	Koppels	**0.47**	**0.2875**	Rain	0.26	13		0	3,440.00	45.9	28.1	15-Oct	3.28
15-Nov	**3-Nov-05**	SamplerComp	Koppels	**0.385**	**0.2398**	Rain	0.21	8	784	0.03	5,473.00	59.8	37.2	15-Nov	4.27
15-Nov	**8-Nov-02**	SamplerComp	Koppels	**0.514**	**0.247**	Rain	0.8	43	374	0.01	3,108.00	45.3	21.8	17-Nov	3.24
15-Dec	**1-Dec-05**	SamplerComp	Koppels	**0.395**	**0.089**	Snow/Rainshowe	0.38	24	114	0.05	6,444.42	72.2	16.3	15-Dec	5.16
	Updated data														
	10/20/2000	Manual Comp	Koppels	0.55							9,352.01	145.9	0.0	17-Oct	10.42
	10/11/2001	SamplerComp	Koppels	0.928	0.2957	Rain	0.59	5	648	0	5,504.00	144.9	46.2	19-Oct	10.35

Lucky	**105**	**ac**	**14**	**Count**										
22-Jan-03	SamplerComp	Lucky	**0.44**	**0.1057**	Rain	0.12	19	183	0.03	2,528.00	31.5	7.6	15-Jan	0.30
19-Feb-05	SamplerComp	Lucky	**0.351**	**0.2064**	Rain	0.19	30		0	3,005.40	29.9	17.6	15-Feb	0.28
25-Mar-06	SamplerComp	Lucky	**0.752**	**0.136**	Thundershowers	0.25	3	400	0	17,999.40	383.9	69.4	15-Mar	3.66
19-Mar-05	SamplerComp	Lucky	**0.599**	**0.3908**	Rain	0.11	7	651	0	6,207.60	105.5	68.8	17-Mar	1.00
21-Apr-04	SamplerComp	Lucky	**0.836**	**0.1532**	Rain	0.19	19.62	552	0.05	46,088.93	1092.9	200.3	15-Apr	10.41
9-Apr-02	SamplerComp	Lucky	**0.944**	**0.367**	Rain	0.15	5	360	0	17,585.56	470.9	183.1	17-Apr	4.48
11-May-03	SamplerComp	Lucky	**0.68**	**0.1328**	Rain	0.26	46.88	134.12	0.01	5,056.00	97.5	19.0	15-May	0.93
17-Oct-04	SamplerComp	Lucky	**1.186**	**0.7001**	Rain	0.26	13		0	9,712.00	326.7	192.9	15-Oct	3.11
3-Nov-05	SamplerComp	Lucky	**0.941**	**0.694**	Rain	0.21	8	784	0.03	5,674.20	151.4	111.7	15-Nov	1.44
16-Nov-03	SamplerComp	Lucky	**0.752**	**0.362**	Rain	0.38	29	2040	0.08	8,832.00	188.4	90.7	17-Nov	1.79
8-Nov-02	SamplerComp	Lucky	**1.16**	**0.6394**	Rain	0.8	43	374	0.01	7,120.00	234.3	129.1	19-Nov	2.23
1-Dec-05	SamplerComp	Lucky	**0.279**	**0.111**	Snow/Rainshowe	0.38	24	114	0.05	15,432.93	122.1	48.6	15-Dec	1.16
Updated data														
4/11/2001	SamplerComp	Lucky	0.219	0.131						9,600.00	59.6	35.7	19-Apr	0.57
10/11/2001	SamplerComp	Lucky	0.893							15,872.00	402.0	0.0	17-Oct	3.83
10/30/2001	SamplerComp	Lucky		0.547	Light Rain	0.1	16	177	0	3,304.77	0.0	51.3	19-Oct	
Production	**19.6**	**ac**	**15**	**Count**										
22-Jan-03	SamplerComp	Production	**0.555**	**0.0675**	Rain	0.12	19	183	0.03	1,156.00	18.2	2.2	15-Jan	0.93
27-Feb-06	SamplerComp	Production	**0.335**	**0.1049**	Rain	0.2	8	630	0.02	17,550.54	166.8	52.2	15-Feb	8.51
19-Feb-05	SamplerComp	Production	**0.329**	**0.1487**	Rain	0.19	30		0	3,370.80	31.5	14.2	17-Feb	1.60
16-Feb-04	SamplerComp	Production	**0.651**	**0.066**	Rain	0.51	15	225	0.05	13,363.43	246.8	25.0	19-Feb	12.59
25-Mar-06	SamplerComp	Production	**0.38**	**0.0901**	Thundershowers	0.25	3	400	0	19,733.52	212.7	50.4	15-Mar	10.85
19-Mar-05	SamplerComp	Production	**0.444**	**0.23**	Rain	0.11	7	651	0	8,081.16	101.8	52.7	17-Mar	5.19
6-Mar-02	Grab	Production	**0.335**	**0.1099**	Rain	0.38	19	336	0.02	4,447.99	42.3	13.9	19-Mar	2.16
21-Apr-04	SamplerComp	Production	**0.688**	**0.2057**	Rain	0.19	19.62	552	0.05	9,205.74	179.6	53.7	15-Apr	9.17
25-Apr-03	SamplerComp	Production	**0.29**	**0.0723**	Rain	0.29	6	432.73	0.08	1,088.00	8.9	2.2	17-Apr	0.46
9-Apr-02	SamplerComp	Production	**0.409**	**0.1535**	Rain	0.15	5	360	0	4,824.47	56.0	21.0	19-Apr	2.86
20-May-06	SamplerComp	Production	**0.873**	**0.3323**						1,697.76	42.0	16.0	15-May	2.14
29-Nov-03	SamplerComp	Production	**0.23**	**0.1214**	Rain	0.27	14	293	0.02	8,637.29	56.3	29.7	15-Nov	2.87
8-Nov-02	SamplerComp	Production	**0.41**	**0.1275**	Rain	0.8	43	374	0.01	1,088.00	12.7	3.9	17-Nov	0.65
Updated data														
4/11/2001	SamplerComp	Production	0.313	0.054						8,050.00	71.5	12.3	21-Apr	3.65
10/11/2001	SamplerComp	Production	0.645							6,672.00	122.1	0.0	15-Oct	6.23
Walnut	**536**	**ac**	**16**	**Count**										
23-Jan-03	SamplerComp	Walnut	**0.37**	**0.0934**						8,150.00	85.5	21.6	15-Jan	0.16
20-Feb-05	SamplerComp	Walnut	**0.259**	**0.0759**	Rain	0.19	30		0	20,838.78	153.1	44.9	15-Feb	0.29
17-Feb-04	SamplerComp	Walnut	**0.484**	**0.0859**	Rain	0.51	15	225	0.05	135,713.29	1863.1	330.7	17-Feb	3.48
19-Mar-05	SamplerComp	Walnut	**0.521**	**0.2799**	Rain	0.11	7	651	0	9,761.94	144.3	77.5	15-Mar	0.27
7-Mar-02	SamplerComp	Walnut	**0.389**							51,951.87	573.2	0.0	17-Mar	1.07
21-Apr-04	SamplerComp	Walnut	**0.414**	**0.11**	Rain	0.19	19.62	552	0.05	12,488.64	146.6	39.0	15-Apr	0.27
25-Apr-03	SamplerComp	Walnut	**0.32**	**0.1208**	Rain	0.29	6	432.73	0.08	17,115.00	155.3	58.6	17-Apr	0.29
10-Apr-02	SamplerComp	Walnut	**0.73**	**0.2892**	Rain	0.15	5	360	0	29,053.88	601.6	238.3	19-Apr	1.12
3-Nov-05	SamplerComp	Walnut	**0.58**	**0.3666**	Rain	0.21	8	784	0.03	15,146.40	249.2	157.5	15-Nov	0.46
3-Nov-04	SamplerComp	Walnut	**0.42**	**0.3433**	Rain	0.12	7	84	0	10,510.20	125.2	102.3	17-Nov	0.23
16-Nov-03	SamplerComp	Walnut	**0.673**	**0.347**	Rain	0.38	29	2040	0.08	18,672.00	356.4	183.8	19-Nov	0.66
8-Nov-02	SamplerComp	Walnut	**0.524**	**0.5028**	Rain	0.8	43	374	0.01	23,344.00	347.0	332.9	21-Nov	0.65
1-Dec-05	SamplerComp	Walnut	**0.278**	**0.101**	Snow/Rainshowe	0.38	24	114	0.05	17,790.12	140.3	51.0	15-Dec	0.26
25-Mar-06	Manual Comp	Walnut(alt)	**0.281**	**0.1059**	Thundershowers	0.25	3	400	0	52,370.04	417.4	157.3	19-Mar	0.78
Updated data														
10/20/2000	Manual Comp	Walnut	0.35							67,920.05	674.3	0.0	15-Oct	1.26
4/11/2001	SamplerComp	Walnut	0.241	0.075	Rain	0.48	4	87	0	67,264.97	459.8	143.1	21-Apr	0.86

Attachment 3c – Wet Weather Graphs

Wet weather total phosphorus loads for 76 sampling events for the period from 2000 to 2006. These data form the basis for estimating annual loads as report for the Boise Area MS4 by ACHD.

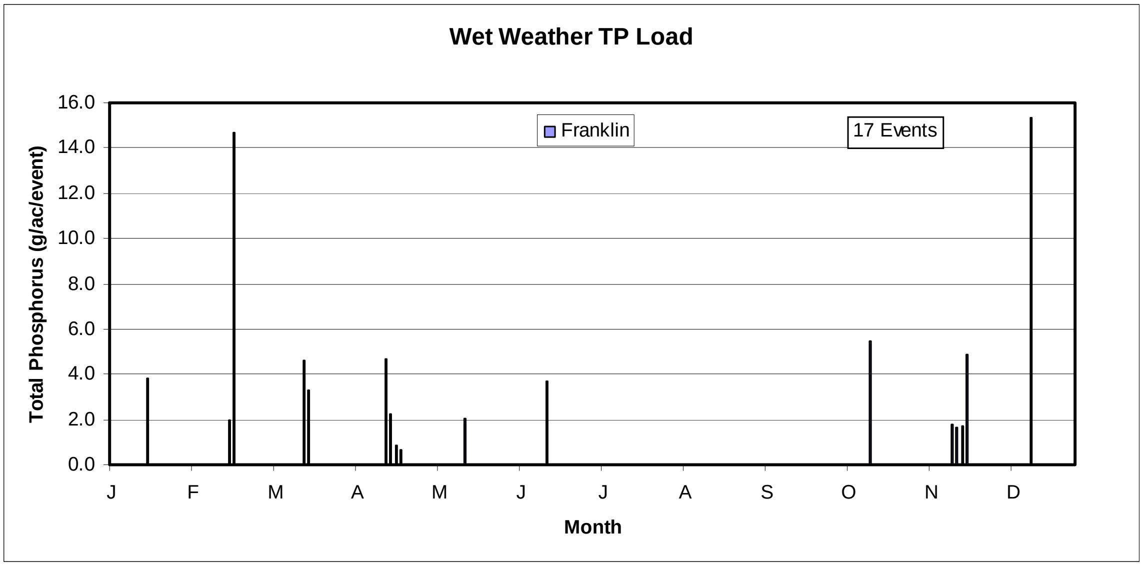

Figure 21. Wet weather total phosphorus loads for ACHD sampling events measured at Franklin sampling site from 2000 to 2006

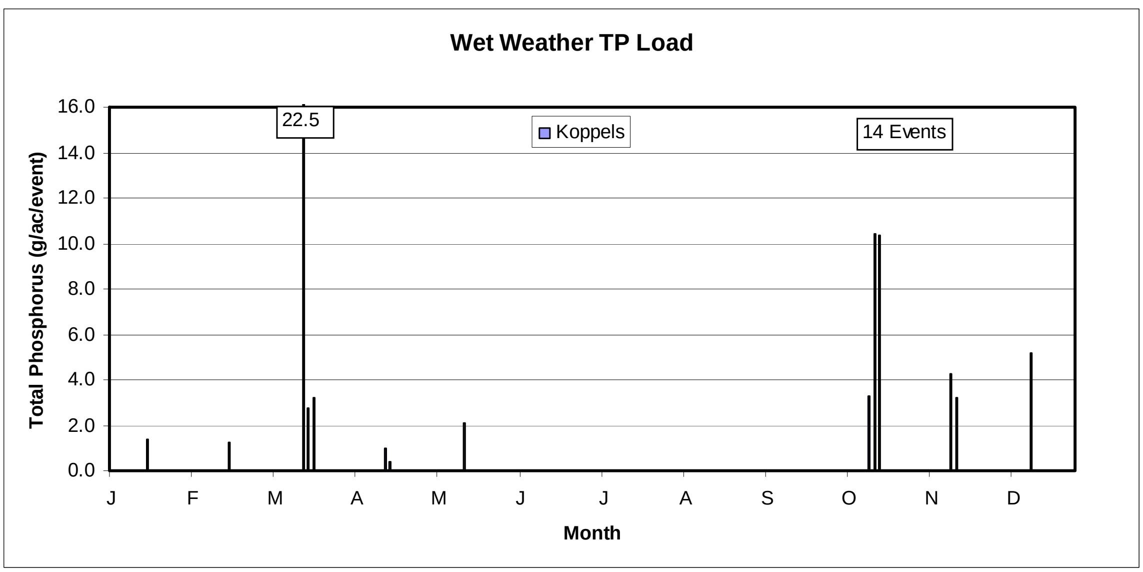

Figure 22. Wet weather total phosphorus loads for ACHD sampling events measured at Koppel's sampling site from 2000 to 2006

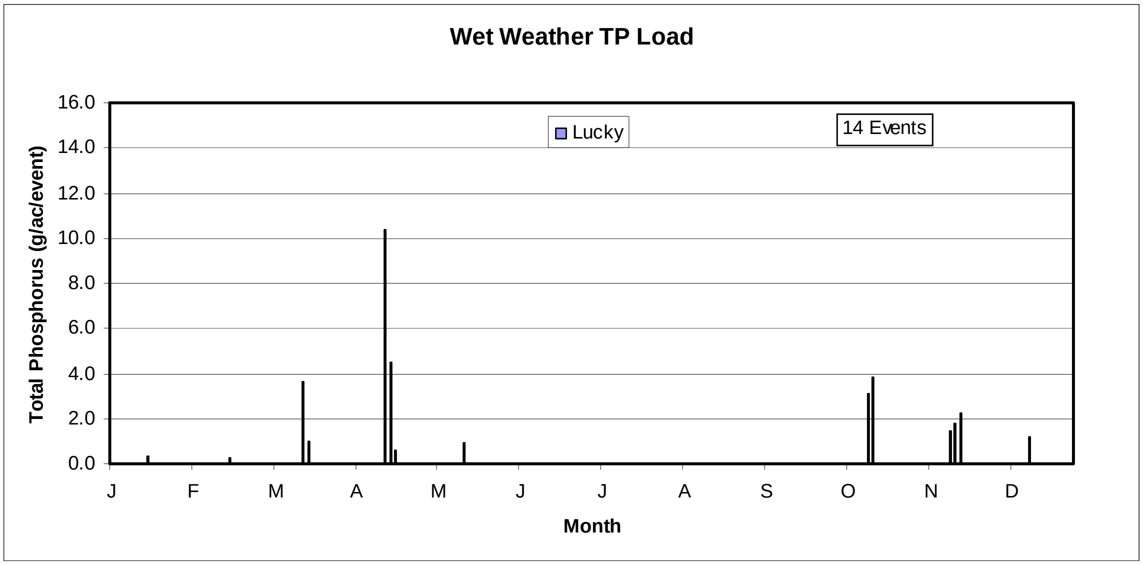

Figure 23. Wet weather total phosphorus loads for ACHD sampling events measured at Lucky sampling site from 2000 to 2006

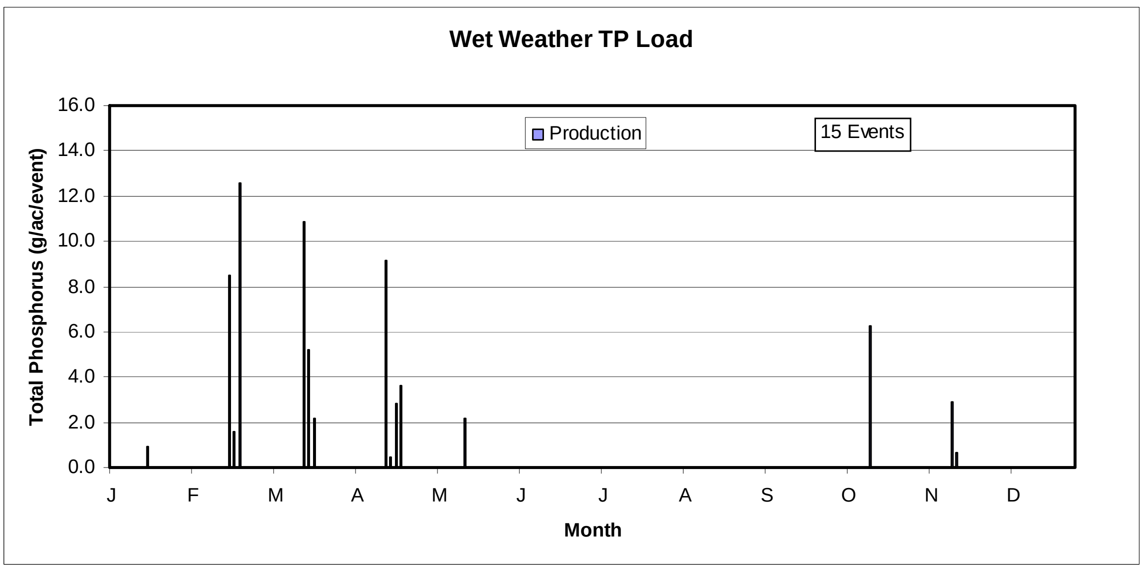

Figure 24. Wet weather total phosphorus loads for ACHD sampling events measured at Production sampling site from 2000 to 2006

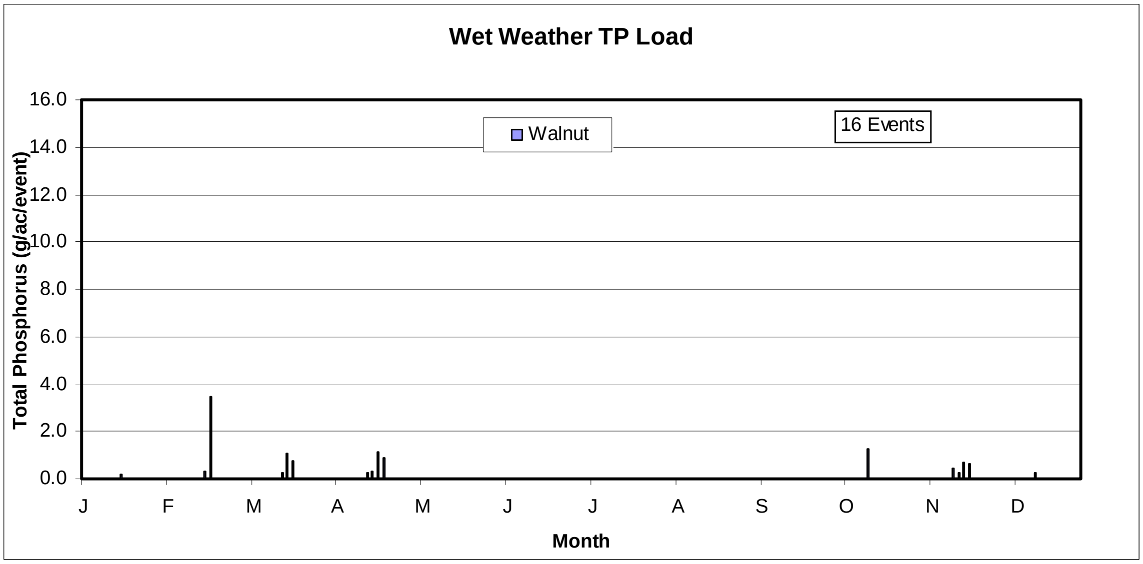

Figure 25. Wet weather total phosphorus loads for ACHD sampling events measured at Walnut sampling site from 2000 to 2006

Attachment 3d – Annual Load Calculation Method

Laboratory analytical results and stormwater discharge volumes (calculated using the rational method) were used to estimate event mean concentrations and annual pollutant loading by component. The results of annual cumulative pollutant loading provide estimates for the monitored area (lbs/acre) and estimated loads to the Boise River (lbs) and to waters of the United States (lbs), and were reported to EPA annually.

For each monitoring event, a flow-weighted event mean concentration was calculated for each detected component using laboratory analytical results from each monitoring station. The weighting accounts for varying concentrations of components from watersheds with varying stormwater runoff flows. The annual mean concentration for each component detected during the year was calculated by averaging the flow-weighted event mean concentrations. An estimated annual discharge volume from all five stormwater monitoring stations was calculated using the annual total precipitation and the observed runoff coefficient geometric means. The National Weather Service total annual precipitation value was used for this calculation. The annual mean concentration for each component was then multiplied by the total discharge volume for all stations to estimate the component mass contributed by the monitored area for the entire water year. As shown in the formula below, pollutant loading (in mass per unit area) for the entire monitored area was calculated by dividing the component mass by the total monitored watershed drainage area.

$$\text{Pollutant Loading}_{\text{MA}} = \frac{\text{Annual Mean Conc} \times \text{Estimated Annual Discharge}}{\text{Monitored Drainage Area}}$$

During WY 2005, ACHD personnel completed a 5-year detailed mapping effort of the permitted watershed to better quantify the pollutant loading calculations in the watershed. These mapping activities estimate the total permit area at 49,372 acres, with 35,150 of these acres draining to the Boise River or water bodies that are considered waters of the United States (e.g., drains, irrigation canals, etc.) The remaining 14,222 acres are considered areas where stormwater drains to groundwater (10,183 acres on-site drainage, 724 acres under construction), or where further investigation is needed during Phase II mapping efforts (2,889 acres to be determined, 399 acres with storm drain problems). As shown in the following formula, the stormwater pollutant loads (in pounds) to the Boise River and to the waters of the United States during WY 2006 were calculated by multiplying the monitored area pollutant loading (lbs/acre) by the mapped drainage area acreage of these watersheds (35,150 acres and 6,594 acres, respectively):

$$\text{Pollutant Load to Waterbody} = \text{Pollutant Loading}_{\text{MA}} \times \text{Watershed Drainage Area}$$

These methods of determining event mean concentrations and annual cumulative pollutant loading by component are based on the assumption that the runoff from the monitored area (691.6 acres) is representative of the runoff from the entire drainage area (35,150 acres).

Attachment 4 – ACHD Dry Weather Data

Americana				Walnut				Lucky			
Date	TP (mg/L)	Flow (cfs)	Load (kg/d)	Date	TP (mg/L)	Flow (cfs)	Load (kg/d)	Date	TP (mg/L)	Flow (cfs)	Load (kg/d)
Median	0.15	0.37	0.16		0.03	0.92	0.06		0.08	0.84	0.16
7/20/2006	0.05	1.66	0.19	7/20/2006	0.06	0.24	0.03	7/20/2006	0.09	0.42	0.09
7/26/2006	0.07	1.15	0.18	7/26/2006	0.05	0.37	0.04	7/26/2006	0.17	0.40	0.17
7/27/2006	0.05	1.20	0.15	7/27/2006	0.04	0.42	0.04	7/27/2006	0.15	0.45	0.16
7/31/2006	0.06	1.00	0.14	7/31/2006	0.04	0.96	0.10	7/31/2006	0.18	0.31	0.13
8/3/2006	0.11	0.93	0.25	8/3/2006	0.03	0.60	0.05	8/3/2006	0.08	1.49	0.28
8/9/2006	0.20	0.47	0.22	8/9/2006	0.03	0.90	0.07	8/9/2006	0.16	0.38	0.15
8/10/2006	0.09	0.88	0.18	8/10/2006	0.04	0.88	0.08	8/10/2006	0.08	1.26	0.25
8/14/2006	0.27	0.39	0.26	8/14/2006	0.03	1.07	0.07	8/14/2006	0.16	0.43	0.16
8/17/2006	0.40	0.31	0.30	8/17/2006	0.02	1.59	0.10	8/17/2006	0.16	0.92	0.37
8/21/2006	0.17	0.48	0.20	8/21/2006	0.03	0.85	0.06	8/21/2006	0.16	0.52	0.20
8/23/2006	0.29	0.29	0.21	8/23/2006	0.03	0.86	0.06	8/23/2006	0.17	0.43	0.18
8/28/2006	0.14	0.32	0.11	8/28/2006	0.03	0.77	0.05	8/28/2006	0.16	0.38	0.15
8/30/2006	0.11	0.34	0.09	8/30/2006	0.03	0.98	0.07	8/30/2006	0.18	0.33	0.14
9/6/2006	0.29	0.23	0.16	9/6/2006	0.03	0.77	0.06	9/6/2006	0.16	0.24	0.09
9/11/2006	0.16	0.24	0.09	9/11/2006	0.03	0.85	0.07	9/11/2006	0.08	1.30	0.26
9/13/2006	0.16	0.32	0.13	9/13/2006	0.03	1.01	0.07	9/13/2006	0.16	0.31	0.12
9/18/2006	0.12	0.45	0.13	9/18/2006	0.03	0.76	0.05	9/18/2006	0.07	0.86	0.15
9/20/2006	0.12	0.33	0.10	9/20/2006	0.05	1.14	0.14	9/20/2006	0.08	0.82	0.15
9/25/2006	0.15	0.24	0.09	9/25/2006	0.05	0.99	0.11	9/25/2006	0.07	1.01	0.16
9/27/2006	0.18	0.24	0.10	9/27/2006	0.02	1.00	0.06	9/27/2006	0.06	1.78	0.25
MEAN	**0.16**	**0.57**	0.22		**0.03**	**0.85**	0.07		**0.13**	**0.70**	0.22

Attachment 5 - Phosphorus Return Flow Loads

Measured data from the Lake Lowell Irrigation Return Drain study (Campbell 2003) provides water quality results for estimating surface discharges related to irrigation return flows from irrigated urban/suburban lands (Table 33). Loads shown assumed 3 ft of water is applied annually and 10 percent of the annual application returns to the hydrologic system as surface water or groundwater discharge.

Table 33. Estimated daily phosphorus return flow load for urban/suburban lands

	Average	DM-1	Units	Comment/source
Irrigation				
Total	3	3	af/ac/season	Draft plan estimated 4.03
Period	200	200	day/season	approximate
Daily	0.015	0.015	afpd/ac	
	0.0076	0.0076	cfs/ac	
Return Flow				
Percentage	10%	10%		assumed: low for typical irr. efficiency
Flow/acre	0.00076	0.00076	cfs/ac	
Total Phosphorus				
Concentration	0.71	0.17	mg/L	Campbell 2003
Daily load	0.0029	0.00069	lb/ac/day	
	1.32	0.31	g/ac/day	Range of suburban runoff loads

Attachment 6 - Comments Received on Stormwater Framework

Not all members of the stormwater workgroup agree on the methodology used to estimate stormwater loads during both dry-weather and wet-weather conditions. Comments were received from the City of Boise Public Works, Ada County Highway District, City of Nampa, Idaho Transportation Department District 3 and Ada County Drainage District #3. The comments provide a record of these issues so that they can be further assessed once additional monitoring data are collected and become available to inform the implementation process. The comments are available on request from the IDEQ Boise Regional Office.

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Appendix C: Analysis Supporting Agricultural Land Use Allocations

Estimated Current Loads

Total phosphorous (TP) loading data from agricultural lands in the Lower Boise River watershed (watershed) does not exist. Furthermore, drainage flow data and drainage water quality data within the watershed are limited. Current total phosphorous loading from agricultural lands was therefore estimated using flow rate data and TP concentration data from five (5) drains located in drainages where agricultural lands use is predominant.

The estimated TP loads may be inaccurate and misleading because TP concentration data can be influenced by flow rates at the time of sample collection. The flow rate measurements and samples used for TP concentration samples used for estimating loads were not always collected at the same time or location. These data gaps and disconnects introduce a significant degree of uncertainty in the load estimates.

Furthermore, with the available drain discharge and TP data it is not possible to determine and distinguish water flow rates or TP concentrations in surface return flows from agricultural lands and returns from groundwater or "subterranean" flows. The estimates in this section therefore represent water flows and TP loading from both surface return flows and groundwater from areas where agricultural land use appear to be predominant.

Notwithstanding these limitations and uncertainties, the estimates of aggregate loading and derived per acre loading rates from agricultural lands are used in this section for the limited purposes of characterizing TP contributions from agricultural lands to provide context for the load allocations to stormwater and wastewater discharges.

For purposes of these estimates, it is assumed that surface water and groundwater return flows in tributary drains located in areas where agricultural land use is predominant are the result of surface irrigation of agricultural lands. In reality, however, it is impossible to parse out purely agricultural return flows.

Sample Location Selection

Flow rate measurements and water samples were collected from the mouth of five drains. Drains were selected to estimate loading from agricultural land use based on (1) the predominance of irrigated agriculture land use within the drainage area for the drain, (2) the availability of TP concentration data for the drain, and (3) location of the drain within the lower Boise River watershed. Given the rapid rate of conversion of lands from agricultural to urban/residential use in the Boise Valley, the profile of land use within these drainages may have changed since the land areas were surveyed in 2001.

Flow Rate Estimates

An average surface and subterranean return flow per agricultural acre was estimated by using the following flow data from the five (5) drains listed in Table 34.

Table 34. Estimated Agricultural Return Flows (Surface and Subterranean)

Tributary	Q (cfs, mouth)	Drainage Area (Ag Acres)	Q/Ag Acre
Willow Creek	17	4,873	0.004
Mason Creek	129	23,493	0.005
Hartley Gulch	84	10,546	0.008
Conway Gulch	47	5,842	0.008
Dixie Slough	178	28,263	0.006
AVERAGE Q (cfs / ag acre)			**0.006**

Flow rate data were collected daily from May through September for the years 2000 and 2001. The flow measurements were taken at the mouth of each listed drain. The flow data for each drain were then averaged. Table 34 contains the average flow rate for each selected drain. Appendix D (Attachment 1) contains the flow rate measurement data.

The drainage area associated with each drain was estimated using field surveys and available aerial photos (Koberg 2001). The estimated flow rate per acre was calculated by dividing the average drain flow rate of each drain by the respective drainage area. An average flow rate per acre for the agricultural lands within the watershed was estimated by averaging the individual flow rate per acre. Table 29 contains the numbers of acres in the drainage area and average flow rate per acre.

Total Phosphorous Estimates

An average total phosphorous concentration for the agricultural runoff was estimated by using total phosphorous concentrations measured from water samples collected from the following five (5) drains listed in Table 35.

Table 35. Estimated Mean Agricultural TP Concentrations in Drain Water (MacCoy 2004)

Tributary	TP Conc. (mg/L, mouth)
Willow Creek	0.18
Mason Creek	0.46
Hartley Gulch	0.25
Conway Gulch	0.34
Dixie Slough	0.37
AVERAGE C	**0.32**

TP concentration data were collected approximately monthly during the irrigation season beginning in 1994 and ending in 2001. TP concentration samples were collected from the mouth of each listed drain. The TP concentration data for each drain was then averaged resulting in an average TP concentration for each drain. Appendix D (Attachment 2) contains the TP concentration data.

TP concentrations in surface waters may be influenced by the flow rate at the time of sample collections. The flow rate of the drains at the time and place of TP sample collection was not considered. The estimated TP loads may be inaccurate and misleading because TP concentration data can be influenced by flow rates at the time of sample collection. The TP concentration data used for the load estimates was not collected at the same time or place as the flow rate data used to estimate the TP loads. This disconnect may be significant and result in indefensible TP load estimates.

Using the above listed information, the estimated agricultural TP loads in the watershed are 4.9 g/day/agricultural acre. Assuming a baseline of 162,000 agricultural acres (Koberg 2001), the aggregate current agricultural TP load is 792 kg/day.

Projected Future Loads

The Treasure Valley is one of Idaho's most rapidly urbanizing areas. The conversion of lands from agricultural to urban-suburban uses affects TP loading, as well as the fate and transport of TP to the lower Boise River. Predictions about future events always carry a level of uncertainty. Future agricultural loads were estimated using the projected future agricultural acres and predicted future implementation of voluntary BMP treatment of the agricultural acres. Conversion of agricultural land to other land uses is a critical assumption in meeting the TP load target at the mouth of the Boise River. Uncertainty in the rate of future conversion of agricultural lands to other land uses and the availability of future funding for BMP implementation for agricultural lands results in a high degree of uncertainty in the projected future loads.

Projected Agricultural Acres

In the Implementation Plan ("plan") for the lower Boise River sediment and bacteria TMDL (IDEQ 2003b), IDWR land use data from 1994 and 2000 were used to determine the relative rate of urbanization within the watershed. Using that data, agricultural lands in the watershed were converted to urban-suburban uses at a rate of 1.4% per year (IDEQ 2003b, p. 48). The plan also presented the results of an extensive on-the-ground inventory of agricultural land uses conducted by the ISCC in 2000-2001. These results suggested that the rate of urbanization was on the order of 2.0% per year.

During 2005, this inventory was updated using National Agricultural Imagery Program aerial photographs taken in spring 2004 (Koberg 2005). Based on comparisons of the 2000-2001 inventory and the National Agricultural Imagery Program aerial photographs taken in spring 2004, agricultural lands within the watershed were converted to other uses at an average rate of 2.1% per year during the period 2000-2004 (Koberg 2005).

The rate of agricultural land use conversion to urban-suburban use is directly related to population growth. COMPASS population projections were used to project future agricultural land use conversion rates (COMPASS, 2007). COMPASS projected annual population growth rates for the next 25 years are shown in Figure 26.

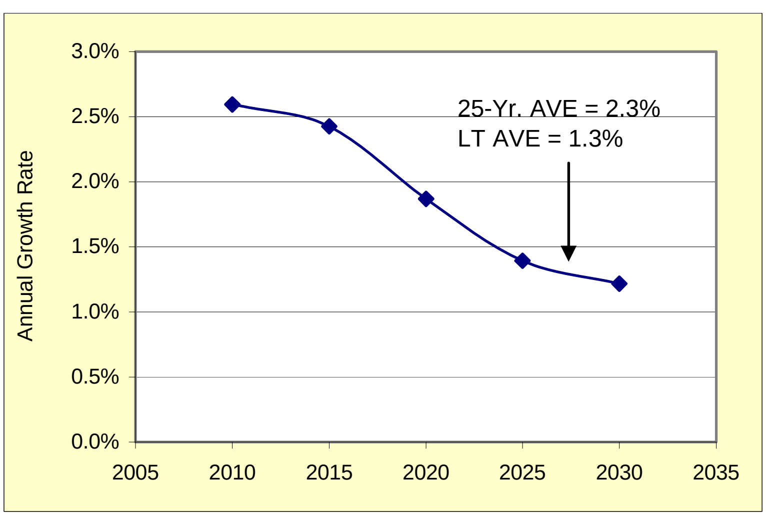

Figure 26. Population Growth Projections (COMPASS 2007)

These projections indicate that over the long-term, the annual growth rate will slow to approximately 1.3%. Thus, the population projections were scaled to reflect a smaller long-term growth rate because the timeframe for implementation is expected to exceed 25 years. Accordingly, a land use conversion rate of 1.2% was used to project future land agricultural land uses.

At Year 15, there are projected to be ~132,000 agricultural acres remaining, which equates to a load allocation of 646 kg/day. This 146 kg/day (792 kg/day - 646 kg/day) anticipated phosphorus loading improvement at Year 15 is solely attributable the expected rate of land use conversion of agricultural lands to urban-suburban uses. In other words, this 146 kg/day phosphorus loading improvement will be realized prior to the implementation of any voluntary BMPs on remaining agricultural lands.

The 1.2% annual land use conversion rate is not the product of data compiled by the WAG's agricultural stakeholders/representatives. This conversion rate is consistent with the land use conversion seen between 1994 and 2000. Changes in the real estate market, major corporate restructuring and layoffs in the local job market, among other factors can quickly change actual land use conversion rates. Naturally, failure to meet the projected annual land use conversion rate will result in decreased phosphorus loading improvements/ projections than are anticipated in this framework.

Though it is committed to improving phosphorus loading, the agricultural community cannot guarantee any specific numeric load improvements given the voluntary nature of BMP implementation and the uncertainties associated with BMP funding. This is particularly true if anticipated land use conversion rate slows as recent evidence suggests it likely will. The agricultural community is not in a position to make up any projected phosphorus loading improvement shortfall attributable to declining land use conversion rates.

Future Implementation of BMPs

As of 2001, 163,270 agricultural acres drain to the lower Boise River. Of those acres, there were 115,798 acres of surface irrigated cropland (including orchards and vineyards), 20,212 acres of surface irrigated pasture, 2,495 acres of non-irrigated pasture, 23,084 acres of sprinkler irrigated cropland, and 1,681 acres of feedlots and dairies (CAFOs/AFOs) (Griswold and Koberg 2001).

As agricultural land use conversion to urban-suburban use occurs, the character of the land changes. To some degree, irrigation return systems will be replaced with stormwater return systems. Additionally, some agricultural load is expected to be treated through the implementation of agricultural BMPs. These practices are nationally derived systems to control, reduce, or prevent phosphorus from entering waterbodies from agricultural land uses (ISCC, 1991). The following phosphorus BMPs (Table 36) are available for use by landowners within the Boise River agricultural implementation area. The table does not include all of the available BMPs for phosphorus.

Table 36. Phosphorus Best Management Practices for Agriculture

Phosphorus BMPs	Phosphorus Control Effectiveness	Installation Costs	Maintenance Costs
Livestock Exclusion	High	Moderate	Low
Nutrient Management	High	Moderate	Low
Dike	High	High	Low
Waste Management System	High	High	Moderate
Waste Storage Pond	High	High	Low
Filter Strips	Moderate	Low	Low
Wetland Development & Restoration	Moderate	High	Moderate
Diversion	Moderate	Moderate	Moderate
Irrigation Water Management	Moderate	Low	Low
Fencing	Low	Moderate	Low

Implementation plans were developed for subwatersheds as part of the sediment and bacteria TMDL implementation plan (Griswold and Koberg 2001). Within each subwatershed, land areas were divided into "treatment units" according to the five agricultural uses.

Within the tributary subwatersheds, BMP implementation is prioritized to address land uses that have the greatest potential for erosion and pollutant transport to the Boise River. The subwatershed implementation plans identify surface irrigated croplands as "critical acreage" because they have the greatest potential for erosion. These critical acres are further prioritized by their proximities to tributaries and their potential for sediment transport according to a tiered method. Critical acres closest to the mouths of the tributaries or adjacent to the tributaries are considered highest priority for treatment due to their increased potential to directly impact surface water quality. It is difficult to determine pollutant delivery potential in a watershed with extremely modified surface hydrology systems. In the lower Boise River watershed, one farmer's return flow often becomes another farmer's irrigation water. The accuracy in determining exactly where particular pollutants originate is greatly compromised as distance from the water body of concern increases. Accordingly, the following is a general rule that applies to the prioritization of critical acres within each tributary subwatershed priority area:

- Tier 1: Fields directly adjacent to either the tributary of concern or a drain to the tributary of concern; or fields having a direct and substantial influence on the tributary of concern
- Tier 2: Fields in the subwatershed with an indirect, yet substantial influence on the tributary of concern
- Tier 3: Fields upland in the subwatershed that indirectly influence the tributary of concern

Feedlots and dairies (CAFOs/AFOs) have varying effects on water quality in the lower Boise River. These lands are not prioritized by tiers in this plan because facility monitoring is administered by the Idaho State Department of Agriculture (ISDA). Both dairy facilities and feedlot facilities in the State of Idaho currently have a Certified Nutrient Management Plan (CNMP) on file with ISDA as per Idaho state law. Although a CNMP is required for each facility, implementation of the various components of each CNMP is ongoing. As a result, CAFOs and AFOs in this implementation plan are identified as critical acreage for treatment.

Sprinkler-irrigated cropland is not prioritized for treatment because the potential for erosion and pollutant transport to the Boise River is typically not significant enough to warrant treatment with additional BMPs.

Lands in pasture are generally low in priority for sediment treatment because pasture lands are not typically disturbed by excavation or tillage. Surface irrigated pastures that are a potential source of bacteria or phosphorus may warrant a higher priority for treatment as determined on a site-specific basis. Generally, non-irrigated pastures do not warrant a high priority because they are an unlikely source of sediment, bacteria, or phosphorus transport to the Boise River.

BMP implementation is not designed to treat TP concentrations in groundwater nor is there any plan for the land user to directly treat TP concentrations in groundwater. Any reduction in TP concentrations in groundwater will be an indirect effect of BMP implementation and land use conversion.

Factors Affecting Agricultural BMP Implementation

Many of the same stakeholders that participated in the SR-HC TMDL process are active in the lower Boise River watershed. As part of that process, a detailed description of those factors that may affect BMP implementation were presented. These factors are presented again below as they apply specifically to the lower Boise River allocation process.

1. Financial. The primary constraints on BMP implementation are limited sources of funding and BMP costs. Low commodity prices result in very limited margins (revenues after farm operating and family living expenses) available to commit to BMP implementation. Historically, there has been limited available funding from federal (e.g., NRCS cost share, 319 grants) and state sources (e.g., OWEB). Generally, there has been $1,500,000 funding available from the State of Idaho for agricultural water quality projects statewide. This funding level has been recently reduced to $1,400,000 due to budgetary shortfalls resulting from the recent recession. Soil Conservation Districts in Idaho apply for funding of projects, so that funding is not evenly distributed throughout the state. Changes in commodity prices, operating expenses, and federal and state funding priorities may further constrain the availability of funds for water quality projects. Priority projects for Snake River tributaries, watersheds, and subwatersheds that yield substantial local water quality benefits may not significantly reduce the delivery of loads to the Snake River. In other words, funding priorities may not always be directed toward reducing loads to the Snake River, and this will diminish funding available to achieve SR-HC TMDL objectives.

Per-acre BMP costs for irrigated agriculture were estimated by the SCC (Griswold and Koberg 2001). These estimates are: low level treatment at $250.00 per acre; medium treatment at $500.00 per acre; and high treatment at $800.00 per acre. Low level treatment involves annual treatment expense (such as application of PAM), and therefore the $250.00 per acre exhibit includes annual operation & maintenance (O & M). Medium and high levels of treatment require investment in equipment and therefore the cost estimates reflect capital costs that do not include O & M. The equipment typically must be replaced in 20 years.

Under the CWA and Idaho law, implementation of control strategies to reduce discharges from irrigated lands is voluntary. It is not reasonable to expect that farmers can or will commit financial resources to BMP implementation if those resources are essential to continue operations or support their families. Imposing such a choice on farmers, or any other individual or entity for that matter, would ensure that they will not voluntarily participate in achieving the allocation objectives, and the DEQs could not provide EPA reasonable assurance that necessary load reductions from agricultural non-point sources will occur. For this reason, a margin or portion of farm gate revenue that could be committed to implementation of control strategies without imperiling continued farming operations or family support is estimated and used in combination with historically available federal and state funding to project levels of BMP implementation and corresponding load reductions. (See discussion of historically available funding.)

2. BMP Effectiveness. The Rock Creek watershed drains to the Snake River upstream from the SR-HC reach. With very little existing infrastructure, a 68% reduction in the discharge of TP from the watershed was achieved. Despite this improvement, TP concentrations from the watershed remained above 0.1 mg/l. (After project funding declined, the range of improvement also declined to approximately 40% due to the inability to fund the recurring annual BMP costs.)

3. Prioritizing Lands for Treatment. It is not necessary to treat all agricultural lands to substantially reduce the discharge of pollutants. BMP implementation should focus on priority lands where treatment will be most effective. Lands can be prioritized in three tiers as described earlier. To the maximum extent possible, treatment should focus on Tier 1 and Tier 2 lands with little or no existing BMPs. Prioritizing lands for treatment will increase BMP effectiveness and the probability of meeting allocation objectives within predictable timeframes.

4. Crop Requirements. Onions and seed crops are more appropriately produced using furrow irrigation than with sprinkler irrigation. Onions and seed crops are adversely affected by overhead sprinkler irrigation. The comparative climatic advantage for onion and seed crop production in the Treasure Valley is directly associated with the absence of rainfall, which promotes high quality. If onions receive regular rainfall or sprinkler irrigation, they become inoculated with fungal and bacterial diseases. These diseases can cause both losses before harvest, and tend to make the crop decompose during storage. Following the unusually rainy 1993 season, a large part of the onion crop was lost during storage due to decomposition. Onions are grown in the Columbia Basin under central pivot irrigation, however, 5,000 acres of sprinkler-irrigated onions in the Columbia Basin have recently been converted to subsurface drip irrigation to improve bulb quality and reduce decomposition losses so that Columbia Basin growers can safely market onions over a long storage season. Columbia Basin growers have been trying to export their crop in a short marketing window in late summer and early fall. Treasure Valley onions are marketed in the late summer, then throughout the fall, winter, and into the beginning of the spring (Shock et al. 2005).

5. Hydrologic. Irrigation systems in many watersheds utilize, and may rely entirely, upon return flows from upstream or upgradient irrigation. Recharge from delivery and use of irrigation water in many watersheds replenishes and, in some circumstances, creates aquifers. The lower Boise River watershed exhibits both of these characteristics. In fact, the majority of water flows in the lower Boise River below Star are generated by return flows, and the shallow aquifer in the watershed was created and is maintained by irrigation delivery and use. For these reasons, eliminating or significantly reducing return flows will significantly impact water use, recharge, and the hydrologic balance in many watersheds.

6. Engineering and Construction of Irrigation Systems. The majority of irrigation systems along the Snake River Plain were designed and constructed to operate by gravity flow. Significant alteration of these systems will be required to accommodate pressurized, sprinkler irrigation and other system modifications to significantly reduce or eliminate return flows.

7. Existing Implementation Levels. Farmers have been implementing BMPs to reduce soil loss to improve productivity and water quality for over 50 years. The level of BMP implementation throughout the lower Boise River varies from watershed to watershed, community to community, and farm to farm. The greatest water quality benefits from BMP implementation will be realized where there has been little or no BMP implementation, on "high priority" lands. Experience in the Rock Creek watershed has demonstrated that, in such areas, implementation of lower per-acre cost BMPs can result in substantial load reductions from irrigated lands. Implementation efforts should therefore be focused in these areas. Where BMPs have been implemented and are maintained, further load reductions from irrigated agriculture will require greater expenditures of available funds. Implementation of higher per-acre cost BMPs in such areas will result in treatment of fewer acres with diminishing per-acre and overall load reductions in comparison to the load reductions realized through treatment of lands with little or no treatment.

8. Power. The highest cost agricultural BMP, conversion to sprinkler irrigation, will result in increased power demands and consumption, at a time when irrigators have been encouraged through Idaho Power's "Buyback" program to cease pumping and sprinkler irrigation to reduce power demands.

9. Availability and Cost of Land. Sediment ponds are viable means for irrigation districts and canal companies to reduce the discharge of sediment and other constituents from drains where there is sufficient land that can be obtained at reasonable cost. Land near drain discharges may not be available at reasonable costs in many watersheds.

Estimated Agricultural BMP Implementation

Attainable interim water quality goals for irrigated agriculture have been defined by identifying or estimating: 1) historically available private and public funding for water quality projects; 2) BMP costs; 3) pollutant reductions resulting from the installation of BMPs; 4) the status of BMP implementation within a watershed, community, or at a farm; and 5) the number of acres to be treated. Each of these factors is explained below, and the analysis is applied to the Malheur, Boise, and Payette watersheds to project BMP implementation and resulting overall pollutant reductions over time from irrigated agriculture.

1. Historically Available Funding. For the purpose of this analysis it is estimated that, on average, farmers have a 3% margin of annual farm gate revenue after farm operating expenses with which to pay living and family expenses. It is further estimated that it is possible for farmers to commit 5% of this margin annually to water quality projects. These estimates are optimistic, given the fact that low commodity prices and high operating expenses have forced many farmers to operate at a loss for many years. Annual farm gate revenues are used to derive available private funding. Historically available federal and state funds have been identified to derive total available funds for BMP implementation within each watershed. Use of these margins and historically available federal funding (e.g., cost share and 319 grants) and state funding (e.g., Oregon's OWEB) to project implementation of future control strategies assumes that farm historic relative commodity prices and expenses continue, and that public funding levels continue to be available. Changes in the economics of farming or available funds will be a subject of periodic review and will be factored into adjustments to interim water quality goals.

2. BMP Costs. This analysis is based upon implementation of the medium level, $500.00 per acre level of treatment. Low level treatment involves recurring, annual $250.00 per acre expense, whereas O & M are the only recurring costs with the medium level of treatment until the equipment must be replaced. Higher level treatment is cost prohibitive, involves conversion to sprinkler irrigation, which is not possible for many crop types, and does not result in significantly greater reductions in pollutant discharges than the medium level treatment. A 10% annual operation and maintenance cost is factored into the analysis by subtracting this cost from the total annual available funding.

3. BMP Effectiveness. This analysis assumes 50% reduction in the discharge of TP from irrigated lands based on the Rock Creek Project results. Reductions in TP discharges from irrigated lands greater than these levels will require conversion to sprinkler irrigation, zero discharge, and other treatment methods that may be feasible in certain locations, but cannot be applied broadly due to financial constraints, hydrology, crop requirements, and other factors affecting BMP implementation discussed above.

4. Lands to be Treated. This analysis assumes that all or most of the loading from irrigated lands comes from lands identified as priority lands (Tier 1 and Tier 2). Treatment of priority lands is the basis for projected load reductions, interim targets, and load allocations. Since the majority of Tier 1 lands discharge directly to the Snake River and its tributaries, and discharges from Tier 2 lands are reused one or more times, it is estimated that treatment of Tier 1 discharges will result in greater reductions that treatment of Tier 2 discharges.

5. BMP Status. The status of BMP implementation varies from watershed to watershed, from community to community and farm to farm within watersheds. Achieving further discharge reductions in many areas

where BMPs have already been implemented will require higher per-acre expenditures, resulting in lower overall treatment. BMP status in each of the SR-HC watersheds cannot at this time be fully characterized.

Information developed to identify the lands to be treated as well as changes in the number of acres to be treated, will be a subject of periodic review and will be factored into adjustments to interim water quality goals.

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Appendix D: Agricultural Load Estimate Information

Attachment 1 – Drain Monitoring Data, Discharge

Attachment 2 – Drain Monitoring Data, Total Phosphorus

Attachment 1 – Drain Monitoring Data, Discharge (cfs)

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
May-Sept Average	17.3	129.1	83.9	46.8	177.8
5/1/2000	28.0	112.0	85.0	47.0	160.0
5/2/2000	29.1	116.3	89.3	47.6	168.6
5/3/2000	30.3	120.6	93.6	48.1	177.1
5/4/2000	31.4	124.9	97.9	48.7	185.7
5/5/2000	32.6	129.1	102.1	49.3	194.3
5/6/2000	33.7	133.4	106.4	49.9	202.9
5/7/2000	34.9	137.7	110.7	50.4	211.4
5/8/2000	36.0	142.0	115.0	51.0	220.0
5/9/2000	40.1	145.9	115.4	52.6	223.6
5/10/2000	44.3	149.7	115.9	54.1	227.1
5/11/2000	48.4	153.6	116.3	55.7	230.7
5/12/2000	52.6	157.4	116.7	57.3	234.3
5/13/2000	56.7	161.3	117.1	58.9	237.9
5/14/2000	60.9	165.1	117.6	60.4	241.4
5/15/2000	65.0	169.0	118.0	62.0	245.0
5/16/2000	63.0	168.4	116.4	62.1	254.3
5/17/2000	61.0	167.9	114.9	62.3	263.6
5/18/2000	59.0	167.3	113.3	62.4	272.9
5/19/2000	57.0	166.7	111.7	62.6	282.1
5/20/2000	55.0	166.1	110.1	62.7	291.4
5/21/2000	53.0	165.6	108.6	62.9	300.7
5/22/2000	51.0	165.0	107.0	63.0	310.0
5/23/2000	54.1	171.3	106.0	64.4	305.9
5/24/2000	57.3	177.6	105.0	65.9	301.7
5/25/2000	60.4	183.9	104.0	67.3	297.6
5/26/2000	63.6	190.1	103.0	68.7	293.4
5/27/2000	66.7	196.4	102.0	70.1	289.3
5/28/2000	69.9	202.7	101.0	71.6	285.1
5/29/2000	73.0	209.0	100.0	73.0	281.0
5/30/2000	68.4	198.9	100.1	72.1	280.6
5/31/2000	63.9	188.7	100.3	71.3	280.1
6/1/2000	59.3	178.6	100.4	70.4	279.7
6/2/2000	54.7	168.4	100.6	69.6	279.3
6/3/2000	50.1	158.3	100.7	68.7	278.9
6/4/2000	45.6	148.1	100.9	67.9	278.4
6/5/2000	41.0	138.0	101.0	67.0	278.0
6/6/2000	38.4	137.6	98.5	66.9	268.7
6/7/2000	35.9	137.1	95.8	66.7	259.4
6/8/2000	33.3	136.7	93.3	62.3	250.1
6/9/2000	30.7	136.3	90.7	61.4	218.3
6/10/2000	28.1	135.9	88.2	66.3	216.5
6/11/2000	25.6	135.4	85.5	66.1	212.1
6/12/2000	23.0	135.0	83.0	66.0	208.0
6/13/2000	22.6	137.4	85.4	64.9	203.4
6/14/2000	22.1	139.9	87.9	63.7	198.1

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
6/15/2000	21.7	142.3	90.3	62.6	190.7
6/16/2000	21.3	144.7	92.7	61.4	183.3
6/17/2000	20.9	147.1	95.1	60.3	175.9
6/18/2000	20.4	149.6	97.6	59.1	168.4
6/19/2000	20.0	152.0	100.0	58.0	161.0
6/20/2000	20.1	152.9	98.7	58.3	160.0
6/21/2000	20.3	153.7	97.4	58.6	159.0
6/22/2000	20.4	154.6	96.1	58.9	158.0
6/23/2000	20.6	155.4	94.9	59.1	157.0
6/24/2000	20.7	156.3	93.6	59.4	156.0
6/25/2000	20.9	157.1	92.3	59.7	155.0
6/26/2000	21.0	158.0	91.0	60.0	154.0
6/27/2000	20.0	157.6	91.1	59.4	160.0
6/28/2000	19.0	157.1	91.3	58.9	166.0
6/29/2000	18.0	156.7	91.4	58.3	172.0
6/30/2000	17.0	156.3	91.6	57.7	178.0
7/1/2000	16.0	155.9	91.7	57.1	184.0
7/2/2000	15.0	155.4	91.9	56.6	190.0
7/3/2000	14.0	155.0	92.0	56.0	196.0
7/4/2000	14.9	156.3	94.4	55.7	200.0
7/5/2000	15.7	157.6	96.9	55.4	204.0
7/6/2000	16.6	158.9	99.3	55.1	208.0
7/7/2000	17.4	160.1	101.7	54.9	212.0
7/8/2000	18.3	161.4	104.1	54.6	216.0
7/9/2000	19.1	162.7	106.6	54.3	220.0
7/10/2000	20.0	164.0	109.0	54.0	224.0
7/11/2000	20.0	164.0	109.0	54.0	224.0
7/12/2000	19.4	161.0	107.4	53.6	227.4
7/13/2000	18.9	158.0	105.9	53.3	230.8
7/14/2000	18.3	155.0	104.3	52.9	234.1
7/15/2000	17.7	152.0	102.7	52.5	237.5
7/16/2000	17.1	149.0	101.1	52.1	240.9
7/17/2000	16.6	146.0	99.6	51.8	244.3
7/18/2000	16.0	143.0	98.0	51.4	247.6
7/19/2000	16.0	143.0	98.0	51.0	248.0
7/20/2000	15.3	140.2	95.6	51.0	248.0
7/21/2000	14.7	137.3	93.4	52.5	232.2
7/22/2000	14.0	134.5	91.0	54.0	226.0
7/23/2000	13.3	131.7	88.6	55.5	218.4
7/24/2000	12.7	128.8	86.4	54.0	212.2
7/25/2000	12.0	126.0	84.0	58.5	212.0
7/26/2000	12.0	126.0	84.0	60.0	211.3
7/27/2000	11.2	126.5	83.7	60.0	204.8
7/28/2000	10.3	127.0	83.3	58.0	204.7
7/29/2000	9.5	127.5	83.0	56.0	204.7
7/30/2000	8.7	128.0	82.7	54.0	201.0
7/31/2000	7.8	128.5	82.3	52.0	199.3
8/1/2000	7.0	129.0	82.0	50.0	198.7

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
8/2/2000	7.0	129.0	82.0	48.0	196.0
8/3/2000	6.7	129.3	81.9	48.0	196.0
8/4/2000	6.3	129.7	81.6	47.0	194.5
8/5/2000	6.0	130.0	81.5	46.0	193.0
8/6/2000	5.7	130.3	81.4	45.0	191.5
8/7/2000	5.3	130.7	81.1	44.0	190.0
8/8/2000	5.0	131.0	81.0	43.0	188.5
8/9/2000	5.0	131.0	81.0	42.0	187.0
8/10/2000	5.5	129.7	81.4	42.0	187.0
8/11/2000	6.0	128.3	81.6	42.8	185.7
8/12/2000	6.5	127.0	82.0	43.7	184.3
8/13/2000	7.0	125.7	82.4	44.5	183.0
8/14/2000	7.5	124.3	82.6	45.3	181.7
8/15/2000	8.0	123.0	83.0	46.2	180.3
8/16/2000	8.0	123.0	83.0	47.0	179.0
8/17/2000	8.5	123.8	84.7	47.0	179.0
8/18/2000	9.0	124.7	86.3	48.0	177.0
8/19/2000	9.5	125.5	88.0	49.0	175.0
8/20/2000	10.0	126.3	89.7	50.0	173.0
8/21/2000	10.5	127.2	91.3	51.0	171.0
8/22/2000	11.0	128.0	93.0	52.0	169.0
8/23/2000	11.0	128.0	93.0	53.0	167.0
8/24/2000	11.5	127.5	93.0	53.0	167.0
8/25/2000	12.0	127.0	93.0	53.8	169.5
8/26/2000	12.5	126.5	93.0	54.7	172.0
8/27/2000	13.0	126.0	93.0	55.5	174.5
8/28/2000	13.5	125.5	93.0	56.3	177.0
8/29/2000	14.0	125.0	93.0	57.2	179.5
8/30/2000	14.0	125.0	93.0	58.0	182.0
8/31/2000	14.7	123.8	91.5	58.0	182.0
9/1/2000	15.3	122.7	90.0	56.5	185.5
9/2/2000	16.0	121.5	88.5	55.0	189.0
9/3/2000	16.7	120.3	87.0	53.5	192.5
9/4/2000	17.3	119.2	85.5	52.0	196.0
9/5/2000	18.0	118.0	84.0	50.5	199.5
9/6/2000	18.0	118.0	84.0	49.0	203.0
9/7/2000	16.8	117.3	84.6	49.0	203.0
9/8/2000	15.7	116.7	85.4	49.5	193.5
9/9/2000	14.5	116.0	86.0	50.0	184.0
9/10/2000	13.3	115.3	86.6	50.5	174.5
9/11/2000	12.2	114.7	87.4	51.0	165.0
9/12/2000	11.0	114.0	88.0	51.5	155.5
9/13/2000	11.0	114.0	88.0	52.0	146.0
9/14/2000	10.7	115.5	87.5	52.0	146.0
9/15/2000	10.3	117.0	87.0	49.7	148.5
9/16/2000	10.0	118.5	86.5	47.3	151.0
9/17/2000	9.7	120.0	86.0	45.0	153.5
9/18/2000	9.3	121.5	85.5	42.7	156.0

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
9/19/2000	9.0	123.0	85.0	40.3	158.5
9/20/2000	9.0	123.0	85.0	38.0	161.0
9/21/2000	9.8	122.2	85.0	38.0	161.0
9/22/2000	10.7	121.3	85.0	38.8	162.8
9/23/2000	11.5	120.5	85.0	39.7	164.7
9/24/2000	12.3	119.7	85.0	40.5	166.5
9/25/2000	13.2	118.8	85.0	41.3	168.3
9/26/2000	14.0	118.0	85.0	42.2	170.2
9/27/2000	14.0	118.0	85.0	43.0	172.0
9/28/2000	12.8	113.8	84.2	43.0	172.0
9/29/2000	11.7	109.7	83.3	43.8	161.0
9/30/2000	10.5	105.5	82.5	38.1	162.0
5/1/2001	19.0	101.0	90.0	55.0	167.3
5/2/2001	19.1	102.4	90.6	57.0	173.0
5/3/2001	19.3	103.9	91.1	57.5	171.7
5/4/2001	19.4	105.3	91.7	58.0	170.3
5/5/2001	19.6	106.7	92.3	58.5	169.0
5/6/2001	19.7	108.1	92.9	59.0	167.7
5/7/2001	19.9	109.6	93.4	59.5	166.3
5/8/2001	20.0	111.0	94.0	60.0	165.0
5/9/2001	21.3	113.6	93.6	60.5	170.1
5/10/2001	22.6	116.1	93.1	61.0	175.3
5/11/2001	23.9	118.7	92.7	62.7	180.4
5/12/2001	25.1	121.3	92.3	64.3	185.6
5/13/2001	26.4	123.9	91.9	66.0	190.7
5/14/2001	27.7	126.4	91.4	67.7	195.9
5/15/2001	29.0	129.0	91.0	69.3	201.0
5/16/2001	27.6	128.4	92.3	71.0	202.3
5/17/2001	26.1	127.9	93.5	71.4	203.6
5/18/2001	24.7	127.3	94.8	71.9	204.9
5/19/2001	23.3	126.7	96.2	72.3	206.1
5/20/2001	21.9	126.1	97.5	72.7	207.4
5/21/2001	20.4	125.6	98.7	73.1	208.7
5/22/2001	19.0	125.0	100.0	73.6	210.0
5/23/2001	18.6	126.0	99.7	74.0	210.8
5/24/2001	18.1	127.0	99.4	73.3	211.5
5/25/2001	17.7	128.0	99.1	72.6	212.3
5/26/2001	17.3	129.0	98.9	71.9	213.0
5/27/2001	16.9	130.0	98.6	71.1	213.8
5/28/2001	16.4	131.0	98.3	70.4	214.5
5/29/2001	16.0	132.0	98.0	69.7	215.3
5/30/2001	16.0	132.9	98.0	69.0	216.0
5/31/2001	15.4	133.8	95.7	69.0	216.0
6/1/2001	14.9	134.6	93.3	69.5	219.7
6/2/2001	14.3	135.5	91.0	70.0	223.3
6/3/2001	13.7	136.4	88.6	70.5	227.0
6/4/2001	13.1	137.3	86.3	71.0	230.7
6/5/2001	12.6	138.1	84.9	71.5	234.3

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
6/6/2001	12.0	139.0	83.5	72.0	238.0
6/7/2001	12.3	136.8	83.8	72.6	233.4
6/8/2001	12.7	134.7	84.0	73.1	228.9
6/9/2001	13.0	132.5	84.3	73.7	224.3
6/10/2001	13.3	130.3	84.5	74.3	219.7
6/11/2001	13.7	128.2	84.8	74.9	215.1
6/12/2001	14.0	126.0	85.0	75.4	210.6
6/13/2001	15.0	126.0	85.0	76.0	206.0
6/14/2001	16.2	126.8	83.5	76.0	206.0
6/15/2001	17.3	127.7	82.0	74.5	203.5
6/16/2001	18.5	128.5	80.5	73.0	201.0
6/17/2001	19.7	129.3	79.0	71.5	198.5
6/18/2001	20.8	130.2	77.5	70.0	196.0
6/19/2001	22.0	131.0	76.0	68.5	193.5
6/20/2001	21.0	130.0	75.1	67.0	191.0
6/21/2001	20.0	129.0	74.0	67.0	191.0
6/22/2001	19.0	128.0	73.1	63.0	186.5
6/23/2001	18.0	127.0	72.0	59.0	182.0
6/24/2001	17.0	126.0	71.1	55.0	177.5
6/25/2001	16.0	125.0	70.0	51.0	173.0
6/26/2001	15.0	124.0	69.1	47.0	168.5
6/27/2001	14.0	123.0	68.0	43.0	164.0
6/28/2001	13.0	121.5	67.5	43.0	164.0
6/29/2001	12.0	120.0	67.0	40.7	157.8
6/30/2001	11.0	118.5	66.5	38.3	151.7
7/1/2001	10.0	117.0	66.0	36.0	145.5
7/2/2001	9.0	115.5	65.5	33.7	139.3
7/3/2001	8.0	114.0	65.0	31.3	133.2
7/4/2001	8.0	114.0	65.0	29.0	127.0
7/5/2001	7.7	112.7	64.3	29.0	127.0
7/6/2001	7.3	111.3	63.7	30.2	129.0
7/7/2001	7.0	110.0	63.0	31.3	131.0
7/8/2001	6.7	108.7	62.3	32.5	133.0
7/9/2001	6.3	107.3	61.7	33.7	135.0
7/10/2001	6.0	106.0	61.0	34.8	137.0
7/11/2001	6.0	106.0	61.0	36.0	139.0
7/12/2001	5.8	108.0	61.0	36.0	139.0
7/13/2001	5.7	110.0	61.0	34.8	135.3
7/14/2001	5.5	112.0	61.0	33.7	131.7
7/15/2001	5.3	114.0	61.0	32.5	128.0
7/16/2001	5.2	116.0	61.0	31.3	124.3
7/17/2001	5.0	118.0	61.0	30.2	120.7
7/18/2001	5.0	118.0	61.0	29.0	117.0
7/19/2001	5.3	116.5	60.3	29.0	117.0
7/20/2001	5.7	115.0	59.7	27.8	116.0
7/21/2001	6.0	113.5	59.0	26.7	115.0
7/22/2001	6.3	112.0	58.3	25.5	114.0
7/23/2001	6.7	110.5	57.7	24.3	113.0

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
7/24/2001	7.0	109.0	57.0	23.2	112.0
7/25/2001	7.0	109.0	57.0	22.0	111.0
7/26/2001	7.3	110.8	58.9	22.0	111.0
7/27/2001	7.7	112.7	60.6	21.0	113.0
7/28/2001	8.0	114.5	62.5	20.0	115.0
7/29/2001	8.3	116.3	64.4	19.0	117.0
7/30/2001	8.7	118.2	66.1	18.0	119.0
7/31/2001	9.0	120.0	68.0	17.0	121.0
8/1/2001	9.0	120.0	68.0	17.0	123.0
8/2/2001	8.7	118.8	67.6	17.0	123.0
8/3/2001	8.3	117.7	67.4	17.7	123.8
8/4/2001	8.0	116.5	67.0	18.3	124.7
8/5/2001	7.7	115.3	66.6	19.0	125.5
8/6/2001	7.3	114.2	66.4	19.7	126.3
8/7/2001	7.0	113.0	66.0	20.3	127.2
8/8/2001	7.0	113.0	66.0	21.0	128.0
8/9/2001	7.3	112.5	66.4	21.0	128.0
8/10/2001	7.7	112.0	66.6	20.5	128.5
8/11/2001	8.0	111.5	67.0	20.0	129.0
8/12/2001	8.3	111.0	67.4	19.5	129.5
8/13/2001	8.7	110.5	67.6	19.0	130.0
8/14/2001	9.0	110.0	68.0	18.5	130.5
8/15/2001	9.0	110.0	68.0	18.0	131.0
8/16/2001	8.5	111.0	68.5	18.0	131.0
8/17/2001	8.0	112.0	69.0	17.7	130.0
8/18/2001	7.5	113.0	69.5	17.3	129.0
8/19/2001	7.0	114.0	70.0	17.0	128.0
8/20/2001	6.5	115.0	70.5	16.7	127.0
8/21/2001	6.0	116.0	71.0	16.3	126.0
8/22/2001	6.0	116.0	71.0	16.0	125.0
8/23/2001	5.7	114.5	70.4	16.0	125.0
8/24/2001	5.3	113.0	69.6	15.2	123.5
8/25/2001	5.0	111.5	69.0	14.3	122.0
8/26/2001	4.7	110.0	68.4	13.5	120.5
8/27/2001	4.3	108.5	67.6	12.7	119.0
8/28/2001	4.0	107.0	67.0	11.8	117.5
8/29/2001	4.0	107.0	67.0	11.0	116.0
8/30/2001	4.0	110.2	68.3	11.0	116.0
8/31/2001	4.0	113.3	69.7	12.5	116.8
9/1/2001	4.0	116.5	71.0	14.0	117.7
9/2/2001	4.0	119.7	72.3	15.5	118.5
9/3/2001	4.0	122.8	73.7	17.0	119.3
9/4/2001	4.0	126.0	75.0	18.5	120.2
9/5/2001	4.0	126.0	75.0	20.0	121.0
9/6/2001	4.4	124.3	73.5	20.0	121.0
9/7/2001	4.8	122.7	72.0	20.3	120.2
9/8/2001	5.2	121.0	70.5	20.7	119.3
9/9/2001	5.6	119.3	69.0	21.0	118.5

Date	Willow Creek	Mason Creek	Hartley (Combined)	Conway Gulch	Dixie Drain
9/10/2001	6.0	117.7	67.5	21.3	117.7
9/11/2001	5.9	116.0	66.0	21.7	116.8
9/12/2001	5.8	115.3	66.4	22.0	116.0
9/13/2001	5.6	114.6	66.9	22.0	112.9
9/14/2001	5.5	113.9	67.3	21.0	109.7
9/15/2001	5.4	113.1	67.7	20.0	106.6
9/16/2001	5.3	112.4	68.1	19.0	103.4
9/17/2001	5.1	111.7	68.6	18.0	100.3
9/18/2001	5.0	111.0	69.0	17.0	97.1
9/19/2001	5.6	109.4	67.9	16.0	94.0
9/20/2001	6.1	107.8	66.7	16.6	96.3
9/21/2001	6.7	106.2	65.6	17.1	98.6
9/22/2001	7.3	104.6	64.4	17.7	100.9
9/23/2001	7.9	103.0	63.3	18.3	103.1
9/24/2001	8.4	103.4	62.1	18.9	105.4
9/25/2001	9.0	103.9	61.0	19.4	107.7
9/26/2001	9.1	104.3	59.9	20.0	110.0
9/27/2001	9.3	104.8	58.7	19.4	105.7
9/28/2001	9.4	105.2	57.6	18.9	101.3
9/29/2001	9.6	105.7	56.4	18.3	97.0
9/30/2001	9.7	106.1	55.3	17.7	92.7

Attachment 2 – Drain Monitoring Data, Total Phosphorus (mg/L)

Willow Creek		Mason Creek		Hartley (Combined)		Conway Gulch		Dixie Drain	
May-Sept Average	0.18	May-Sept Average	0.46	May-Sept Average	0.25	May-Sept Average	0.34	May-Sept Average	0.37
2-May-94	0.12	4-May-94	0.58	5-May-99	0.30	6-May-94	0.44	6-May-94	0.37
12-May-95	0.16	15-May-95	0.23	18-May-99	0.31	18-May-95	0.38	19-May-95	0.26
7-Jun-95	0.18	15-Jun-95	0.40	10-Jun-99	0.32	14-Jun-95	0.36	14-Jun-95	0.37
7-Jun-95	0.16	17-Aug-95	0.33	22-Jun-99	0.39	16-Aug-95	0.20	16-Aug-95	0.35
14-Aug-95	0.23	14-May-96	0.93	7-Jul-99	0.31	16-May-96	0.41	17-May-96	0.46
13-May-96	0.19	12-Jun-96	0.72	21-Jul-99	0.34	10-Jun-96	0.35	10-Jun-96	0.41
11-Jun-96	0.29	20-Aug-96	0.40	11-Aug-99	0.26	20-Aug-96	0.19	21-Aug-96	0.28
19-Aug-96	0.24	16-Jul-97	0.45	31-Aug-99	0.32	18-Jun-97	0.18	18-Jun-97	0.36
10-Jun-97	0.09	13-Aug-97	0.30	15-Sep-99	0.26	15-Jul-97	0.54	16-Jul-97	0.39
5-May-99	0.10	12-May-98	0.29	28-Sep-99	0.22	12-Aug-97	0.15	12-Aug-97	0.41
18-May-99	0.12	19-Aug-98	0.37	18-May-00	0.26	13-May-98	0.16	14-May-98	0.28
10-Jun-99	0.10	10-May-99	0.43	18-May-00	0.20	18-Aug-98	0.27	19-Aug-98	0.36
22-Jun-99	0.29	9-Jun-99	0.46	27-Aug-01	0.20	4-May-99	0.34	4-May-99	0.42
7-Jul-99	0.22	23-Jun-99	0.84	28-Aug-01	0.24	19-May-99	0.71	19-May-99	0.45
21-Jul-99	0.31	6-Jul-99	0.76	5-May-99	0.18	9-Jun-99	0.28	9-Jun-99	0.36
4-Aug-99	0.27	21-Jul-99	0.54	18-May-99	0.20	21-Jun-99	0.48	21-Jun-99	0.46
30-Aug-99	0.17	12-Aug-99	0.28	10-Jun-99	0.17	6-Jul-99	0.56	6-Jul-99	0.38
15-Sep-99	0.14	2-Sep-99	0.24	22-Jun-99	0.20	19-Jul-99	0.58	5-Aug-99	0.44
28-Sep-99	0.15	16-Sep-99	0.25	7-Jul-99	0.27	5-Aug-99	0.42	1-Sep-99	0.29
18-May-00	0.15	27-Sep-99	0.22	21-Jul-99	0.24	1-Sep-99	0.16	13-Sep-99	0.31
27-Aug-01	0.18	17-May-00	0.44	11-Aug-99	0.17	13-Sep-99	0.15	27-Sep-99	0.29
		15-Jun-00	0.58	31-Aug-99	0.21	27-Sep-99	0.15	17-May-00	0.40
		2-May-01	0.63	15-Sep-99	0.18			30-Aug-01	0.36
		18-May-01	0.55						
		31-May-01	0.56						
		6-Jun-01	0.41						
		14-Jun-01	0.34						
		18-Jul-01	0.43						
		28-Aug-01	0.35						
		19-Sep-01	0.37						

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Appendix E: EPA Comments on the DEQ Proposed De-listing of the Lower Boise River for Nutrients

EPA Comments on the DEQ Proposed De-listing of the Lower Boise River for Nutrients

DEQ has proposed de-list the Lower Boise River from Middleton to the mouth for nutrients (total phosphorus). DEQ contends that the Lower Boise River is no longer impaired by nutrients. However, data indicate that nutrients in the Lower Boise impair beneficial use support in the River, contribute to the impairment of the beneficial uses of the Snake River and Brownlee Reservoir and exceed EPA criteria recommendations for nutrients. EPA has reviewed DEQ's documentation and justification for de-listing and finds that the existing and readily available information is not consistent with this conclusion and instead recommends that the Lower Boise should remain 303(d) listed for nutrients.

Response: DEQ will be responding to EPA's assertion that nutrients impair beneficial use support in the River on a point by point basis in the text below. We note that contribution to impairment in downstream reaches is not a basis for listing. We also note that DEQ is not bound by EPA criteria recommendations for nutrients.

In considering DEQ's de-listing rationale, EPA reviewed Idaho's water quality standards that address nutrients. Idaho Administrative Code (IDAPA 58.01.02-200.05, 06, 07) outlines the following water quality criteria that pertain to nutrients:

05. Floating, Suspended or Submerged Matter. Surface waters of the state shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of nonpoint source activities. (8-24-94)
06. Excess Nutrients. Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. (8-24-94)
07. Oxygen-Demanding Materials. Surface waters of the state shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition. (7-1-93)

Many states have narrative criteria for nutrients that must be interpreted to determine if beneficial uses are supported. While Idaho has not developed specific guidance to interpret their criteria, they have developed the River Macroinvertebrate Index (IDEQ, 2002) and use other parameters (DO, chlorophyll a, etc) and the narrative criteria above, to determine if nutrient problems are impairing beneficial use support.

Response: *The narrative standard is interpreted as indicating that if the designated and existing beneficial uses are not impaired by the effects of excessive nutrients in the water body, nutrients are not exceeding the narrative water quality standard (IDEQ 2001).*

Various nuisance thresholds have been established by different studies. However, no thresholds have been proposed in relation to the adverse impacts to aquatic life. Impacts to aquatic life are generally based on DO and pH problems and the reduction of living space for aquatic organisms due to excessive algal biomass.
In August 1997, the USGS took hourly DO measurements over 24 hour periods at 5 sites (Eckert, Glenwood, Middleton, Caldwell and Parma). Normal diurnal DO patterns were observed but concentrations never dropped below the criteria. No DO measurements less than 6.0 mg/L have been recorded from Lucky Peak to the mouth of the river from 1986 to 1999 (by USGS). The City of Boise

submitted diurnal dissolved oxygen data to IDEQ during the listing process. Dissolved oxygen data was collected at two sites, Glenwood and Linder bridges (both below the wastewater treatment plants), in 15 minute intervals July 2004 through 2007. Dissolved oxygen (mg/L) never dropped below 6.0 mg/L. 0.08% and 1.34% of the dissolved oxygen percent saturation values were below 75% saturation at Glenwood and Linder monitoring sites, respectively.

The relationship between Lower Boise River channel hydraulics, nutrients, and periphyton growth was examined in the Lower Boise River Nutrient Subbasin Assessment (IDEQ 2001). Results indicated that during the irrigation season (April to October) when conditions are most suitable for periphyton growth, velocities in the Lower Boise River are higher than the scour threshold, even in low flow years. The absence of nuisance levels of periphyton indicates that the macroinvertebrates have ample living space and that the intergravel flows are not impeded. Hydraulic conditions in the Lower Boise River mitigate for nutrient enriched conditions. In addition, DEQ complaint logs (1997-2000) indicated no complaints of nuisance growth. Irrigation companies and other water users did not report algal impediment at river withdrawal locations during the same time period. Recreational and aesthetics beneficial uses are not impaired by algae.

EPA has developed *Ambient Water Quality Criteria Recommendations* (EPA 822-B-0006) that present nutrient criteria for rivers and streams in Nutrient Ecoregion III (the Ecoregion which includes the Lower Boise). The recommendations are that for minimally impacted rivers and streams in Ecoregion III, the reference condition which is protective of designated uses and allows management flexibility is 0.010-0.055 mg/l total phosphate phosphorus. More specifically, reference conditions for Level III, Ecoregion 12 streams for total phosphorus are stated at 0.043 mg/l. The seasonal average concentration in the Lower Boise for the irrigation season currently is given to be 0.296 mg/l. This is far above the reference condition.

Response: State Water Quality Standards include narrative criteria for nutrients. It is also unrealistic to expect reference conditions (Lochsa, St. Joe and MF Salmon Rivers) to exist in the flow and habitat conditions that exist in the Boise River. The reference conditions for the Level III Ecoregion have no force of law.

As an indicator of nuisance aquatic growth, several sources suggest that periphyton chlorophyll *a* values of 100 -200 mg/m^2 constitute a nuisance threshold, above which aesthetics are impaired (Horner and others, 1983; Watson and Gestring, 1996; Welch and others, 1988; Welch and others, 1989). In September 1999 IDEQ established the Boise River TMDL for sediment and bacteria. The TMDL also included discussion of nutrients, and on page 46, Figure 21 is a graph showing 33 chlorophyll a data points for five locations on the Lower Boise River. Fifteen of the measurements from Caldwell, Middleton and Glenwood Bridge are above 200 mg/m^2 with a maximum measurement of >900 mg/m^2. These measurements were collected from 1995 to 1997. On page 48 the document states the following:

> "The available data do not show major impairment of beneficial uses due to nutrients and associated nuisance aquatic growths. High nutrient concentrations and periphytic algae levels above suggested nuisance thresholds together imply that nutrients are a potential threat to aquatic life and recreational uses."

On page 45, the document states the following:

> "It is also possible that high sediment concentrations in the river below Caldwell are preventing algae growth by limiting the amount of light that penetrates the water column. If sediment concentrations in the summer are reduced, algae growth in the reach of the river below Caldwell may increase."

Response: This is purely speculation by the author and is strictly hypothetical in nature. When sediment concentrations decrease in the lower river, appropriate measures will needed at that time.

This question has been addressed for both phytoplankton and periphyton growth in the Lower Boise River and was included in the Lower Boise River Nutrient Subbasin Assessment (IDEQ 2001).

Chen and Wells (1975) and CH2M Hill (2001) modeled phytoplankton conditions in the Lower Boise River; both concluded that if TSS in the river was reduced by 50%, algae growth would not increase more than 10%. Both studies support the conclusion that it is unlikely that sediment reductions of 37% (50 mg/L TSS target) would lead to nuisance phytoplankton growth in the lower segments of the river.

Suspended chlorophyll a samples were collected in the Boise River (Diversion, Glenwood, Middleton and Parma) from 1995-2007. Only 4 of the measured values exceeded 40 ug/L and only 14 samples in a 12 year period exceeded 25 ug/L.

Hydraulic conditions in the Lower Boise River mitigate for nutrient enriched conditions and limit periphyton growth (see earlier response)

As mentioned above, nutrients from the Boise River also contribute to the impairment of the beneficial uses of the Snake River and Brownlee Reservoir. Sampling conducted by the Idaho Power Company indicates that significant planktonic algae occur in the Snake River just downstream from the mouth of the Boise River during the months of March through October (IDEQ, 1999). Also, the Snake River Hells Canyon phosphorus TMDL establishes a target (allocation) for the Lower Boise River at 0.070 mg/l or less during the May-September timeframe. As noted above, the seasonal average concentration at the mouth of the Lower Boise for the irrigation season currently is 0.296 mg/l, far above both the Ecoregion reference condition and the TMDL target.

Response: DEQ has drafted an Implementation Plan which includes phosphorus allocations for the river to address nutrient impairment in SRHC.

It has been acknowledged that although nutrients are not impairing beneficial uses in the Boise River, they are contributing to the impairment of beneficial uses in the Snake River and Brownlee Reservoir. The Lower Boise River received a phosphorus allocation in the Snake River-Hells Canyon TMDL.

In the Boise River TMDL (1999), DEQ evaluated macroinvertebrate data available from the USGS for five sites sampled in October of 1995 and 1996. The macroinvertebrate data indicated that the Boise River had degraded conditions from Eckert Road to its mouth. Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa richness is a traditional metric that consistently has been used to detect impacts to macroinvertebrate assemblages in rivers and streams. In the Lower Boise, a limited number of EPT taxa were found at all sites indicating that the macroinvertebrate assemblage was in poor condition. In addition, there were other metrics (i.e. Plecoptera taxa richness, % predators, etc.) that also indicated poor biological condition.

Since the time of the TMDL, USGS has continued to monitor water quality and biological conditions in the Lower Boise River (MacCoy, 2004). Macroinvertebrates were collected at five sites in the Lower Boise from 1995 to 2002. The average number of EPT taxa in the Lower Boise was less than half the average number at four least-impacted, similar-sized rivers in Idaho. USGS calculated the RMI (River Macroinvertebrate Index, developed by DEQ in 2002) scores for the Lower Boise and most scores indicated poor water quality and impaired biotic integrity. In addition, USGS used a fine-sediment index to evaluate the effect of fine sediment on insect populations (Relyea et al, 2000). This index, the Fine Sediment Biotic Index (FSBI), indicated fine sediments impacted macroinvertebrates in the Lower Boise.

Response: The lower Boise River is a highly regulated flow and habitat altered system (three large dams above and approximately eighty diversions). There is little to no gravel recruitment and thus little suitable habitat. The lack of suitable macroinvertebrate taxa is attributed to this reality in the upper reaches and due to increased sediment loading in the lower reaches. There is no mention of nutrients contributing to the low scores in the macroinvertebrate index in the USGS report. Your last sentence of the above paragraph is a correct interpretation of the USGS report. There is also an approved TMDL for sediment.

Macroinvertebrate assemblages are monitored in rivers because they are a direct measure of the aquatic life uses. Another reason that they are used in monitoring is because macroinvertebrates integrate the effects of multiple environmental factors such as water quality, substrate quality, and habitat. In both the TMDL and in more recent USGS studies, it is clear that the macroinvertebrate assemblages in the Lower Boise River are in poor condition. The more recent USGS study shows that fine sediments impact macroinvertebrates in the Lower Boise River; however this does not mean that fine sediment is the sole stressor. The macroinvertebrates are also exposed to increased temperatures, altered flow regimes, increased phosphorus and other anthropogenic environmental factors. The cumulative and synergistic effects of these pollutants in the Lower Boise may exceed the tolerance levels of many of these taxa.

Response: There is no mention of nutrients contributing to the decreased habitat for macroinvertebrates in the USGS report. There is also an approved TMDL for sediment.

In summary, EPA believes the Lower Boise is impaired for nutrients because periphyton levels are well above nuisance thresholds in the literature, phosphorus concentrations are well above EPA recommended nutrient levels and upstream background levels at Lucky Peak, and above targets set to achieve water quality standards in downstream waters (per Snake River Hells Canyon TMDL). We also believe it is very likely that excess sediment in the lower river masks additional effects of high nutrient concentrations. If the existing sediment TMDL were to be fully implemented and nutrient concentrations are not reduced, the nutrient impairment would become even worse since increased light penetration to the bottom sediments of the river would promote vegetation growth given the presence of high nutrient concentrations. Based on the data and information presented, EPA recommends that the Lower Boise remain 303(d) list for nutrients.

Response: Again, this is speculative and not a basis for the lower Boise River to remain on the list for nutrients. DEQ based its opinion to delist nutrients on diel DO data collected by the USGS in August 1997. It is our opinion that this data is a better indication that nutrients are not impairing the river.

General response and additional comments:

The following are excerpts from the U.S. GEOLOGICAL SURVEY
Scientific Investigations Report 2006-5111, Fish Communities and Related Environmental Conditions of the Lower Boise River, Southwestern Idaho, 1974-2004

Within the last century, the lower Boise River downstream of Lucky Peak Dam in southwestern Idaho has been transformed from a meandering, braided, gravel-bed river that supported large runs of salmon to a channelized, regulated, urban river that provides flood control and irrigation water…

> *Examination of the long-term flow record from the Boise River near Boise gauging station (USGS station 13202000) just downstream of Lucky Peak Dam shows a change in the magnitude and variability of seasonal flow following dam construction. Median mean monthly discharge for December and August prior to 1915 were about 1,090 and 1,200 ft^3/s, respectively, with standard deviations near 460 ft^3/s. In comparison, median discharge after dam construction (post-1957) for December and August were 350 and 4,020 ft^3/s, respectively, with standard deviations of 350 and 640 ft^3/s, respectively (U.S. Geological Survey National Water Information System Web site, accessed August 30, 2005, at http://nwis.waterdata.usgs.gov/id/nwis/qwdata). In fact, the flow regime in 2002 is opposite of pre-dam flows in December and August. The mean December post-dam flows are significantly lower than those in pre-dam years ($P<0.001$, Wilcoxon rank sum test with $\alpha=0.05$); and the mean August post-dam flows are significantly higher ($P<0.001$, Wilcoxon rank sum test with $\alpha=0.05$) than those recorded during pre-dam years.*
>
> *Little information is available on the effect of flow alteration on the lower Boise River fishery, although most of the lower Boise River fish investigations have indicated that low winter flows were the reason for the decrease in the fish community (Idaho Department of Fish and Game, 1975; 1988; 2000; Mullins, 1999a). Altering the flow regime affects not only the fish community, but the entire aquatic environment. Several studies have shown that altering the natural river flow regime affects fish community biodiversity, food availability, habitat complexity, life history patterns, and connectivity (the ability of an organism to move freely through the stream hierarchy) (Ward and Stanford, 1983; Collier and others, 1996; Poff and others, 1997; Bunn and Arthington, 2002; Postel and Richter, 2003).*

The lack of higher flows to recruit and move gravel for riffle habitat and to mobilize fine sediment has caused embeddedness throughout the river that measures between 50 and 75 percent.

IBI scores for all sites were negatively correlated with maximum instantaneous water temperature, specific conductance, and suspended sediment; as well as the basin land-use metrics of area of developed land, impervious surface area, and number of major diversions within a subbasin.

It is this body of evidence that leads DEQ to believe that the lower Boise River is not impaired by nutrients.

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Appendix F: Unit Conversion Chart

Table 37. Metric - English unit conversions

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft^2) Square Miles (mi^2)	Hectares (ha) Square Meters (m^2) Square Kilometers (km^2)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft^2 = 0.09 m^2 1 m^2 = 10.76 ft^2 1 mi^2 = 2.59 km^2 1 km^2 = 0.39 mi^2	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft^2 = 0.28 m^2 3 m^2 = 32.29 ft^2 3 mi^2 = 7.77 km^2 3 km^2 = 1.16 mi^2
Volume	Gallons (gal) Cubic Feet (ft^3)	Liters (L) Cubic Meters (m^3)	1 gal = 3.78 L 1 L= 0.26 gal 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 gal = 11.35 L 3 L = 0.79 gal 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (cfs)[a]	Cubic Meters per Second (m^3/sec)	1 cfs = 0.03 m^3/sec 1 m^3/sec = 35.31cfs	3 ft^3/sec = 0.09 m^3/sec 3 m^3/sec = 105.94 ft^3/sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/L)	1 ppm = 1 mg/L[b]	3 ppm = 3 mg/L
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 lb
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 °C = 37.4 °F

[a] 1 cfs = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 cfs.
[b] The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water.

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Appendix G: Public Comments

Comments From: Lee Van De Bogart, City of Caldwell	**Response**
Dear Mr. Shepard, The City of Caldwell is pleased to submit comments on the draft "Lower Boise River Implementation Plan, Total Phosphorus" (Plan). The Plan contains allocations to point and nonpoint sources that will result in the Lower Boise River watershed meeting the allocations assigned to the Boise River in the Snake River Hells Canyon (SR-HC) TMDL. The City strongly encourages adoption of the Plan. The Lower Boise Watershed Council LBWC has done an excellent job of looking at all aspects of the Phosphorus problem. The Plan takes in the effects of agriculture and is able to reach its goal in 70 years as required in SR-HC TMDL. If the cities were to spend hundreds of millions of dollars on upgrading their municipal wastewater plants and millions of dollars annually on chemical cost to lower Phosphorus levels to 0.07 mg/L it would still take about 60 years to reach the goal do to the impact of agriculture. (See page xviii Table C. Long-term Prediction of a seasonal Average of 0.07 mg/L. Set the WWTF load to zero and add up Stormwater, Agriculture, Background, and Groundwater the first year the Parma load is under 200 Kg/day is over 55 years.) Therefore there is insignificant environmental improvement and enormous cost to a lower Phosphorus limit below that proposed by the Plan. The City had made substantial investment in existing infrastructure and looks forward to continuing to do our fair share in efficiently meeting the Boise River allocations in a costly and environmentally effective manner.	Thank you for your comments.
Comments From: Robbin Finch, City of Boise Public Works	
The City of Boise is pleased to submit comments on the draft "Lower Boise River Implementation Plan, Total Phosphorus" (Plan). The Plan contains allocations to point and nonpoint sources that will result in the Lower Boise River watershed meeting the allocations assigned to the Boise River in the Snake River Hells Canyon (SR-HC) TMDL. The City strongly encourages adoption of the Plan with minor changes as recommended in the attached comments. The municipal wastewater allocations contained in the Plan will result in a 97% reduction within three permit cycles. The level and speed of the reductions represent a significant financial and technical commitment. The Plan also requires some effort from non-point sources for the watershed to meet SR-HC allocations. The municipal wastewater	Thank you for your comments.

allocations effectively "front end load" the reductions needed by anticipated future growth by requiring implementation now (e.g. facilities capable of meeting future growth discharge limits within 10-15 years). These municipal wastewater allocations will result in significant water quality improvement. The City is supportive of the allocations and other key components of the Plan, including Boise and Snake River monitoring, adaptive implementation process required by State law, and trading being available as a tool to minimize the cost of implementation within the Boise and Snake River watersheds. The City had made substantial investment in existing infrastructure and staff to protect surface water quality and looks forward to continued investment to do our fair share and provide leadership in efficiently meeting the Boise River allocations in a sustainable manner. In closing, we would like to acknowledge the diligence and hard work which IDEQ staff and management have contributed to the draft implementation plan. We sincerely appreciate all the time and effort, and look forward to finalizing the plan. Should you have any questions on the attached comments, please feel free to contact me at 384.3916. **General Comments:** 1. Excellent Effort and Work Product by IDEQ and the LBWC in producing the "Lower Boise River Implementation Plan Total Phosphorus" (Plan). 2. Special thanks are due to IDEQ staff and management and the Lower Boise Watershed Council (LBWC) and facilitators who have been working so long and hard on the draft Implementation Plan, the earlier allocation documents, and the associated issues. 3. The Plan satisfies State and Federal Clean Water Act Requirements. The Plan has been developed to and satisfies federal and state Clean Water Act responsibilities. The allocations, adaptive management, monitoring and trading concepts included in the Snake River-Hells Canyon (SR-HC) TMDL are included in this framework and provide both a significant step forward and the on-going management tools (e.g. monitoring, adaptive implementation) to meet Lower Boise watershed responsibilities for phosphorus contained in the SR-HC TMDL. We strongly support adoption of the Plan with modifications as recommended below. **Specific Comments**	
1. page xv, paragraph 2, first sentence; p 3, section 1.3 Target Interpretation, p 33 5.0 Allocation, and throughout the document; SR-HC Target Replace paragraph 2 with: To reduce "nuisance" algal growth in the Snake River upstream from Brownlee	Page xv and page 1, We have added language concerning chlorophyll *a* taken directly from the Snake River Hells Canyon TMDL. The seasonal average text has been changed.

Reservoir, the SR-HC TMDL establishes a seasonal, May 1 to September 30, in-stream seasonal average chlorophyll a target of 14 ug/l with a maximum chlorophyll a concentration of 30 ug/L. To attain this target, the SR-HC TMDL established 70 ug/l TP seasonal in-stream target and tributary allocations to meet the target (70 ug/l total phosphorus concentration multiplied by a seasonal average flow). There is uncertainty about the relationship between chlorophyll a and total phosphorus, and it is possible that the chlorophyll a target will be attained at a different (higher or lower) total phosphorus concentrations. Ultimately, the SR-HC target is the attainment of the chlorophyll a target and associated beneficial uses. Rationale: The target contained in SR-HC TMDL for nutrients is seasonal mean chlorophyll a and a conservative estimate of the associated seasonal phosphorus concentration (70 ug/l) necessary to meet the target (SR-HC TMDL, IDEQIODEQ, 2004, see Section 3.2.8.4 and 3.2.8.5). The chlorophyll a target may be met and uses attained at seasonal phosphorus concentrations that are higher or lower than 70 ug/l. The adaptive implementation process described in SR-HC TMDL and state rules will provide opportunities to revise and fine tune the approach to meet water quality standards through the implementation period. For example, IDEQ recently published and EPA approved the 2006 SR-King Hill to CJ Strike TMDL, which documents attainment of the seasonal average chlorophyll a target at King Hill at seasonal average TP concentrations of 111, 84 and 76 ug/l Total Phosphorus (TP) in 1997, 1998, and 2001 respectively (see Table 19 and Figure 31 in the SR-King Hill to CJ TMDL). **2**. page xv; paragraph 2, last sentence, Annual Tributary Loading The Snake River Hells Canyon (SR-HC) TMDL provides seasonal phosphorus allocations to tributaries (Table 4.0.9, p 447). Delete "annual" and replace with "seasonal".	
3. page xvii, Stormwater is a point source with a total phosphorus treatment goal. Replace with: Stormwater is a "point source" that is provided waste load allocations within MS4 regulated areas based on a phosphorus treatment goal of 50% reduction (see Appendix B, Attachment 1, first paragraph). page xvii, replace the second bullet with the following: A TP treatment goal of 50% reduction will be implemented by stormwater dischargers and applied to new development and significant redevelopment. The TP treatment goal of 50% reduction would be accomplished through onsite stormwater facilities,	Page xvii, The bullet item concerning stormwater has been modified.

public education, and increased maintenance. page 12, Section 3.3, replace the fist paragraph with the following: A TP treatment goal of 50% reduction will be implemented by stormwater dischargers and applied to new development and significant redevelopment. The TP treatment goal of 50% reduction for stormwater would be accomplished through onsite stormwater facilities, public education, and increased maintenance.	
4. page xx, paragraph 2, sentence 2: "all feasible steps" to attain highest water quality. Recommend striking the second sentence or revising it to be consistent with state and federal rules and regulations. (e.g. achieve the highest attainable use through implementation of point and nonpoint source control programs) The Federal Clean Water Act objective is to "restore and maintain the chemical, physical, and biological integrity of the Nation's Waters." (Section 101(a). Sections 101(a) and 303(c) of the act set out the "purposes of the Act" which means that water quality standards should: "wherever possible, achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water, and take into consideration the use and value of public water supplies, and agricultural, industrial, and other purposes." Uses are set by states and approved by EPA based on suitability of a water body (e.g. physical, chemical, biological characteristics), geographic setting, scenic qualities and socio-economic and cultural characteristics of the surrounding area. States must designate the highest achievable use. If uses are not attainable, documentation that at least one of the six 40CFR131.10 (g) factors is required. The Act requires that water quality will be protected through implementation of both point and nonpoint source actions. "(7) it is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of point **and nonpoint** sources of pollution."(CWA Section 101(a) (7)). For point sources, the Act requires implementation of the more stringent of either a technology based or water quality based approach to meet water quality standards (use and criteria to support the use). If uses are unattainable, the Act and implementing regulations provide for short (e.g. variances) or long term (e.g. Use Attainability Analyses) measures and processes for states to adopt the appropriate and attainable use(s). Neither the Act nor state water quality standards and regulations require "all feasible	Page xx, This sentence has been modified.

steps" to attain the highest water quality. For example, Idaho's nonpoint source control programs are precluded by rule from being required to implement Best Management Practices other than on a voluntary basis. (see IDAPA 58.01.02.054.04 and 05). **5**. page xx, Low Flow Analysis, Table D; p 38 l0th % Flow Loads/Target Achievability a. Change 90th % to l0th % at the identified locations and throughout the document (e.g. p xx, p 38...). Nomenclature: 90th % refers to high flow condition, not low flow. 10th% flows are what are described in the Implementation Plan (see USGS flow info at **http://~ater.usgs.gov/waterwatch/?m=nwc&w=ma** b. The document includes a low flow analysis (l0th% daily Parma flow) i. Seasonal 10% Flow: The allocation requirement for tributaries is seasonal, May- September. The seasonal l0th% daily flow (May - Sept) for the period 1982 to present should be used because operations of the three reservoirs from 1955 to 1981 were different than post 1982. The 10% flow for the 1982 to 2006 period of record is approximately 379 cfs. ii. Delete paragraph 5, Table Dl and paragraph 6, replace with discussion of SR-HC low flow and Table 6 in the Implementation Plan Table D uses median flow relative contributions (RC) or location ratios and low flows, which results in a significant over estimate of the loads reaching Parma. During extreme low flow conditions, RCs change significantly because more of the water is reused. River flow and irrigation diversion data show that for Boise WWTF discharges, only 3-5% of the water discharged makes it to Parma during low flow years compared to about 50% during median flow years. The preferred alternative to the location ratio/mass balance analysis is to reiterate the low flow discussion from SR-HC TMDL regarding nutrients (see SR-HC TMDL at 3.2.9 Reductions Necessary to Meet Nutrient Targets) and Table 6 of this document which shows that during median flows a 79% reduction is needed and during moderately low and extreme low flows only slightly greater % reductions are required (e.g. 1-2%). Proposed replacement language: The specific level of reduction realized by attainment of the concentration based target is dependent on the type of water year and the tributary. Setting a concentration-based target means that in high flows, the loading delivered at the target value will be greater than the load delivered at the target value during medium or low flow years. Low and average	 Page xx Low Flow Analysis, We have deleted the table and modified the text accordingly. We agree that the SRHC TMDL was based on median flows and that for consistency, the lower Boise River should use median flows for management decisions. However, this information is provided to show that the target established at the mouth of the Boise River in the SRHC TMDL cannot be met at certain low flow scenarios just as would be the case of the Snake River at low flows.

flow years may show a larger relative percentage reduction in nutrient loading by meeting the 14 ug/L mean growing season chlorophyll a concentration and 0.07 mg/L total phosphorus targets as loading is based on instream flow (load = flow x concentration). For the Lower Boise River, concentration reductions under varying flows have been calculated and are contained in Table 6. The percent concentration reductions required are 73%, 79%, and 80% for high, median, and low flow conditions respectively. The Lower Boise River Implementation Plan allocations when fully implemented, are projected to result in an 81% load reduction and therefore will meet the SR-HC TMDL required concentration targets under all flow conditions.	
6. page 37, Section 5.2 Load Capacity; Delete Tables 7, 8, and 9, and associated text; Replace with text describing the seasonal load capacity (seasonal flow x seasonal concentration) The allocation to the all of the tributaries, including the Boise River, and the upstream Snake River in the SR-HC TMDL was for a median year and was calculated based on seasonal flow and a concentration of total phosphorus of 70 ug/l. Add new sentence to the second paragraph below Table 9 that says: The Lower Boise Total Phosphorus target is 70 ug/l on a seasonal basis.	Page 37, Same response as Page xx, Low Flow Analysis.
7. page 43, Section 5.4 Allocation Approach, second sentence and citations a. Replace the second sentence with: "It is contained as Appendix I of the EPA-approved SR-HC TMDL (IDEQJODEQ, 2004)." b. The reference list is missing the citations for "EPA, 1991" and "ODEQ, 2001" They are: EPA, 1991, Guidance for water quality based decisions: the TMDL process ODEQ, 2001, June 26, 2001, pre-draft TMDL rule, 340-042-001, Procedures for determining, issuing, and implementing TMDLs, 5 p.	Page 43, We have made these modifications.
8. page 44, Section 5.4 last paragraph The second to last sentence in the last paragraph should be modified to read: Given the complexity of the watershed and existing and future conditions, we believe that the SR-HC TMDL targets can be met.	Page 44, We have added clarifying language.
9. page 45-47, Point Source Wasteload Allocations: The document would benefit from new text and a table that identifies the wastewater point source allocations associated with the three treatment steps to clarify allocations the state is providing to WWTFs. EPA recently issued guidance for the translation of annual or seasonal allocations to monthly and weekly NPDES permit limits for	Page 45-47, Point Source Wasteload Allocations, DEQ feels the information provided in the document concerning point source wasteload allocations is sufficient.

WWTFs (EPA, 2007, *Options for Expressing Daily Loads in TMDLs* http://www.epa.nov/owow/tmdl/draft daily loads tech.pdf. The following daily wasteload allocations and associated monthly and weekly permit limits were calculated using the new EPA guidance and are recommended for inclusion in the document. **Daily Wasteload Allocations and Weekly and Monthly Permit Limits Needed to Meet Seasonal (May-Sept) Total Phosphorus Target Daily Wasteload Allocations and Total Phosphorus Permit Limits Needed to Meet** DWLA = Daily expression of seasonal Wasteload Allocation AWL = Average Weekly Limit (equal to 1.5 times the AML) AML. = Average Monthly Limit (CV= 0.6, sample n = 4/week) **Seasonal TP Target** **10**. Stormwater Construction and Other Industrial Waste Load Allocations **1,000 ug/L** **DWLA l AWL 1 AML** Bring the discussion on the Multi-Sector General Permit (MSGP) and Construction General Permit (CGP) waste load allocations (WLAs) stated in Appendix B into Section 5 & clarify that the Municipal Separate Storm Sewer System (MS4) WLAs include both construction site activities and MSGP discharges, and outside of MS4 impacted areas, that agriculture LAs also includes both construction site activities and MSGP discharges. **500 ug/L** **DWLA l AWL l AML** **200 ug/L** **DWLA l AWL l AML**	
Page 48, Section 5, replace the last paragraph with the following two paragraphs: Municipal Separate Storm Sewer Systems (MS4) waste load allocations (WLAs) include both Construction General Permit (CGP) and industrial Multi-Section General Permit (MSGP) discharges. Within MS4 regulated areas construction site discharges that are consistent with MS4 NPDES permit requirements and the CGP NPDES permit requirements are included in the to total MS4 WLAs. Current and future industrial stormwater WLAs (i.e., MSGP) within MS4 regulated areas are established at the same mass per acre WLAs as the MS4 WLAs. Outside of MS4 regulated areas, CGP and MSGP discharges that comply with local requirements and with the general permits are included in the total agriculture load allocations (LAs).	Page 48, We have added language similar to your comment.
Page 91, Section B.6.1, replace the first paragraph with the following two paragraphs:	Page 91, We have added language similar to your comment.

Municipal Separate Storm Sewer Systems (MS4) waste load allocations (WLAs) include both Construction General Permit (CGP) and industrial Multi-Section General Permit (MSGP) discharges. Within MS4 regulated areas construction site discharges that are consistent with MS4 NPDES permit requirements and the CGP NPDES permit requirements are included in the to total MS4 WLAs. Current and future industrial stormwater WLAs (i.e., MSGP) within MS4 regulated areas are established at the same mass per acre WLAs as the MS4 WLAs. Outside of MS4 regulated areas, CGP and MSGP discharges that comply with local requirements and with the general permits are included in the total agriculture load allocations (LAs).	
11. page 55, Section 6.0 Implementation Strategies, Delete first paragraph. The 242 kg/d allocation provided to the Lower Boise River in SR-HC TMDL (see Table 4.0.9) is a seasonal average flow times the target concentration, which can be met at all flow conditions as demonstrated by the varying flow analysis and Tables C, 9, and 17 in the document. **12**. page 56, Table 20 Table 20 should be modified to provide three permit cycles for each of the existing wastewater treatment facilities to be consistent with the allocations provided to IDEQ by the municipal workgroup and adopted by the Lower Boise Watershed Council, . , Rationale: The SR-HC TMDL provides for phased implementation to be able to better understand sources, loads, targets, and other factors that influence attainment of beneficial uses. Within the first permit cycle, WWTFs will achieve at least 83% of the total reduction goal for all three permit cycles. Keeping all WWTFs on the same schedule allows monitoring and modeling of the associated load and concentrations reductions to inform the adaptive implementation process and ensure we are on track to meet watershed based goals or provide information that allows us to modify the approach based on better information. Individual facilities may be able to accomplish each permit cycles goals more quickly depending on site specific conditions.	Page 55, We agree that the SRHC TMDL was based on median flows and that for consistency, the lower Boise River should use median flows for management decisions. However, the target established at the mouth of the Boise River in the SRHC TMDL is less than or equal to 0.07 mg/L total phosphorus and cannot be met at certain low flow scenarios just as would be the case of the Snake River at low flows. The Adaptive management Plan has been developed for this reason to measure success toward meeting the target. Page 56, We have deleted Table 20 and added language concerning the three permit cycles for achieving compliance.
13. Relative Contributions (RC) Only one RC is provided, more recent work shows RCs are lower in median Q and significantly lower in low Q conditions. Accurate RCs are necessary to correctly estimate loads at various flows reaching Parma and the effectiveness of various control actions or that new/additional control actions are needed. Additional text providing for the variability of RCs with flow and for updating of the RCs as better information becomes available should be added to	Relative Contributions, We have added a caveat concerning different flow regimes and relative contributions.

the text.	
14. Section 6: Trading Text Needs to be added to the Implementation Plan The August 2007 Lower Boise River TP Allocation document included an entire section concerning trading. Lower Boise stakeholders, EPA, and IDEQ have all expended a significant amount of energy in developing the Lower Boise River Trading framework. We recommend including the trading text from the August 2007 document in its entirety.	Section 6, Trading, Trading language has been added.
15. Lower Boise Watershed Complexity The mass balance analysis cited in the draft Implementation Plan stipulates seasonal phosphorus loads as meeting SR-HC TMDL load allocations (with WWTFs achieving 0.2 mg/L after 15 years). It is probable that this mass balance model did not fully account for known fate and transport characteristics of phosphorus in the LBR. Influential characteristics include catchment size, dampening effects that the complex water routing in the Lower Boise River watershed has on retention of phosphorus spikes, and increased summer nutrient retention (spiraling). Such characteristics were recognized previously regarding: 1) development of the LBR trading program (e.g., Parma pounds); 2) water quality studies by MacCoy (2004); and, 3) the SR-HC TMDL references to adaptive management (pages 22/24 and 454). These Lower Boise River fate and transport issues are highly relevant for supporting the Implementation Plan proposed WWTF compliance schedule. They also provide justification for expecting full compliance with the SR-HC TMDL using the adaptive management process.	Lower Boise River Watershed Complexity, DEQ agrees that the watershed is complex and that relative contributions are relevant.
Minor Comments:	
1. page xviii, Table C, first footnote, replace "Increases in stormwater loads due to land use conversion that is expect to add suburban acreage." With "Stormwater allocations include current and future wet weather loads, summer (May-September) dry weather loads (e.g. agricultural irrigation), and ground water infiltration into the MS4 system."	Minor Comments: Page xviii, For the purpose of the table, the existing language is adequate.
2. page 7, paragraph 1, last sentence: replace "plans" with "proposed"	Page 7, We have made this modification.
3. page 7, section 2.1, paragraph 1, Nutrient Listing Status Add additional text describing more recent data and analysis IDEQ has done and included in the 2008 Integrated Report regarding the nutrient listing status of the Lower Boise River.	Page 7, Nutrient Listing Status, We have added an Appendix with the EPA comments on the 303(d) list, along with our responses.
4. page 9, section 3.1, paragraph 1: Relative Contributions Delete "1996", the correct citation is "Ross and Associates, 2000".	Page 9, We have made this modification.
5. page 11, section 3.2, paragraph 1, Sentence 2: Replace "are expected to" with "may"	Page 11, We have made this modification.

6. page 12, Section 3.3, to be consistent with Appendix B, replace the second paragraph with: Table 3 summarizes estimated stormwater flows and applied concentrations for both existing and future MS4 areas. Stormwater point source allocations are composed of: MS4 wet weather annual loads MS4 dry weather load from agricultural irrigation, and groundwater infiltration into the MS4 system. Increases in municipal stormwater loads due to land use conversion are expected as urban-suburban acreage increases and from increases in groundwater infiltration into the MS4 system and dry weather loads from agricultural irrigation sources. These estimates are placeholders and individual MS4 allocations are based on a kg/acre basis applied to applicable number of acres in the regulated permit area. Estimated flows and concentrations are derived from analysis and data, as summarized in Appendix B. 7. page 19, section 4.0, paragraph 1, Caldwell WWTP performance: Replace "phosphorus removals down to around 1 mg/l." with ""seasonal phosphorus discharges of less than 400 ug/l (e.g. 240 ug/l in 2006 and 340 ug/l in 2007)."	Page 12, We have made this modification. Page 19, We have made this modification.
Comments From: Lower Boise River Watershed Council	
This letter is submitted on behalf of the Lower Boise Watershed Council (LBWC), which is the designated watershed advisory group for the Lower Boise River. Our stakeholders consist of citizens and operators of facilities that generate and reduce through treatment or application of Best Management Practices (BMPs) point and non-point pollutants. We would like to thank the Idaho Department of Environmental Quality (IDEQ) for your hard work and cooperation on this important document. This Implementation Plan sets forth a reasonable and effective approach toward nutrient control as required by the downstream Snake River-Hells Canyon (SR-HC) total maximum daily load (TMDL). In particular, we fully support the allocation framework and adaptive management approach, consistent with the requirements of the SR-HC TMDL. This approach depends greatly on the strong monitoring program as included in the document. Because the implementation plan was developed, in part, based on the document we submitted to IDEQ in August 2007, our substantive comments on its technical content are minimal. Those comments are presented below: 1. Page xv and Page 1, Second paragraph. Please replace : "To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-	Thank you for your comments. Page xv and page 1, We have added language concerning chlorophyll *a* taken directly from the Snake River Hells Canyon TMDL. The seasonal average text has been changed.

HC TMDL establishes a seasonal, May 1 to September 30, instream total phosphorus (TP) target of 0.07 mg/l for the SR-HC reach upstream from Brownlee Reservoir." with: "To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a seasonal, May 1 to September 30, instream a 14 ug/L seasonal average chlorophyll a target, and a maximum chlorophyll a concentration of 30 ug/L. To attain this target the SR-HC TMDL established tributary allocations based on 0.07 mg/L total phosphorus concentrations multiplied by a seasonal average flow. There is uncertainty about the relationship between chlorophyll a and total phosphorus, and it is possible that the chlorophyll a target will be attained at a different (higher or lower) total phosphorus concentrations. Ultimately, the SR-HC target is the attainment of the associated beneficial uses."	
2. Page xvii, Second bullet and Page 12, First Paragraph. Please replace "non-point source" with "stormwater source" in the first sentence.	Page xvii and 12, This sentence has be modified.
3. Page xvi and Page 51. Table C and Table 17. Please delete (2005) from the Baseline column header. Baseline conditions were previously defined in the trading framework as 1996 conditions, data collected to establish baseline flows and concentrations for this document ranged between 1995-2005, and land use conversion data are from 2000-2001 and 2004; it would be simpler to refer to Baseline without a year throughout the document.	Page xvi and 51, The tables have been modified.
4. Page xx and Pages 37-38. Table D and Section 5.2. Please remove the discussion regarding monthly low flows. Flow conditions specified in the Snake River-Hells Canyon TMDL are clearly seasonal, not monthly, in nature. We feel that the analysis presented in Figure 8 and Table 6, in combination with the proposed adaptive management monitoring approach, negate the need for additional variable flow analysis at this point.	Page xx and 37-38, We have deleted the table and modified the text accordingly. We agree that the SRHC TMDL was based on median flows and that for consistency, the lower Boise River should use median flows for management decisions. However, this information is provided to show that the target established at the mouth of the Boise River in the SRHC TMDL cannot be met at certain low flow scenarios just as would be the case of the Snake River at low flows.
5. Page 10. Table 1. We agree with the use of the 2000 trading framework relative contributions to characterize how much of each source load might be transported to Parma. We request that an additional footnote be added that states: "The 2000 trading framework relative contributions are based on median flow conditions. Under low flow conditions, more of the water in the watershed is reused and less of each individual source load reaches to Parma."	Page 10, Table 1, We have added a caveat concerning different flow regimes and relative contributions.
6. Page 33, Second paragraph. Please add a new paragraph following the SR-HC text: "To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a seasonal, May 1 to September 30, instream a 14 ug/L seasonal average chlorophyll a target, and a maximum chlorophyll a	Page 33, We added similar language to the text on page xv.

concentration of 30 ug/L. To attain this target the SR-HC TMDL established tributary seasonal average target inputs of 0.07 mg/L total phosphorus. There is uncertainty about the relationship between chlorophyll a and total phosphorus, and it is possible that the chlorophyll a target will be attained at a different (higher or lower) total phosphorus concentrations. Ultimately, the SR-HC target is the attainment of beneficial uses, which is driven by chlorophyll a levels."	
7. Page 44. Last paragraph. Please delete the following sentence: "Given the complexity of the watershed (under existing and future conditions), given the load at complete implementation of controls on point and nonpoint sources, it has been determined that it is not possible to meet the SR-HC TMDL target." This statement contradicts Table C and Table 17, and we have requested that Table 9 be removed.	Page 44, We have added clarifying language. See above response to Pages 37-38 regarding Table 9.
8. Page 45. First paragraph following the bullets. Please re-insert the following language from the August 2007 document: "Permit limits based on WLAs will be mass-based defined by the seasonal concentration target and the facility design discharge for the applicable permit cycle. If permit limits are to be applied to any period other than seasonal (e.g., monthly), the seasonal allocation will be translated to other periods using appropriate statistical guidance such as that presented in EPA's Technical Support Document for water quality-based limits."	Page 45, We have added this language.
9. Page 48. Last paragraph. Please replace this paragraph with: "In general, if construction activities are conducted consistent with NPDES MS4 requirements of the community in which the activity occurs and/or NPDES Construction General Permit (CGP) requirements, they are considered to be in compliance with the provisions of these allocations. Sites regulated under the CGP that are located within MS4 permit boundaries are included in the current and future WLAs. Similarly, existing industrial facilities regulated under the Multi-Sector General Permit (MSGP) that are located within MS4 permit boundaries are included in the estimate of total developed acres and receive the same per-acre WLAs as given to the current MS4 areas. Future MSGP receive the same WLA as future MS4 areas. All MSGP facilities are expected to implement SWPPPs that include BMPs to meet a phosphorus reduction goal of 50%. MSGP impacted facilities outside of MS4 permit boundaries are expected to implement SWPPPs that are consistent with stormwater management programs required for facilities within MS4 areas. Industrial facilities that are located outside MS4 permit boundaries are included in the estimate of total acres used to	Page 48, We have added this language.

develop non-point agricultural source load allocations, and are included in the agricultural load allocation.” 10. Page 49. First paragraph. Please replace: “Future non-point agricultural loads will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production.” with: “Future non-point agricultural loads, including permitted land application sites, will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production.”	Page 49, We have added this language.
11. Page 50. Table 16. Please add the following table note: “Existing and future nonpoint agricultural loads include permitted land application sites within each of the above watersheds.”	Page 50, We have added this language.
12. Page 55. First and second paragraphs. Please replace: “In the case of the lower Boise River, adaptive management is the appropriate classification of this process, recognizing that the SR-HC TMDL target can only be achieved based on a seasonal average because of the land use conversion from agricultural to urban land uses and cannot be achieved at all based on a not to exceed target of 0.07 total phosphorus. The lower Boise River adaptive management strategy builds on the immediate action of initially reducing wastewater treatment discharges of phosphorus, combined with an array of long-term actions/trends that will result in additional and substantial nutrient load reductions (including stormwater management programs, agricultural BMPs, and land use conversion). DEQ will evaluate progress made toward improved water quality in the Snake River and Brownlee Reservoir. (See Monitoring Strategy on Page 46)” with: “In the case of the lower Boise River, adaptive management is the appropriate classification of this process. The lower Boise River adaptive management strategy builds on the immediate action of initially reducing wastewater treatment discharges of phosphorus, combined with an array of long-term actions/trends (including stormwater management programs, agricultural BMPs, and land use conversion) that will result in additional and substantial nutrient load reductions. DEQ will evaluate progress made toward improved water quality in the Snake River and Brownlee Reservoir (see Monitoring Strategy on Page 58).”	Page 55, We have added clarifying language.
13. Page 55 and 56, Last paragraph and Table 20. Please replace: “Table 20 shows the estimates implementation schedule for point source phosphorus removal in the	Page 55 and 56, We have deleted table 20 and added this language.

watershed. Any compliance scheduled developed by EPA for NPDES permitting should follow this schedule." with: "The estimated implementation schedule for point source phosphorus removal specifies achievement of 0.200 mg/L seasonal average discharge within three permit cycles, as described in Section 5.4 and Table 13. Anticipated progress for each of the larger wastewater facilities is detailed in the letters included in Section 4.0. Any compliance scheduled developed by EPA for NPDES permitting should follow this schedule. " Please delete Table 20. This table is inconsistent with the information provided by individual facilities as detailed in letters contained in Section 4. Because these letters are accurate and provide more appropriate detail, including for those facilities that have already implemented biological nutrient removal, Table 20 should be removed. 14. Section 6. Please re-insert Section 6.4 (Trading) of the August 2007 document in its entirety. This section was originally developed in response to EPA's comments in 2005 and this section further discusses trading issues specific to this watershed. The LBWC would like to re-iterate our thanks to IDEQ for all of your efforts in helping to develop this very important document. Please do not hesitate to contact me if you have any questions.	 Section 6, Trading language has been added.
Comments From: Lynn Moser, Eagle Sewer District	
The Idaho Department of Environmental Quality (IDEQ) has completed its draft of the Lower Boise River Implementation Plan for reduction of phosphorus and requested public comment by June 6. This letter provides comments from the Eagle Sewer District (ESD). ESD provides sewer collection and preliminary treatment for the residents of Eagle and the adjacent areas. ESD currently treats to partial secondary levels in an aerated lagoon system. The lagoon effluent is then pumped to the City of Boise's West Boise Wastewater Treatment Facility for final treatment and disposal to the South Channel of the Boise River. For many years, ESD had its own National Pollutant Discharge Elimination System (NPDES) permit to discharge to the North Channel of the Boise River from a treatment plant that was located near the intersection of State Highway 44 and Eagle Road. In the early 1980s, ESD constructed a new treatment plant downstream about a mile on the north side of the North Channel of the Boise River. In the spring of 1983, ESD decided to discontinue discharge into the Boise River and to instead discharge the partial secondary treated	Thank you for your comments.

effluent to rapid infiltration basins (RIBS) located about 4.5 miles northwest of the current treatment plant. In the fall of 2001, after reaching a contractual agreement with the City of Boise for the acceptance and final treatment of ESD effluent, ESD discontinued using its RIBs and began pumping all of its treated effluent to the City of Boise. ESD has applied to the Environmental Protection Agency EPA) for reactivation of its original WDES permit and is shown as an existing discharger in the draft Implementation Plan. ESD commends IDEQ on a thoughtful and complete approach to a very difficult and contentious issue. Overall, the document is very comprehensive and ESD strongly supports IDEQ on this document. We appreciate that ESD is noted as an existing discharger at two locations in the document (pages 11 and 46.) ESD is committed to improving the environment and is supportive of the Implementation Plan. ESD must, along with agriculture and other interests, manage their affairs within the reality of their capital funding availability. ESD concurs that the Implementation Plan goal of meeting a 0.2 mg/l TP limit in three cycles allows for proper management of District capital. It also gives the critical time to look at various funding sources for the required additional capital necessary to implement this plan. The lessons learned from the early phases will likely provide the only reasonable approach for developing better designs in subsequent phases.	
Comments From: Brian Hoelscher, Idaho Power Company	
Idaho Power Company (IPC) is pleased to submit the following comments on the April 2008 Public Comment Draft of the *Lower Boise River Implementation Plan Total Phosphorus* (Implementation Plan). IPC has long supported the watershed approach for the development of total maximum daily loads (TMDLs) as an appropriate mechanism to improve water quality in the Snake River. IPC is concerned that the Implementation Plan as written is not consistent with the U.S. Environmental Protection Agency approved Snake River-Hells Canyon TMDLs. The Snake River-Hells Canyon TMDLs established a no-greater-than total phosphorus target of 0.070 mg/L applicable to the Snake River from May through September. This applicable target was then translated into load allocations for all major sources, including the Boise River, based on an average water year. The Implementation Plan concludes that ". . .a "not to exceed target" of, 0.070 mg/L total phosphorus at Parma is not achievable."	Thank you for your comments. DEQ is committed to improving the water quality in the Boise and Snake Rivers. The Snake River Hells Canyon (SRHC) TMDL approved by the EPA in September 2004 was based on median flows. Consultation with the EPA concerning this project now indicates they require low flow conditions (approximately 1/3 of median conditions) to be addressed in the load allocations for the lower Boise River. After a thorough review of existing water quality data and projections of future conditions, it has been concluded that even with total removal of WWTP effluents and total implementation of nonpoint source controls, the load allocations to meet 0.07 mg/L total phosphorus (TP) at the mouth of the Boise River cannot be met at low flow conditions. The Implementation Plan was developed with adaptive management in mind. When significant TP removals from WWTPs (advanced treatment), stormwater (through BMP implementation) and agriculture (through BMPs and land conversion)

IPC is concerned that the Implementation Plan as written is not consistent with the downstream Snake River-Hells Canyon TMDLs. Changing upstream load allocations on which downstream water quality is dependant is not a singular or simply process. If the proposed change to the total phosphorus target at Parma is warranted to protect downstream waters, it seems reasonable to assume that all load allocations should be re-evaluated and, as needed, changed. IPC strongly encourages Idaho Department of Environmental Quality to develop TMDLs that fairly and consistently partition the responsibility to the appropriate sources.	occurs, water quality assessment is needed to determine where the river stands with regards to water quality improvement, TP target and beneficial use attainment.
Comments From: Clint Dolsby, City of Meridian	
The City of Meridian is pleased to submit comments on the draft "Lower Boise River Implementation Plan, Total Phosphorus" (Plan). The City has made substantial investments into capital improvements for Biological Phosphorus removal and looks forward to continued investment to do our fair share in efficiently meeting the Boise River allocations in a sustainable manner. The City strongly encourages applying an adaptive management strategy during the implementation of the regional improvements at the WWTF's and making adjustments as necessary in order to reach the goals of the implementation plan. The City supports adoption of the plan with minor changes as recommended in the attached comments. 1. Reference page xix in the Executive Summary. Has nutrient spiraling been adequately researched to determine its nutrient assimilation effects on the watershed? 2. Reference page xix in the Executive Summary. Algae blooms occur during high flows in spring, while low flows occur in late summer. Are the phosphorus limits based on algae blooms occurring at low flows? 3. Table 2, page 11. The Meridian WWTF discharges into Fivemile Creek and not Mill Slough. The mean discharge of 5.5 cfs (3.55 mgd), mean effluent TP concentration and resultant load is out of date. The average flow in 2007 was 8.35 cfs and the mean effluent TP concentration was 1.57 mg/L which corresponds to a load of 32 kg/ day. 4. Page 26, Letter from the City of Meridian. Under the answer to question 1, the City of Meridian has removed phosphorus down to an average of 1.57 mg/L, not 0.5 mg/L. 5. Page 40, Table 10. Adjust the load to 24 kg/day in order to match the modified load of 52 kg/day from Table 2, Page 11. 6. Page 46, Table 13. Revise the mean discharge to 19 cfs, Wasteload allocation to 9.3 kg/day and the	Thank you for your comments. 1. DEQ believes that there is assimilation of nutrients in the Boise River that accounts for the difference in loading from source contribution and that measured at Parma. 2. Phosphorus targets are based on the Snake River Hells Canyon TMDL approved by the EPA in September 2004. 3. The projected flow calculations for all facilities are estimated values based on 2004 DMR flow reports and potential projection populations as determined by COMPASS. These estimates are placeholders because actual flow to be used in future permits to determine loads will be based on real-time facility plans submitted by each discharger at the time of permit application. On a watershed-wide basis, total projected WWTF loads are estimated based on current per capita WWTF discharge volumes applied to future population projections. This means that some of these facilities will likely serve more people and require greater loading than these placeholder estimates. To accommodate this, such a discharger may be allocated a portion of the lumped watershed-wide "Reserve" allocation as determined by their

Parma adjusted load to 7 kg/day to match projected average flows. 7. Page 47, Table 14. Revise the mean discharge to 32.5 cfs, Wasteload allocation to 15.9 kg/day and the Parma adjusted load to 11.9 kg/day to match projected average flows. 8. Table 20, page 56. Meridian would be required to achieve 0.5 mg/L in the first permit cycle rather than the second cycle, like most other treatment plants. Meridian should only be held to the same standard as other plants in the first cycle which is a discharge limit of 1.0 mg/L total phosphorus in the first cycle, 0.5 mg/L in the second cycle and 0.2 mg/L in the third cycle or this table should be removed from the analysis.	facility planning. 4. We have made this change. 5. See response to 3 above. 6. See response to 3 above. 7. See response to 3 above. 8. We have deleted Table 20 and added language concerning the three permit cycles for achieving compliance.
Comments from: Tom Dale, City of Nampa	
DEQ has completed its draft of the Lower Boise River Implementation Plan for reduction of phosphorus and requested public comment by June 6. This letter provides comments from the City of Nampa. The City of Nampa Wastewater Treatment Plant facility treats the domestic and commercial wastewater for a population of over 80,000. It also treats the food processing and industrial wastewater from two major and over twelve smaller industries. As such, the influent BOD, TSS, and nitrogen concentrations are the highest in Idaho. Also, the influent phosphorus concentration may be the highest in the State. The treated effluent is discharged into Indian Creek. Further downstream Indian Creek combines with the Riverside Canal. After a shared channel with Riverside Canal, Indian Creek eventually reaches the Boise River near Caldwell. The City of Nampa also discharges storm drainage to Indian Creek. The City of Nampa commends DEQ on a thoughtful and thorough approach to a very difficult and contentious issue. Overall, the document is very complete and the City strongly supports DEQ on this document. The aerial photographs on pages 68 through 74 vividly show the recent changes that have occurred in land use. The City is committed to improving the environment and is supportive of the implementation plan. The City has treated the wastewater to meet the discharge permits for over 50 years. During that time, the plant has grown significantly and the City has invested large amounts of money to maintain its history of compliance. The plant was given the *Award of Excellence for Operations and Maintenance* from EPA in 1988. The City also must manage the overall system wisely in order to utilize the limited resources of the community. Therefore, the City	Thank you for your comments.

supports and concurs with the implementation plan of meeting a 0.2 mg/l TP limit in three permit cycles since this allows for proper management of capital. This plan also allows for phasing and using the results of the initial phases to better understand and design subsequent phases. Due to Nampa's unique food processing and industrial wastewater dischargers, the City's wastewater plant works with high influent phosphorus concentration and loads. The wastewater treatment plant's design has evolved over the years to accommodate continued compliance with NPDES permit requirement. Implementing plant compliance with new permit limits on phosphorus poses significant plant design, construction, and financial considerations. With that in mind the City is pursuing a complete update and evaluation of its Facility Plan, which will be completed this fall. The Facility Plan is examining closely the choices for phosphorus removal methods. Nampa is working hard to pursue options that are environmentally effective, compliant with environmental regulations, and economically realistic. Nampa strongly supports the three permit cycle implementation plan as an efficient and realistic approach for Nampa to be able to attain these goals. We support DEQ's position that the 0.2 mg/l TP limit is more reasonable than the lower limit requested by EPA.	
As noted in Tables 1 and I0 of the draft implementation Plan, the "relative contribution" of the Nampa discharges is 0.2 (meaning that only 20% of the phosphorus discharged into Indian Creek actually reaches the Boise River). This is due to the complex plumbing of the Indian Creek and Riverside Canal channels. We believe that ongoing studies that the City is funding will provide supporting information of its relative contribution and may demonstrate that the actual contribution from the Nampa discharges is even lower than the current estimate. We respectfully request that DEQ note that the relative contributions are based on median conditions. During different flow conditions, the relative contributions could be significantly less. For instance, if the Boise River flow is low, more of the Indian Creek flow will be diverted into the Riverside Canal and utilized for agricultural irrigation, which means even less of the Nampa discharge, will reach the Boise River.	Relative Contributions, we have included language specifying the flows used. We have also added language concerning the potential for additional data to support revised relative contributions at low flows.
On page xv and page 1 of the Implementation Plan, we request that the wording be changed. The current wording is that the Snake River target is 0.07 mg/l TP. While this is technically correct, the actual goal is to limit nuisance growths by limiting chlorophyll-a	Page xv and page 1, We have added language concerning chlorophyll *a* taken directly from the Snake River Hells Canyon TMDL. The seasonal average text has been changed.

to 14 micrograms/liter (see page 3 of the draft Implementation Plan). This is expected to be met by limiting the TP concentration to 0.07 mg/l. However, in other portions of the Snake River, a TP concentration as high as 0.085 mg/l has been accepted as causing the same chlorophyll-a concentration. The City requests that the text be changed to identify the chlorophyll-a concentration as the goal with the TP concentration as the expected requirement. This could allow a higher TP concentration if it is shown to meet the chlorophyll-a limit. We also request that the limit be listed as a "seasonal average". The current implementation plan is silent on whether the limit is daily, monthly or seasonal. Also, we request that a table be included that shows the appropriate statistical values to convert a seasonal or monthly average into a daily limit. To meet a daily limit of 0.2 mg/l TP means operating at a monthly goal of approximately 0.14 mg/l to allow for periodic excursions. If the monthly average limit is set at 0.26 mg/l, then the WWTP can be efficiently operated to meet a seasonal average of 0.2 mg/l. This will save the City in that more efficient facilities can be constructed. Also, this approach allows less chemical to be used and less sludge to be generated. On Page 11, in Table 2, the XL Four Star Beef plant is listed as discharging into Fivemile Creek. It actually discharges into Indian Creek. On Page 56, in Table 20, the XL Four Star Beef plant is not shown. Also, the smaller municipalities such as Kuna (under construction), Middleton, Notus, and Star are not shown. At a minimum, the XL Four Star Beef plant should be included. On page 91 (Appendix B), there is important text dealing with Multi-Sector General Permits that needs to be included in the main body of the report. On page xvii and page 12, the text requires "50% TP reduction". We recommend that the text be changed to read to require a "BMP goal of 50%". The ability to utilize trading is not readily visible in the draft Implementation Plan. While trading is not currently practiced in the drainage, the ability to use it should be encouraged. We request that it be listed as a specific tool that is available to the Cities. The Nampa City Council was briefed on this document at their January 2, 2008, Council meeting and directed me to write this letter in support of the draft Implementation Plan. We appreciate the opportunity to comment on this important document. If you have any questions, please call Michael Fuss, the City's Public Works Director, at (208) 468-5420.	Page 11 Table 2, This has been corrected. Page 56, We have deleted Table 20 and added language concerning the three permit cycles for achieving compliance. Page 91 Appendix B, We have added language concerning Multi Sector General Permits on page 49. Page xvii and 12, The ability to meet the target total phosphorus concentrations at certain flows is dependent on stormwater achieving 50% reduction. BMPs are required on 100% of new construction. Trading language has been added.
Comments from: Larry Bennett, MWH	

I support the proposed Implementation Plan and I appreciate the efforts of DEQ and the Lower Boise River Watershed Advisory Group in the preparation of this document. The following are some specific comments on the draft Lower Boise River Implementation Plan for Total Phosphorus. I. **Page xiii and xiv:** there are some missing acronyms (i.e., ODEQ**,** Reclamation [see page 141). Also, is MOS still included in the text (I believe that section has been deleted)? 2. **Page xv:** in the second paragraph, second line, delete the commas before May 1 and after September 1. 3. **Page xv:** in the second paragraph, the target is stated as 0.07 mg/l TP. The actual target is chlorophyll-a which is expected to be met at a TP concentration of 0.07 mg/l (see page xix, first paragraph and page 2, paragraph 2). I suggest that the wording on page xv be revised to include the chlorophyll-a standard so that the adaptive management plan can be more readily explained and implemented if a higher TP concentration succeeds in meeting the chlorophyll-a standard. 4. **Page xv:** in the second paragraph, would it possible to include the word "seasonal" in the limit so that it is understood to be a seasonal average instead of a maximum day? 5. **Page xv:** in the third paragraph, in the third line, delete the word "tributaries" after the words "0.07 mg/l limit". 6. **Page xvii:** in the second bullet, in the first line, change "non-point source" to "stormwater". 7. **Page xvii:** in the third bullet, in the fifth line, the phrase 'these levels" is unclear. Should that refer to (or be replaced by) "50% to 68% reduction"? 8. **Page xix:** in the third paragraph, in the 9'"Iine, a quotation is started but never finished (it should end at the end of that sentence in the l0th line.) 9. **Page xix:** in the fourth paragraph, in the first line, add a comma after the "(34 days on average)". 10. **Page xx:** in the second paragraph, last line, what does "all feasible steps" mean to EPA? How this phrase is interpreted could be costly to municipalities. 11. **Page xx:** in the 4'h paragraph, in the second line, I suggest that the word "producers" be changed to "farmers". 12. **Page 1:** in the second paragraph, see comment 3 on using chlorophyll-a as the limit instead of TP. 13. **Page I:** in the third paragraph, in the third line, see comment 5 (delete "tributaries") 14. **Page 1:** in the last paragraph, in the 7th line add the word 'The" before "Boise River". 15. **Page** 2: in the last paragraph, in the third line, add the word "Currently" before "average seasonal	Thank you for your comments. We have made all of the revisions in your comments with the following exceptions: 3. We have added language concerning chlorophyll *a* taken directly from the Snake River Hells Canyon TMDL. 12. Same correction.

concentrations". 16. **Page 9:** in the second paragraph, in the 7th line, delete the comma after "Fifteen Mile".	
17. **Tables 1 and 10:** the relative contribution factors should be noted as representative of median flows. These relative contribution factors will change when the river flows are low. For instance, most of the City of Boise WWTF effluent will not get past the diversions at Middleton. Also, the Nampa WWTP and XL Four Star Beef plant effluents will go entirely to the Riverside Canal if the Boise River is at low levels. 18. **Page 11:** in Table 2, the footnote that was in the draft report for the Caldwell WWTP (see the asterisk on Caldwell WWTF two places) has been deleted. Why was it deleted? 19. **Page 11:** in Table 2, the XL Four Star Beef plant is shown as discharging to Fivemile Creek. It actually discharges into Indian Creek. 20. **Page 12:** in the first paragraph, in the first line, I suggest that you replace "non-point sources" with "stormwater. This more clearly defines the sources. 21. **Page 39:** in the top paragraph (starts on page 38), there is a quotation that is started but never finished (same as comment 8).	17. We have added language concerning the potential for additional data to support revised relative contributions at low flows.
22. **Page 44**: in the last paragraph, delete the sentence that reads in part ". . . it has been determined that it is not possible to meet the SR-HC TMDL target." This is no longer relevant. 23. **Page 45**: in the last paragraph, last line, it states Year 15-20; however, Table 13 uses years 10-15. 24. **Page 47:** Table 14, can the format of the third column be widened so that the word "concentration" is not broken onto two lines? 25. **Page 52*:*** Figure 9, the label on the vertical axis was printed horizontally instead of vertically. 26. **Page 55**: in the second paragraph, there is reference to "page 46". 1 believe that should be "page 58".	22. We have added clarifying language.
27. **Page *56:*** In Table 20, please include XL Four-Star Beef in the table. 28. **Page *56:*** In Table 20, the implementation plan for Caldwell has been accelerated with the 0.2 mg/l limit within two permit cycles and the memo on page 24 does not match the accelerated plan (it still shows meeting the 0.2 mg/l limit in three permit cycles). With the accelerated schedule, the City of Caldwell will have to fund the needed improvements in a quicker manner than anticipated. Since the filters are the largest expenditure, this is unequal treatment. Meridian, which also has the same compliance schedule for meeting the 0.5 mg/l limit, is then given two permit cycles to meet the 0.2 mg/l limit. So Caldwell and Meridian are being treated differently. We recommend that all WWTFs meet the same schedule for the 0.5 mg/l and 0.2 mg/l limits (i.e.,	27. We have deleted Table 20 and added language concerning the three permit cycles for achieving compliance.

postpone Caldwell and Meridian to the second permit cycle for the 0.5 mg/l limit and to the third permit cycle for the 0.2 mg/l limit.) 29. **Appendix A:** the photos on pages 68 and 72 are vivid examples of the growth in the area. These are excellent additions to the report. 30. **Pages *85, 86, 91,* and *93:*** this Appendix B was originally Appendix C and it still refers to Appendix C in many locations; these references should be changed to Appendix B**.** 31. **Page 104:** this page references an attachment with the record of disagreement. The attachment was not included.	
Comments from: Bruce Mills, Ada County Highway District	
As a member of the Lower Boise Watershed Council, Ada County Highway District (ACHD) participated in development of a load allocation document titled "Lower Boise River, Phosphorus Allocations for the SR-HC TMDL (LBWC, August 2007) to ensure appropriate allocations for current and future stormwater discharges. During development of the TMDL Allocation document, DEQ stated that it would not be an implementation plan, but a load allocation document subject to approval by EPA. This appeared to be an appropriate approach because it is only after allocations are developed and improvement timeframes are established that an implementation plan can be developed. In Idaho this typically occurs within an 18 month period after TMDLs are approved. In the Lower Boise River Implementation Plan - Total Phosphorus (April 2008), DEQ has made substantial changes compared to the 'Phosphorus Allocation" document developed and voted on by the Lower Boise Watershed Council (LBWC). The most significant change is representing this document as an Implementation Plan. In general, implementation plans are not legally binding. This raises the following concerns: • Because implementation plans are non-regulatory plans, there are no binding allocations for EPA issued permits. From a stormwater standpoint, it is in our best interest to have a binding TMDL that sets an allocation, and provides some protection from more stringent restrictions, and provides more certainty for planning purposes. Without binding allocations and time frames for implementation, the proposed 50% stormwater reduction goal is subject to change. If in the next few permit cycles there is little improvement in the river water quality, stormwater could be saddled with more restrictions. • Without a TMDL there are no trading opportunities in the watershed. For example, when	Thank you for your comments. DEQ is committed to improving the water quality in the Boise and Snake Rivers. The Snake River Hells Canyon (SRHC) TMDL approved by the EPA in September 2004 was based on median flows. Consultation with the EPA concerning this project now indicates they require low flow conditions (approximately 1/3 of median conditions) to be addressed in the load allocations for the lower Boise River. After a thorough review of existing water quality data and projections of future conditions, it has been concluded that even with total removal of WWTP effluents and total implementation of nonpoint source controls, the load allocations to meet 0.07 mg/L total phosphorus (TP) at the mouth of the Boise River cannot be met at low flow conditions. The Implementation Plan was developed with adaptive management in mind. When significant TP removals from WWTPs (advanced treatment), stormwater (through BMP implementation) and agriculture (through BMPs and land conversion) occurs, water quality assessment is needed to determine where the river stands with regards to water quality improvement, TP target and beneficial use attainment.

land used for agricultural purposes is converted to land used solely for transportation all allocated load should be transferred to the transportation use. The SR-HC TMDL did not authorize trading. Without a lower Boise TMDL and associated allocations there is no authorized trading. • The lower Boise will stay on the 303(d) list until an EPA approved TMDL is completed. EPA will continue to view the lower Boise River impaired and will likely limit newly issued discharges to target levels. Because of these concerns ACHD does not support the Implementation Plan as developed by DEQ. We will continue to work toward fair and equitable allocations and reasonable implementation timeframes. Once legally binding allocations are developed we are prepared to participate in the development of an implementation plan.	
Comments from: Robert L. Braun, The Amalgamated Sugar Company	
The Amalgamated Sugar Company, LLC (T ASCO) is pleased to have the opportunity to provide comments on The Lower Boise River Implementation Plan Total Phosphorus. Although TASCO does not directly discharge wastewater to the Boise River, we are a definite stakeholder for two reasons. First, our sugar beet processing facility located in Nampa discharges wastewater to the city of Nampa which discharges under NPDES permit to Indian Creek, a tributary of the Boise River. Secondly, TASCO operates a permitted land application facility on the Nampa site. By virtue of the methods used to process sugar beets, wastewater from our facility does not discharge phosphorus in significant quantity. The lower Boise River drainage system is very complex and water quality is subject to numerous factors. For this reason it is important that measures and plans to improve water quality fully consider the impacts and benefits on all stakeholders. Reduction of the phosphorus load to the river can be accomplished through a step by step adaptive management approach that balances resources and time to minimize impacts on sources, point and non-point. The approach used to reduce phosphorus loads in the Boise River must be consistent with and integrally tied to the Snake River - Hells Canyon (SR-HC) Total Maximum Daily Load (TMDL) so that the focus remains on the overall goal of improving water quality in the Snake River. The implementing agencies should avoid imposing unreasonable or untimely requirements on pollutant dischargers to the Boise River that come at great cost and without significant benefit to the water quality of the Snake River.	Thank you for your comments.

This Implementation Plan sets forth a reasonable and effective approach toward phosphorus control as required by the downstream SR-HC TMDL. We support the allocation framework and adaptive management approach as long as it is consistent with the parameters of the SR-HC TMDL. This approach depends greatly on the strong monitoring program and periodic reality check as provided in the document. Because of our ongoing interest in the water quality of the Boise River, TASCO has actively participated in the Lower Boise Watershed Council (LBWC). Dermis Seale has been a member of the council since 2004. Because the Lower Boise River Implementation Plan is based in part on the phosphorus allocation plan submitted by the LB WC to IDEQ in August 2007, our comments on the Plan are limited to the following:	
Page xv and Page 1, Second paragraph. Please replace : "To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a seasonal, May 1 to September 30, in-stream total phosphorus *(TP)* target of 0.07 mg/l for the SR-HC reach upstream from Brownlee Reservoir." with: "To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a seasonal (May 1 to September 30) in-stream seasonal average chlorophyll *a* target concentration of 14 ug/ L, and a maximum chlorophyll *a* concentration of 30 ug/L. To attain this target the SR-HC TMDL established tributary allocations based on 0.07 mg/ L total phosphorus concentrations multiplied by a seasonal average flow. There is uncertainty about the relationship between chlorophyll *a* and total phosphorus, and it is possible that the chlorophyll a target will be attained at a different (higher or lower) total phosphorus concentration. Ultimately, the SR-HC target is the attainment of the associated beneficial uses."	Page xv and 1, We have added language concerning chlorophyll *a* taken directly from the Snake River Hells Canyon TMDL.
1. Page xvi and Page 51, Table *C* and Table *17,* Please delete (2005) from the "Baseline" column header. Baseline conditions were previously defined in the trading framework as 1996 conditions. Data collected to establish baseline flows and concentrations for this document ranged between 1995-2005, and land use conversion data are from 2000-2001 and 2004. It is more accurate to refer to "Baseline" without reference to a specific year throughout the document.	Page xvi and 51, We have made this correction.
2. Page xvii, second bullet and Page 12 first	Page xvii and 12, We have revised this sentence.

paragraph. Please replace "non-point source" with "stormwater source" in the first sentence. 3. Page xvii, paragraph after bullets, and page 44, paragraph after bullet. The last sentence is not consistent with the SR-HC TMDL which specified a load allocation of 242 kg/ day based on average flow. If 210 kg/ day based on median flow is comparable, this should be explained. Otherwise it appears you have arbitrarily lowered the load allocation. 4. Page xx and Pages 37-38, Table I) and Section 5.2. Please remove the discussion regarding monthly law flows. Flow conditions specified in the SR-HC TMDL are clearly seasonal, not monthly, in nature. The analysis presented in Figure 8 and Table 6, in combination with the proposed adaptive management monitoring approach, negates the need for additional variable flow analysis at this point. 5. Page 10, Table 1, We agree with the use of the year 2000 trading framework relative contributions to characterize how much of each source load might be transported to Parma. We request that an additional footnote be added that states: "The year 2000 trading framework relative contributions are based on median flow conditions. Under low flow conditions, more of the water in the watershed is reused and less of each individual source load reaches to Parma." 6. Page 33, second paragraph. Please add a new paragraph following the SR-HC text: "To reduce "nuisance" algal growth in the Snake River upstream from Brownlee Reservoir, the SR-HC TMDL establishes a seasonal (May 1 to September 30) instream seasonal average chlorophyll *a* target concentration of 14 ug/L and a maximum chlorophyll *a* concentration of 30 ug/L. To attain this target the SR-HC TMDL established the seasonal target inputs of 0.07 mg/ L total phosphorus based on average flow at the mouth of each tributary. There is uncertainty about the relationship between chlorophyll *a* and total phosphorus, and it is possible that the chlorophyll *a* target will be attained at a different (higher or lower) total phosphorus concentration. Ultimately, the SR-HC target is the attainment of beneficial uses, which is driven by chlorophyll *a* levels." 7. Pages 37-39, Section 5.2. The narrative in this section concerning low flows should be deleted because the phosphorus allocations in the Snake River - Hells Canyon TMDL to all sources including tributaries and point sources were based on average flows. 8. Page 44, last paragraph. Please delete the following sentence: "Given the complexity P of the watershed (under existing and future conditions), given the load at complete implementation of	Page xvii and 44, The 242 kg/day shown in Table 4.0.9 in the SR-HC TMDL is based on using data from medium-flow years (1995, 1996, and 2000) identified in Table 3.2.3.b. These years based on Snake River flows do not coincide with actual mean conditions within the Lower Boise River watershed. For the purposes of the allocation document, mean flows were determined using a period of record (1990-2005) coinciding with available monitoring data to generate a more precise picture of baseline loading conditions. Using a more precise mean flow value does not change the target concentration of 0.070 mg/L, but it does decrease the available loading capacity to 210 kg/day. We have added clarifying language. Page xx and 37-38 Table D and Section 5.2, We have deleted the table and modified the text accordingly. We agree that the SRHC TMDL was based on median flows and that for consistency, the lower Boise River should use median flows for management decisions. However, this information is provided to show that the target established at the mouth of the Boise River in the SRHC TMDL cannot be met at certain low flow scenarios just as would be the case of the Snake River at low flows. Page 10 Table 1, Relative Contributions, we have included language specifying the flows used. We have also added language concerning the potential for additional data to support revised relative contributions at low flows. Page 33, We added similar language to the text on page xv. Pages 37-39 Section 5.2, We agree that the SRHC TMDL was based on median flows and that for consistency, the lower Boise River should use median flows for management decisions. However, this information is provided to show that the target established at the mouth of the Boise River in the SRHC TMDL cannot be met at certain low flow scenarios just as would be the case of the Snake River at low flows.

controls on point and nonpoint sources, it has been determined that it is not possible to meet the SR-HC TMDL target." This statement contradicts Table *C* and Table 17, and should be deleted.	Page 44, We have added clarifying language.
9. Page 45, first paragraph following the bullets, Please re-insert the following language from the August 2007 LBWC document: "Permit limits based on WLAs J will be mass-based defined by the seasonal concentration target and the facility design discharge for the applicable permit cycle. If permit limits are to be applied to any period other than seasonal (e.g., monthly), the seasonal allocation will be translated to other periods using appropriate statistical guidance such as that presented in EPA's Technical Support Document for water quality-based limits."	Page 45, We have added the appropriate language.
10. Page 48, last paragraph. Please replace this paragraph with: "In general, if construction activities are conducted consistent with NPDES MS4 requirements of the community in which the activity occurs and/or NPDES Construction General Permit (CGP) requirements, they are considered to be in compliance with the provisions of these allocations. Sites regulated under the CGP that are located within MS4 permit boundaries are included in the current and future WLAs. Similarly, existing industrial facilities regulated under the Multi-sector General Permit (MSGP) that are located within MS4 permit boundaries are included in the estimate of total developed acres and receive the same per-acre WLAs as given to the current MS4 areas. Future MSGP receive the same WLA as future MS4 areas. All MSGP facilities are expected to implement SWPPPs that include BMPs to meet a phosphorus reduction goal of 50 %. MSGP impacted facilities outside of MS4 permit boundaries are expected to implement SWPPPs that are consistent with stormwater management programs required for facilities within MS4 areas. Industrial facilities that are located outside MS4 permit boundaries are included in the estimate of total acres used to develop non-point agricultural source load allocations, and are included in the agricultural load allocation."	Page 48, We have added the appropriate language.
11. Page 49, first paragraph, Please replace: "Future non-point agricultural loads will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production." with: "Future non-point agricultural loads, including permitted land application sites, will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production."	Page 49, We have added the appropriate language.

12. Page 50, Table 16. Please add the following table note: "Existing and future non-point agricultural loads include permitted wastewater land application (or reuse) sites within each of the above watersheds."	Page 50, We have added the appropriate language.
13. Page 55, first and second paragraphs. Please replace: "in the case of the lower Boise River, adaptive management is the appropriate classification of this process, recognizing that the SR-HC TMDL target can only be achieved based on a seasonal average because of the land use conversion from agricultural to urban land uses and cannot be achieved at all based on a not to exceed target of 0.07 total phosphorus. The lower Boise River adaptive management strategy builds on the immediate action of initially reducing wastewater treatment discharges of phosphorus, combined with an array of long-term actions/ trends that will result in additional and substantial nutrient load reductions (including stormwater management programs, agricultural BMPs, and land use conversion). DEQ will evaluate progress made toward improved water quality in the Snake River and Brownlee Reservoir. (See Monitoring Strategy on Page 46)" with: "In the case of the lower Boise River, adaptive management is the appropriate classification of this process. The lower Boise River adaptive management strategy builds on the immediate action of initially reducing wastewater treatment discharges of phosphorus, combined with an array of long-term actions/ trends (including stormwater management programs, agricultural BMPs, and land use conversion) that will result in additional and substantial nutrient load reduction. DEQ will evaluate progress made toward improved water quality in the Snake River and Brownlee Reservoir (see Monitoring Strategy on Page 58)."	Page 55, We have added clarifying language.
14. Page 55 and 56, last paragraph and Table 20. Please replace: "Table 20 shows the estimates implementation schedule for point source phosphorus removal in the watershed. Any compliance schedule developed by EPA for NPDES permitting should follow this schedule." with: "The estimated implementation schedule for point source phosphorus removal specifies achievement of 0.200 mg/ L seasonal average discharge within three permit cycles, as described in Section 5.4 and Table 13. Anticipated progress for each of the larger wastewater facilities is detailed in the letters included in Section 4.0. Any compliance schedule developed by EPA for NPDES permitting should follow this schedule."	Page 55 and 56, We have deleted Table 20 and added language concerning the three permit cycles for achieving compliance.

Please delete Table 20. This table is inconsistent with the information provided by individual facilities as detailed in letters contained in Section 4. These letters are accurate and provide more appropriate detail, including those facilities that have already implemented biological nutrient removal. 15. Section 6. Please re-insert Section 6.4 (Trading) of the August 2007 document in its entirety. This section was originally developed in response to EPA's comments in 2005 and this section further discusses trading issues specific to this watershed. Finally TASCO acknowledges and appreciates the time and effort expended by the Department in conjunction with stakeholders and the LBWC to develop a plan that will contribute to improved water quality conditions in the Snake River while acknowledging the importance of maintaining a healthy economy in the Boise Valley.	Section 6, Trading language has been added.
Comments from: Dale Eldridge, Micron Technology, Inc.	
I am writing on behalf of Micron Technology, Inc. in response to the Idaho Department of Environmental Quality (IDEQ)'s request for comment on the lower Boise River Implementation Plan Total Phosphorus Draft dated April 2008 (the "Plan"). The Plan states that it is designed to improve water quality in the Snake River. Though the Plan also states that not all phosphorous in the Lower Boise River ever reaches the Snake River, and that costly improvements will be required by many sources to implement the Plan, Micron supports IDEQ's proposed allocation and phased implementation schedule, which includes reducing phosphorous discharges from waste water facilities by 96-97%. I also understand that IDEQ, and perhaps other entities, will conduct monitoring, and that progress will be evaluated periodically. Micron appreciates the countless hours of hard work by IDEQ, the Lower Boise Watershed Council, and many others that went into developing the Plan. Additional comments on specific portions of the Plan are attached. Subject to IDEQ's consideration of comments, Micron supports adoption of the Plan. Thank you for the opportunity to comment. Executive Summary, page xv, second paragraph, last sentence, strike "annual" and insert "seasonal". See SR-HC TMDL Abstract page ii and page 447. Executive Summary, Implementation Strategies, page xx, second paragraph, strike the second sentence. See SR-HC TMDL page 57 and Table 2.2.1. The Plan could also emphasize that it has adopted the approach of the SR-HC TMDL, is., due to complexity and data gaps, the Plan includes: 1) an iterative, phased approach (page gg, hh, 21), 2) measurable milestones to determine effectiveness, 3) monitoring (pages 210-211,479-480), 4) feasible and attainable control strategies	Thank you for your comments. Page xv, We have removed the word “annual.” Page xx, The second sentence has been modified. The plan also contains suggestions 1 through 5 in subsequent sections.

(pages 451 -452), and 5) a process for reviewing and revising management approaches. In addition, the Plan should indicate that it encourages pollutant trading to the extent allowed by law. See SR-HC TMDL pages 25-28.	
Executive Summary, Implementation Strategies, page xx, strike the fifth paragraph, Table D, and associated text. A rigorous allocation determination for low flow water quality attainment was not undertaken by the SR-HC TMDL because of the extraordinary scale of the watershed and the lack of data. The SR-HC TMDL, therefore, assumes median flow addresses all flow conditions. The SR-HC TMDL further indicates that site specific implementation plans [such as the LBR Plan] should address the influence of flow on water quality in the development of future monitoring plans (page 317), which IDEQ has proposed to do in the Plan. See also, SR-HC TMDL pages 479-480. Table D also overestimates WWTF contributions by failing to account for the effects of irrigation and related uptake during low flow conditions. It also fails to account for probable technical advancement in pollution prevention and remedies that will be available to all sectors of society over time. Table D is also in conflict with Table 6 and the following paragraph at page 37: "The percent load and percent concentration reductions under medium and low flow conditions are essentially comparable, which reinforces the LOADEST results predicted by USGS (that is, that load fluctuations are more sensitive to flows than to concentration). Thus it appears allocations developed based on average year conditions to meet the Parma target should be protective over a critical range of flows at Parma".	Page xx, We agree that the SRHC TMDL was based on median flows and that for consistency, the lower Boise River should use median flows for management decisions. However, this information is provided to show that the target established at the mouth of the Boise River in the SRHC TMDL cannot be met at certain low flow scenarios just as would be the case of the Snake River at low flows.
5.2 Load Capacity, page 37, strike Tables 7, 8, and 9 and associated text. See comment above.	Page 37 See response above.
5.4 Allocation Approach, page 44, last paragraph, second sentence, strike "it has been determined that it is not possible to meet the SR-HC TMDL target", which conflicts with other portions of the Plan, such as Tables C and 17 page 51. In addition, Figure 9, page 52, and accompanying text indicates that the Plan is designed to ensure compliance with water quality requirements and that point source reductions will occur under the Plan at a rate faster than the rate of overall reductions contemplated in the SR-HC TMDL.	Page 44, We have added clarifying language. Also, this would not appear to be inconsistent with the language from the "Allocation Approach". The last sentence in the paragraph from Page 52 states, "While these initial improvements will most likely not result in meeting water quality targets all the time, everywhere, all at once, they will undoubtedly result in substantial, consistent improvement in water quality conditions throughout the reach." (IDEQ/ODEQ 2004, p. 449)."
6.0 Implementation Strategies, page 55, first paragraph, strike "and cannot be achieved at all based on a not to exceed target of 0.07 mg/L total phosphorus". See comment above. The Plan should clearly state it is designed to ensure compliance with water quality requirements. 6.0 Implementation Strategies, page 55, second paragraph, last line, strike "46" and insert "58".	The Snake River Hells Canyon (SRHC) TMDL approved by the EPA in September 2004 was based on median flows. Consultation with the EPA concerning this project now indicates they require low flow conditions (approximately 1/3 of median conditions) to be addressed in the load allocations for the lower Boise River. After a thorough review

6.0 Implementation Strategies, page 56, Approach, strike the second sentence. See SRHC TMDL page 57 and Table 2-21.	of existing water quality data and projections of future conditions, it has been concluded that even with total removal of WWTP effluents and total implementation of nonpoint source controls, the load allocations to meet 0.07 mg/L total phosphorus (TP) at the mouth of the Boise River cannot be met at low flow conditions. Page 55, We have added clarifying language. Page 55, This change has been made. Page 56, This sentence has been modified.
Comment from: Henry Hamanishi, JR Simplot Company	
The J. R. Simplot Company (Simplot) would like to thank Idaho DEQ for their concern, diligence and overall support for the lower Boise River total phosphorus plan over the years. Simplot has been actively involved since 1992, providing the guidance for improving the water quality of the lower Boise River through membership on the Lower Boise Watershed Council (WAG) and the Southwest BAG. Simplot has multiple involvements that impact the Boise River including a land application permit adjacent to the river, industrial significant discharger to a POTW that discharges into the Boise River system, NPDES general permit, multi-sector general permits, participation in the construction stormwater permit program, agricultural non-point sources, and several thousand employees and their families that live, work and recreate on or near the Boise River. Simplot has been involved with the development of the comments of the Lower Boise Watershed Council on the Implementation Plan and fully supports the comments submitted by the Council. Simplot also supports the submitted comments by the city of Boise on multi-sector general permits and construction general permits inclusion in the overall stormwater implementation plan. Simplot also reiterates their support for the point source total phosphorus removal schedule of three permit cycles to achieve a final discharge limit of 0.200 mg/L. In particular, Simplot would like to emphasize the following particular comments from the Lower Boise Watershed Council: Item 9: from the Lower Boise Watershed Council comments concerning inclusion of multi-sector and construction general permits: Page 48. Last paragraph. Please replace this paragraph with: "In general, if construction activities are conducted consistent with NPDES MS4 requirements of the community in which the activity occurs and/or NPDES Construction General Permit (CGP)	DEQ has incorporated your comments.

requirements, they are considered to be in compliance with the provisions of these allocations. Sites regulated under the CGP that are located within MS4 permit boundaries are included in the current and future WLAs. Similarly, existing industrial facilities regulated under the Multi-Sector General Permit (MSGP) that are located within MS4 permit boundaries are included in the estimate of total developed acres and receive the same per acre WLAs as given to the current MS4 areas. Future MSGP receive the same WLA as future MS4 areas. All MSGP facilities are expected to implement SWPPPs that include BMPs to meet a phosphorus reduction goal of 50%. MSGP impacted facilities outside of MS4 permit boundaries are expected to implement SWPPPs that are consistent with stormwater management programs required for facilities within MS4 area. Industrial facilities that are located outside MS4 permit boundaries are included in the estimate of total acres used to develop non-point agricultural source load allocations, and are included in the agricultural load allocation." Items 10 & 11: from the Lower Boise Watershed Council comments, concerning inclusion of permitted land application sites (both industrial and municipal) in the non-point source agricultural allocation. Agricultural BMPs would include Reclamation and Reuse of Municipal and Industrial Guidance for phosphorus: Page 49. First paragraph. Please replace: "Future non-point agricultural loads will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production." with: "Future non-point agricultural loads, including permitted sites will decrease based on two factors: land use conversion and the application of BMPs on those lands that remain in agricultural production." Page 50. Table 16. Please add the following table note: "Existing and future non-point agricultural loads include permitted land application sites within each of the above watersheds." Please contact me for any comments or questions at (208) 389-7375 or my email at hharnanishi@simplot.com.	
Comments from: Bryan Horsburgh, Bureau of Reclamation	
Pages 9& 10, The ratios are based on data from 1996. Are the ratios still the same with the recent growth in Meridian, Nampa, Caldwell, Kuna, and other outlying areas? The plan should make allowances for the ratios to be recalculated in the future?	Thank you for your comments. Page 9 & 10, We have added language concerning the potential for additional data to support revised relative contributions at low flows.

Table 1: From the table itself it is not clear about what the relative contributions mean. Page 11, In the table of wastewater flows (Table 2), it lists Meridian and Nampa as having discharges of 5.5 cfs and 13.9 cfs, respectively. In their letters, Meridian and Nampa state having a discharge of 10.7 cfs (6.9 mgd) and 15.4 cfs (10 mgd), respectively. It is noted that both of these current outflow numbers (from the letters) are greater than the projected flows for years 10-15 (see page 26). Page 15, The first paragraph indicates a summary of the mass balance model used for the assumption of % the method detection level, is in Appendix A. However, Appendix A contains Land Use and Water Balance Issues. Page 26, Is part of the letter missing? It seems incomplete. Page 43, What are the agricultural BMPs? Are there any for the agricultural application of fertilizers? Pages 44 & 45 Even though the land is converted to residential, won't there still be TP in the runoff from residential fertilizers and doesn't this conversion shift the load to the WWTPs? The load would be converted to constant load versus a seasonal load. With an increase in population wouldn't there be an increase in TP load going to the WWTP from the increase in detergent use? Are there any local or city outreach programs that are in place or can be established to educate the public on these issues? The City of Meridian has in their general plan to construct another WWTP in the next 10-15 years. This plan would require them to achieve 100% reuse for the new plant and 50% reuse for the existing plant. Using the discharge listed in their letter 10.7 cfs (6.9 mgd) and dividing it equally between the two plants, according to this plan they would have to reuse 8.0 cfs (5.2 mgd). Is this a reasonable number to expect?	Table 1, There is a discussion of relative contributions on Page 9. Page 11, The projected flow calculations for all facilities are estimated values based on 2004 DMR flow reports and potential projection populations as determined by COMPASS. These estimates are placeholders because actual flow to be used in future permits to determine loads will be based on real-time facility plans submitted by each discharger at the time of permit application. On a watershed-wide basis, total projected WWTF loads are estimated based on current per capita WWTF discharge volumes applied to future population projections. This means that for some of these facilities will likely serve more people and require greater loading than these placeholder estimates. To accommodate this, such a discharger may be allocated a portion of the lumped watershed-wide "Reserve" allocation as determined by their facility planning. Page 15, This has been corrected. Page 26, This is all that was received. Page 44 & 45, The WWTPs are required to remove phosphorus and agriculture would fall under a voluntary program. High removal rates for total phosphorus will be required for all WWTPs in the valley. Eventually, there will be no load capacity for additional sources, so wastewater reuse will be the only option.
Page 46, See comment for page 11. Based on their letters, Meridian and Nampa are already above their 10-1 5 year projection. Using the City of Meridian as an example and using the current and projected (2020) populations given on page 80; the current population of 62,997 produces a discharge of 10.7 cfs (6.9 mgd from letter) or 109 gallons of wastewater per person per day. If this value is used to calculate the projected discharge for 2020, using a population of 97,172 people, the projected flow would be 16.4 cfs (10.6 mgd), not 6.7 cfs.	Page 46 (2), See response to comments on Page 11 above.
Page 54, (Using data from previous comment) For Meridian, if flows increase to 16.4 cfs (comments on page 46) for 2020, how is it going to be kept in check by reuse if they are above the projected allocation? Even if they reuse half of the 16.4 cfs it is still above the projected (allocated) flows of 6.7	Page 54, See response to comments on Page 11 above. The wastewater reuse season will be included in permits, and will in all likelihood include May through September or more months weather depending.

cfs and the reuse only occurs in the summer months. What is the schedule for reuse? (May-September)	
Page 55, Are there any outreach programs to farm groups or to homeowners associations? Are there any possible research grants or projects that can be planned for or implemented? Can programs through the Idaho Department of Agriculture, NCRS, Ada and Canyon Counties, or other programs that help farmers with fertilizers or irrigation be incorporated into this plan?	Page 55, There are may outreach programs for farm groups and homeowners associations. Information concerning these is currently available on line for the offices of the agencies or local governments you have referred to.
General comment, 40 CFR 130.33 (b) (10) requires an implementation plan to include a monitoring plan to determine if the allocations are being met. We suggest adding a section or appendix addressing the monitoring being done by USGS and the watershed council's relationship with them.	General, The monitoring plan in the document describes all the elements of future monitoring in the Boise River. The agencies and local governments involved are aware of their responsibilities.