# *Report on Water Quality Data, and Research Activity in Blaine County, Idaho*

*By*

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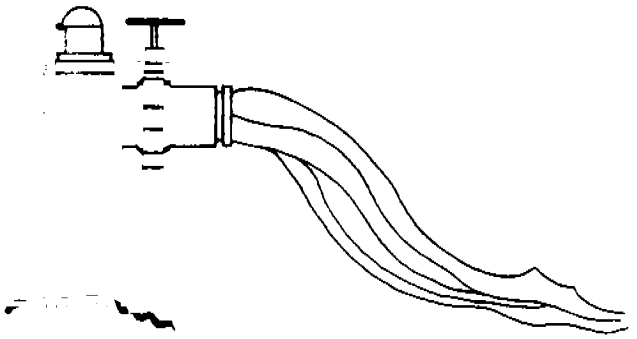

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# *Report on Water Quality Data and Research, Activity in Blaine County, Idaho*

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**Blaine County Commission**

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# Report to Blaine County Commissioners
## *Assessment of Water Quality Data and Research Activity in Blaine County, Idaho*

### Project History & Purpose

Rapid population growth in Blaine County, Idaho (County) underscores the necessity of developing prudent land and water use strategies in order to avoid undesirable consequences. Recent Census Bureau statistics state the rise in Idaho's population not only outpaced the nation but 43 other states as well. Even though the "rate" of the rate of growth is diminishing, Idaho is still ranked 7th in American population increase. Between April 2000 and July of 2001 Idaho grew over two percent.[1]

Rapid population growth ushers in a host of unwanted passengers, among these problems is the ever-constant threat water quality degradation. Since the mid 1990s, for example, Blaine County's population has grown from 13,000 to over 18,000 persons calling for the South Central District Health (SCHD) Department to issue over 1,000 new on-site sewer permits; an average of 128 new permits a year since 1991. Simultaneously, increasing reports of septic tank failure, biological contamination, and non-point nutrient pollution present evidence of surface and groundwater quality at risk. In addition, back to back drought years made Water Year 2001 driest year since records began; the gauge at Ketchum Ranger Station recorded a scant 7.81 inches of precipitation.[2]

Prompted by these occurrences, in July of 2001, Blaine County Commissioners initiated the exploration of a tentative plan to monitor and protect drinking water in the un-incorporated sector of the County. Subsequently, the County contracted a study to:[3]

> ...identify and assess previous investigations with respect to groundwater quality in Blaine County, Idaho. In addition to the enumeration of existing groundwater quality studies, this project will also evaluate this information with respect to compatibility and potential integration into either a ***Groundwater Quality Monitoring Protocol*** or ***Source Water Protection Plan***

What is to follow represents a summary of results obtained in the effort to fulfill this mission. In all, 21 personal interviews were conducted with knowledgeable experts, over 20 scientific studies reviewed, and 6 major Idaho water quality documents appraised, along with numerous WebPages, policies, and laws (see Appendices).

## Current Water Quality Projects

Viewed from afar, it appears many state and local agencies are involved in water quality data collection and analysis, thus presenting the interested bystander with a bewildering array of scientific activity. In an effort to disentangle confusion, this report follows a federalist approach seeking to explain the various programs in descending order by "level" of government.

**Federal Activities** - The U.S. Departments of Interior (DOI), Agriculture (USDA), and Commerce (DOC) as well as the Environmental Protection Agency (EPA) are currently involved in water quality research in Idaho. By far the biggest national player in this group is DOI---home to the Bureaus of Reclamation (USBR), Land Management (BLM), National Park Service (NPS), US Fish and Wildlife Service (USFWS), and the US Geological Survey (USGS). While most of these line agencies are represented in Blaine County, only DOI and EPA are actively engaged in pursuits directly connected to water quality monitoring.

***US Geological Survey*** - The USGS has been active in Blaine County since the turn of the century. Beginning with the collection of stream flow measurements, the USGS first measured the Little Wood River (1904), followed by the Big Wood River (1916), and Silver Creek (1920).[4] Later, in the 1950s, the USGS added groundwater tables to its protocol; in Blaine County today, there are 16 "observation" wells where groundwater levels are taken annually. Beginning in the early 1990s, a collaborative effort by the Idaho Department of Water Resources (IDWR) and the USGS was initiated to build a statewide groundwater quality database (discussed in detail below under IDWR).

Today, historical water data are digitalized and available either from the internet or USGS as printed documents; real-time flow values are also electronically accessible (i.e. Station 13139500 on the Big Wood River at Hailey).[5] The full extent of the USGS/IDWR partnership to sample groundwater quality is explained below in the IDWR section.

The second category of water research conducted by USGS is the National Water Quality Assessment Program (NAWQA). Facing new challenges concerning water quality issues in 1985, the USGS established a program to provide: (1) a nationally

consistent description of water-quality conditions; (2) define long-term trends (or lack of trends) in water quality; and (3) explain the major natural and human factors affecting water quality. In 1986, a pilot program was begun to refine methods for a full-scale national water-quality assessment program. By 1989, the program was fully funded and NAWQA was underway to develop long-term consistent and comparable information on more than 50 major river basins and aquifers across the nation. Generally speaking, NAWQA focuses upon critical areas with more than 4,000 square miles and studies them intensively on a rotating, long-term cycle (every 3 to 4 years). In Idaho, two study units were designated: the Upper Snake (Unit 48 – touching on parts of Blaine County), and Northern Rockies (Unit 46 – in the Panhandle).[6]

***US Environmental Protection Agency*** – President Nixon created the Environmental Protection Agency by Executive Order in 1970 and most of its responsibilities are specified in major pieces of environmental legislation such as the National Environmental Policy Act (42 USCS 4321, 1969), Clean Water Act (33 USCS 1251, 1972), and Safe Drinking Water Act (42 USCS 300f, 1974) as amended. Idaho is part of EPA's Region 10 along with Montana, Washington, and Alaska. As lead agency protecting America's environment, EPA often delegates oversight responsibility to individual states, which, in this case, primarily means IDEQ.

EPA maintains major database archives amalgamating information from a variety of contributors. Digitalized water quantity and quality information can be retrieved from either the Legacy Data Center (LDC) or from its STOorage and RETrieval System (STORET).[7] For the most part, STORET and LDC simply divide their respective databanks chronologically, LDC warehousing information collected prior to 1999 and STORET holding data subsequent to 1999. More recently, EPA has begun to operate the national arm of the Safe Drinking Water Information System (SDWIS-F) where source water protection information from public water systems throughout the United States is warehoused. A final databank maintained by EPA is the Environmental Information Management System (EIMS) focusing on the organization of descriptive information (metadata) for data sets, databases, documents, models, projects, and spatial data.[8]

Three EPA national activities currently affect Idaho in general and Blaine County in particular: (1) establishment of Total Maximum Daily Loads (TMDL) for impaired

surface water streams; (2) directives from the Safe Drinking Water Act Amendments; and (3) clean up activities taken at Triumph under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA---Superfund---(42 USCA 9601 *et. seq.* ).[9]

EPA's role in the TMDL process was established by the Clean Water Act during the early 1970s when Section 303 (d) of the law directed each state to assess its surface waters and list those streams considered to be "impaired" by pollutants. An impaired stream is, by definition, unable to fulfill its beneficial uses such as drinking water, agriculture, or instream values for fish and wildlife. If a stream is designated as impaired, then a TMDL study is conducted to determine the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure the water body can be used for the purposes that each state so designates. All states, territories, and authorized tribes are to submit their list of waters on April 1 of every even-numbered year, except in 2000. In March 2000, EPA issued a rule removing the requirement for the 2000 list - though some states are choosing to submit such lists on their own initiative. The highlights of the TMDL process are explained below under the IDEQ section.

The second EPA activity affecting Blaine County stems from the reauthorization of the Safe Drinking Water Act in 1996. To promote national primary drinking water standards, Congress directed EPA to support protection of all public drinking water systems. Building on foundations laid by earlier wellhead protection programs, EPA now sought to identify all potential sources of surface and groundwater contamination. This community--based approach to protecting drinking water set out procedures and criteria for identifying boundaries of areas constituting sources of drinking water for public water systems. This process begins with each state submitting a program and once EPA approves the state takes the lead in implementation and execution. EPA's goal is to have 30,000 public water systems develop Source Water Protection Plans (now called Drinking Water Protection Plans) by 2006.[10] This on-going activity is administered by Idaho Departmental of Environmental Quality and will be discussed below.

***US Natural Resources Conservation Service*** – The NRCS grew out of the older organization known as the Soil and Conservation Service. It is active in Blaine County as

an adjunct to growers and those interested in protection of natural resources. In addition to in-the-field services, the NRCS compiles information of a scientific nature and publishes them periodically. The most notable information compiled for this region appears in the *Soil Survey of Blaine County Area, Idaho* last updated in 1985. While few of these data are digitalized, the manual remains important for soil and water scientists as well as farmers. Moreover, the survey contains soil maps, engineering indices of properties and their characteristics. Also, the NCRS houses aerial photographs for reference and publishes the occasional scientific study on specific topics.

## State Agency Programs

Turning to the State's water quality monitoring activities, it should be stressed that most discussions of water "quality" are usually referring to drinking water. Thus in Idaho, when the topic is drinking water, 95 percent of the time we are really talking about groundwater. In 1989, the Idaho legislature passed Senate Bill 1269 known colloquially as the "Ground Water Protection Act." This bill created a special council to devise a statewide groundwater plan and delineated the responsibilities of the various agencies. Basically, IDEQ was made the primary agency to coordinate and administer groundwater quality protection programs while IDWR was charged as the research arm to collect baseline data. Lastly, the bill authorized the Idaho Department of Agriculture (IDAG) to regulate pesticides and fertilizers as well as the licensing applicators.

***Idaho Department of Water Resources*** - By 1991, the Ground Water Quality Council approved and sent to the legislature an Idaho Ground Water Quality Plan. This plan was designed to work conjunctively with the pre-existing Idaho State Water Plan; together these policies are to manage protection of groundwater quality, prevent contamination, and provide remediation of groundwater already impaired. The Groundwater Quality Plan (enacted in 1992), stipulated IDWR as the responsible agency to create and sustain a Statewide Ambient Groundwater Monitoring Program with three primary objectives:

- Characterize the groundwater quality of major aquifers
- Identify trends in groundwater quality in major aquifers
- Identify potential groundwater problem areas

Initial data were collected during a First Round (1991-94) to address the first and third objectives while a Second Round (1995-98) focused on analysis of trends. A Third Round (1999-2003) was set aside for trend monitoring. With IDWR responsible for overall administration, analysis of data, and writing of reports, the USGS became the field partner guiding acquisition of water quality data. According to this Plan, any significant groundwater quality problems found by IDWR are then handed over to either IDEQ or IDAG for action.

In 1991, the IDWR/USGS partnership created the Statewide Ambient Groundwater Monitoring Project to include a network of 1,500 monitoring sites. Selection of monitoring wells for scientific purposes is done randomly and all wells are required to meet rigid construction standards. During Round 1 (1991-94), and Round 2 (1995-1998) 26 wells were sampled. Only one well---4N 17E 12 ADB1 just north of Ketchum---is sampled each year. Until this year the remaining wells were sampled on a rotational basis (between 5-10 per year) with the cycle repeating every 4 years. Beginning in 2001, however, IDWR added more wells increasing its rotation to 5 years. These sites are analyzed for 30 chemical constituents and should not be confused with the observational wells USGS samples annually for depth to static water tables (see Table 1).[11]

The Median change in Nitrate values for Blaine County increased by 0.258 mg/L between Round 1 and Round 2 and while this increase may be statistically significant it is inconsequential. In other words, given the laws of probability the increase is genuine and not happening by chance but is of such a low magnitude it is not an immediate cause for concern. Science considers values below 2.0 mg/L to be occurring naturally background not from human activity thus an increase of 0.258 mg/L is well below the threshold of concern.

The set of wells for Blaine County stretches to the southern tip of the County bordering the interstate. In an effort to focus more on the Wood River Valley growth corridor, the author did some analysis of his own. Using IDWR data, it was possible to isolate 9 wells from Ketchum to the Belleuve Triangle and retrieve Nitrate data. Analysis of this subset of wells indicated similar results to the entire County. The Nitrate

Table 1 – Location & Cycles of USGS/IDWR Wells in Blaine County

| Well Location | 1991 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 | 01 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7N 14E 17DDB1 | | | | XX | | | | XX | | | |
| 5N 16E 10CAA1 | | | XX | | | | XX | | | | XX |
| 5N 17E 14CBC1 | | XX | | | | XX | | | | XX | |
| 4N 17E 12ADB18* | | | XX | | XX | XX | XX | XX | XX | XX | XX |
| 4N 18E 30ADB3 | XX | | | | XX | | | | XX | | |
| 3N 18E 18AAA1 | XX | XX | | | XX | | | | XX | | |
| 3N 18E 32DBA1 | | | | XX | | | | XX | | | |
| 2N 18E 15CCA1 | | XX | | | | XX | | | | XX | |
| 1N 19E 07BAC1 | | | XX | | | | | XX | | | |
| 1N 19E 07CDB1 | | XX | | | | XX | | | | XX | |
| 1S 18E 31DBC1 | XX | | | | XX | | | | XX | | |
| 1S 19E 06ADD1 | | XX | | | | XX | | | | XX | |
| 1S 19E 20ABB1 | | | | XX | | | | XX | | | |
| 1S 20E 19BDA1 | | | XX | | | | XX | | | | |
| 1S 20E 26CDC1 | | | XX | | | | XX | | | | XX |
| 1S 21E 14CDB1 | XX | | XX | XX | XX | | | | XX | | |
| 1S 21E 22BCC1 | XX | | | XX | XX | | | | XX | | |
| 1S 21E 23BCB1 | XX | | | | XX | | | | XX | | |
| 1S 21E 34BDD1 | | XX | | | | XX | | | | XX | |
| 1S 21E 35DCB1 | | | XX | | | | XX | | | | |
| 1S 21E 03DDA1 | XX | | | | XX | | | | XX | | |
| 2S 29E 10CCA1 | | | XX | XX | | | | | XX | | |
| 5S 27E 17BCA1 | | | | XX | | | | XX | | | |
| 8S 26E 12BCA1 | | | XX | | | | XX | | | | |
| 9S 27E 02CBB1 | | | | XX | | | | XX | | | |
| 9S 27E 12ACC1 | | | XX | | | | | | | XX | |
| TOTAL 26 WELLS | 7 | 6 | 10 | 8 | 8 | 6 | 6 | 7 | 9 | 7 | 3 |

Source: Annette Campbell, USGS Section Chief Groundwater Levels Data

increase for Blaine County was +0.26 mg/L while the change for the Wood River Valley/Bellevue Triangle growth corridor was +o.24 (Table 2). To interpret this information it is helpful to remember:

- 10 mg/L is the EPA Maximum Contaminant Level for Nitrate
- 2 mg/L or less is considered "natural background"
- to be considered a Nitrate Priority Areas either 25% of wells sampled must exceed 5 mg/L or 50% of wells sampled must exceed 2 mg/L.

Table 2 - Nitrate/Nitrite ($NO_X$) Values for 10 Wells Located Along Wood River Valley Growth Corridor from 1991 to 2000. Source USGS/IDWR

- 4n 17E 12ADB18 has N0x values for 1986 of 0.11 and 1987 of 0.14

| Well Location | 1991 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 | TREND |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4N 17E 12ADB18* | | | 0.23 | | 0.13 | 0.18 | 0.13 | 0.15 | 0.16 | 0.16 | No Change |
| N4N 18E 30ADB3 | 0.35 | | | | 0.22 | | | | 0.18 | | Decrease |
| 3N 18E 18AAA1 | 0.16 | | | | 0.2 | | | | 0.37 | | Increase |
| 3N 18E 32DBA1 | | | | 0.49 | | | | 0.61 | | | Increase |
| 2N 18E 15CCA1 | | 0.79 | | | | 1.3 | | | | 0.87 | Bimodal |
| 1N 19E 07BAC1 | | | 0.61 | | | | | 0.85 | | | Increase |
| 1N 19E 07CDB1 | | 0.27 | | | | 0.6 | | | | 0.42 | Bimodal |
| 1S 19E 06ADD1 | | 0.44 | | | | 0.73 | | | | 0.52 | Bimodal |
| 1S 19E 20ABB1 | | | | 0.36 | | | | 0.36 | | | No change |

Most data are available either through the IDWR or USGS WebPages. The 1992 Groundwater Plan stated data should also be available to the general public by an Environmental Data Management System (EDMS) databank. While this databank can be found on IDWR's WebPage its format makes it difficult for the public to access and it remains unclear what information is available through this databank.[12]

***Idaho Department of Environmental Quality*** – IDEQ supports four programs of interest to Blaine County: (1) evaluation of Total Maximum Daily Loads in surface water bodies; (2) administration and monitoring of Public Water Systems; (3) investigation of Nitrate Priority Area; and (4) implementation of Source/Drinking Water Protection.

"TOTAL MAXIMUM DAILY LOAD" – The surface water investigation known as TMDL was mentioned previously in the EPA section. In Idaho, the EPA relinquishes this responsibility to IDEQ. In the effort to assess TMDL requirements for Idaho's surface water bodies, Section 39-3615 of Idaho Code divides the state's rivers into six "Hydrologic Unit Codes" (HUC). Blaine County has two watersheds within the Upper Snake HUC: Big Wood River (HUC 17040219) and Little Wood River (HUC 17040221). For the past four years both the IDEQ and a citizens' Watershed Advisory Group (WAG) have been developing a Big Wood River Watershed Management Plan. A Draft Plan was submitted to IDEQ headquarters in December 2001 and final approval from EPA is anticipated in early 2002. Highlights of this report include the determination that surface waters above Sawtooth National Recreation Area (confluence of the Big Wood River and the North Fork of the Big Wood River) are in good shape and

segments of Horse, Owl, and Baker Creeks are to be removed from the 303 (d) impaired list. The remainder of the Big Wood River south of SNRA, however, will sustain its impaired status for a variety of reasons. For example, from Trail Creek to Glendale Diversion, IDEQ studies found the Water Quality Index went from good to poor between the 1970s and the 1990s due principally to increases in fecal coliform bacteria, total solids and total nitrogen.[13] Currently, the WAG/IDEQ are shifting assessment from the Big Wood River to the Little Wood River. The issue of contaminants in the Big Wood River touches upon groundwater quality in the County due to surface and groundwater connectivity where gaining reaches of the Big Wood River could be susceptible to contamination from nutrients and bacteria leaching into the river from groundwater sources.

"PUBLIC WATER SYTEMS" - Turning to Public Water Systems (PWS) we find they are defined in federal law and refined by state code as a: "...piped water system for human consumption having at least 15 service connections or regularly serving an average of at least 25 individuals a day for 60 days per year.[14] Public Water Systems are separated into the categories of Community (i.e. residential units which can be large or small) and Non-community. A "small" community public water system has at least 15 service connections used by 25 or more residents for 60 days a year; "large" systems have 25 or more connections serving 100 or more residents for a minimum of 60 days a year. Taking the PWS classification a step further, the Non-community PWS group is subdivided into Non-community/non-transient (i.e. a factory) and Non-community/transient (i.e. a campground).[15]

An agreement between SCHD and IDEQ delineates respective oversight authority with respect to septic systems, public water systems, solid waste, and sanitary restrictions for subdivisions. Essentially, the SCHD has jurisdiction over small community PWS while IDEQ oversees large community PWS systems. [16] Idaho and federal groundwater monitoring policy requires community and non-community/non-transient PWS to test monthly for biological contaminants as *Giardia labia* and *Total Coliforms* while non-community/transient may test every 3 months. In addition, EPA's Primary Contaminant List requires all community and non-community/non-transient PWS to test annually for Nitrates and every three years for 16 Inorganic chemicals (i.e. Arsenic, Cadmium,

Copper, Fluoride); and 54 Organic, Synthetic Organic, and Volatile Organic Compounds. Lastly, Radionuclides (i.e. Beta, Gross alpha, and Radium isotopes) are examined on a 4 year rotation. Supplemental to this list most municipalities also monitor for "Secondary Standards" such as chlorides, sulfates, or Zinc. IDEQ has the capacity to grant both extensions for the frequency of the testing or waivers based on conditions.

State law specifies all PWS operators must be certified, their results reported directly to IDEQ.[17] Traditionally IDEQ entered PWS test results into the database "Drinking Water Information Management System" (DWIMS). Recently, however, DWIMS has been replaced with a system entitled Safe Drinking Water Information System (SDWIS-S). Data acquired from PWS are first digitalized in SDWIS-S then uplinked to EPA databanks of EIMS, SDWIS-F (the "S" in SDWIS-S stands for "state" and the "F" is for "federal") and STORET. Public and local government access to these databanks is restricted but conversations with IDEQ representatives indicate an arrangement for Blaine County access could be provided. At present, though, Blaine County is not able to retrieve directly (via internet) information concerning PWS in the un-incorporated county.[18]

"NITRATE PRIORITY AREAS" – Nitrogen is an abundant natural element essential for all plant and animal life. When nitrogen enters the soil a succession of reactions occurs known as the nitrogen cycle. By-products of human processes affect both the addition of nitrogen (i.e. fertilizers, waster water effluent) and its subtraction (i.e. plant uptake) in subsurface zones. A result of the nitrogen cycle is the combination of oxygen with nitrogen producing a compound known as Nitrate (chemically $NO_3^-$) that can have potentially adverse effects on human health, particularly young infants. For this reason, EPA lists nitrate as a contaminant and specifies a Maximum Contaminant Level (MCL) for drinking water of no more than 10 milligrams per liter of nitrogen measured as Nitrate.

In Idaho, 11 aquifers are identified by the Idaho Groundwater Plan of 1996 including the Snake River Plain Aquifer. Since parts of southern Blaine County fall within the boundary of the Snake River Plain Aquifer, segments of the County are eligible for investigation.[19] Generally speaking, Idaho's aquifers are classified geologically (i.e. valley fill, basalt, sedimentary, volcanic) and administratively (i.e.

General Resource, Sensitive Resource, Other Resource).[20] In Idaho, only 1 of the 11 delineated aquifers is currently designated as a Sensitive Resource (Spokane Valley-Rathdrum Prairie) requiring special groundwater management practices.

It is necessary to underscore the fact that 95 percent of all drinking water in Idaho comes from groundwater. Groundwater monitoring is thus tantamount to assessing drinking water and human health is always a factor. With health in mind, IDEQ has a special interest in watching groundwater regions where nitrate levels have been consistently in excess of EPA and Idaho drinking water standards. These geographic regions of elevated nitrate are referred to by a variety of definitions such as "Area of Critical Concern," "Nitrate Priority Area," or "Degraded Groundwater Quality Areas." All names refer to the same concept with "Nitrate Priority Area" (NPA) being the most common referent. An NPA is defined as a geographic region where groundwater has become so degraded it can no longer meet established water quality standards, designated beneficial uses, or trend evidence indicates such a situation is likely in the not-too-distant future.[21]

In March of 2000, IDEQ issued Memoranda PM00-4 connecting nitrate testing and public policy. This step assembled an interagency/citizen group known as the Ground Water Monitoring Technical Committee (GWMTC) charged with identifying NPAs, devising a way to prioritize regions by level of degradation, and developing groundwater quality management strategies to address problems. Nitrate Priority Areas are divided into two tiers; Level 1 (25 percent of the wells have nitrate levels greater than 5 mg/L) and Level 2 (50 percent of the wells having nitrate greater than 2 mg/L). Using these criteria, the GWMTC originally determined Idaho had 33 NPA regions, an amount later compressed to 25 regions. The GWMTC also devised an elaborate empirical technique incorporating many dimensions to assign rank order to the 25 regions.[22]

Blaine County is clearly not a Nitrate Priority Area. In a search of data for the 1999-2000 ranking process, all PWS wells in the County's river growth corridor/Bellevue Triangle had nitrate levels less than 2 mg/L. Five wells in the Carey area and 2 wells in the southwestern corner of the County had nitrate levels of 2 mg/L and 4.99 mg/L respectively.

Statewide, the Central District Health Department (CDHD) and IDEQ have adopted research policies for dealing with development in NPA regions known as "Nutrient-Pathogen Analysis" (NP Analysis). This technique imposes a pre-development site investigation for nitrate transport prior to subdivision plan approval. The CDHD requires this type of analysis for subdivision proposals involving 5 or more lots and commercial facilities generating 600 gallons or more of wastewater per day in "Areas of Concern." An Area of Concern is defined as a region where nutrient and/or pathogen contamination exists and has the potential to create a health risk or where the soil depth is shallow comprised of mostly coarse grained sediments and the depth to groundwater is 10 feet or less. IDEQ requires a N-P evaluation for applicants whose plans include either a central septic system (with output effluent >2,500 gallons per day or having more than 2 dwellings under separate ownership) or a large soil absorption system (with effluent output greater than 2,500 gallons per day).[23]

The objective of an N-P evaluation is to guide the location of an appropriate number of on-site wastewater treatment systems on a given parcel of land so they will not degrade the already existing level of groundwater quality. When a developer is asked to complete a site investigation this means he needs to hire a geohydrologist or hydrological engineering firm to compile data on the soils, geology and hydrology of the proposed development. Crucial to the success of this endeavor is the accurate determination of the prevalent nitrate and nutrient values, groundwater flow paths, and other aquifer properties. To accomplish these requirements two levels of N-P analysis have been structured by IDEQ. A Level 1 evaluation requires:

- well logs for all bore holes within 0.5 mile radius
- a detailed map showing important hydrologic features
- groundwater depths below surface and flow path direction
- information on soil and geologic conditions gathered from test pits
- data on existing groundwater quality data in project vicinity
- utilization of a mass-balance spreadsheet estimating development impact

The Level 1 analysis usually costs the developer $3,000 to $5,000 and may suffice provided the results of the mass-balance spreadsheet indicate a nitrogen impact to groundwater less than or equal to 1.0 mg/L at the project boundary. Sometimes the developer's hydrogeologist can present data to demonstrate the site is not an Area of

Concern and IDEQ will exempt the requirement. If a Level 2 evaluation becomes necessary, far more technical intervention becomes necessary such as the installation of at least 3 monitoring wells, constituent chemistry analysis, and the construction of a groundwater model with the ability to trace contaminant fate. Level 2 analyses rarely cost less than $10,000. All N-P analyses must be conducted by an experienced geohydrologist who is acceptable to IDEQ. The reason for the control is that the modeling part of a Level 2 site investigation necessitates the use of complex mathematical models such as MODFLOW or MODFLOW MT3D. To date, the only groundwater modeling in Blaine County has been performed by the University of Idaho, Idaho Water Resources Research Institute in the Bellevue Triangle.

"SOURCE/DRINKING WATER ASSESSMENT" – A final area where IDEQ interfaces with local counties about groundwater quality rests upon what has become known as "Source Water Assessments." The Safe Drinking Water Act (1974) was amended in 1986 calling for states to protect ground water. Section 1428 requires all states to develop plans describing: (1) duties of state and local agencies in implementing the program; (2) determination of wellhead protection areas (WHPAs) for each public well or well field; (3) identification of potential anthropogenic sources within the protection area; (4) a program containing appropriate technical and financial assistance for implementation of control measures, education, training, and demonstration projects to protect wellhead areas from contaminants; (5) contingency plans for alternative water supplies in case of contamination; (6) siting consideration for all new wells; and (7) public participation.

In reality, little progress was made by most states in pursuing the Wellhead Protection approach. As a result, the Safe Drinking Water Act was further amended in 1996 but this time each state was called upon more vigorously to create a Source Water Protection Plan. Idaho complied and submitted its Plan to EPA and approval was granted in 1999. Among other things, the Source Water Protection Plan of Idaho said it would make source water "Assessments" for each of its Public Water Systems by May of 2003. This process has been completed for Blaine County's 19 Community and Non-community/non-transient public water systems. Each "Assessment" demanded three things: (1) delineation of impact zones; (2) listing of potential contaminants;

and (3) description of the possible susceptibility of the zone to contaminants.[24] Once the first three steps of the Source Water Assessment---or Drinking Water Assessment as it has more recently been named---are completed, the final task becomes development and implementation of a formal Drinking Water Management Plan.

Delineation of a public water system involves identification of zones of influence where contaminants may enter a water system's recharge zone. Essentially, this process calls for the delineation of three "time-of-travel" (TOT) zones, also referred to as capture zones. These zones include the 3 year TOT (Zone I); the 6 year TOT (Zone II); and the 10 year TOT (Zone III). For instance, the 3 year TOT, or Zone I, identifies the borders of land overlying that portion of an aquifer that will contribute to a PWS well in a 3 year time period. In other words, the outer boundary of the delineation represents the locations from which it would take a molecule of groundwater 3 years to travel to the PWS wellhead. Identification of these three zones suggests groundwater management strategies appropriate to each. For all community and non-community/non-transient public water systems, either a fixed radius method or a refined delineation technique was used to set zone boundaries, depending upon the level and quality of geologic information known about aquifer parameters.

Once delineation is complete, an inventory of potential contaminants is initiated. The emphasis here is on "potential" contaminants and usually centers upon activities such as land fills, agricultural, or industrial operations. A primary inventory---conducted by IDEQ---was performed in Blaine County. A secondary, or Enhanced Inventory, is supposed to be performed by local parties within the public water system. In reality, IDEQ has done the primary inventory and asked PWS's to review it. If the PWS did not respond to this information, it was assumed to be an affirmation of the Enhanced Inventory. Results of this investigation as well as assessment of each of Blaine County's community and non-community/non-transient public water systems PWS' susceptibility to contamination is now available from IDEQ.[25]

The first two of these tasks have been completed by IDEQ for all of Blaine County's 19 community and non-community/non-transient public water systems. What now remains is for each PWS to engage in the effort to take this information and prepare a Drinking Water Protection Plan---formerly known as a Source Water Protection Plan.

It is precisely at this point where confusion can enter the picture due to a "blending" of the organizations involved. Basically three scenarios are at hand, each of which having its requirements. Some "community" public water systems are incorporated cities and may guide activity through a variety of management tools such as municipal ordinances, overlay districts, building codes, design standards, zoning regulations, bonding or other measures as authorized by state law. Thus the City of Hailey is capable of having an entirely different Drinking Water Protection Plan than another type of community public water supply such as a homeowner's association. Groundwater protection alternatives available to, say, Hulen Meadows Homeowner's Association are not the same as the cities of Sun Valley, Carey, or Bellevue. When these entities successfully finish their Plan, they take steps not only to protect their drinking groundwater sources but upon certification from IDEQ other privileges are made available such as ease of waiver exemptions or access to funding.

Blaine County is in a peculiar position with respect to a Drinking Water Protection Plan. Since Blaine County does not supply drinking water it is not a public water system! Does this mean the County should compile a Drinking Water Protection Plan? Surely the County does have a strong interest in the future of groundwater quality and overlooks this challenge only at great peril. It may be true the County is not eligible to be certified as a public water system, on the other hand it possesses strong land sue management tools. In fact, one could argue that since the County's authority begins where a city's authority ends, it has an even greater obligation to engage in drinking water protection. Other counties in Idaho have come to this realization and completed not only groundwater quality management plans but enacted ordinances as well.

Today, two groups in Blaine County are moving along parallel lines: (1) the Source/Drinking Water Protection Committee comprised of representatives from the county and outside support groups (i.e. IDEQ, Idaho Rural Water Association, Environmental Finance Center of Boise State University); and (2) the Blaine County Water Quality Technical Advisory Committee (local citizens, experts, and elected officials).

Both committees could benefit from examining the Plans and ordinances of two Idaho counties: Twin Falls County and Valley County. One of Blaine County's closest

neighbors to the south is Twin Falls County, a region experiencing serious groundwater quality contamination from nitrates. Twin Falls County has been designated as a Nitrate Priority Area where more than 25% of the Salmon Falls and Rock Creek wells within the Statewide Ambient Groundwater Quality Monitoring Program exceed 5 mg/L of nitrate. Some wells have even exceeded the EPA maximum contaminant level of 10 mg/L.

In response to these threats, Twin Falls County recently completed a Groundwater Quality Management Plan.[26] While keeping a future option open should mandatory restrictions be needed, the initial response was a voluntary approach. The Twin Falls plan sets three broad objectives: (1) implement management strategies through voluntary actions; (2) try to reduce nitrate without adversely affecting the economy; and (3) use the plan itself as a communication tool to solicit compliance from the broader community. With the help of IDEQ to assure compliance of regulated sources by periodic review of permits conditions, the Twin Falls Plan pinpoints residential and agricultural activities as primary targets for remediation. Agricultural recommendations for improvement are nutrient management, application of wastewater land surfaces, animal feeding and pasturing, and distribution of solid manure. Residential guidelines are recommended for septic tanks and landscaping along with general suggested improvements for well construction and groundwater recharge.

Valley County has taken it a step further and enacted an ordinance known as the Wellhead Protection Overlay District.[27] While having some apparently contradictory language (i.e. they want to "minimize land use restrictions that: protect life and health") the ordinance establishes an overlay district with three separate zones (50 feet of a PWS wellhead; 3 year TOT; 6 year TOT). Within each zone the ordinance goes on to declare what sorts of activities are restricted (or permitted) within each zone. In actuality, the ordinance creates three overlay districts, one for each zone.

As a final perspective on drinking water protection plans it should be noted that sometimes problems occur due to the intersection of natural boundaries versus political ones. Often an aquifer or groundwater recharge zone can extend across administrative boundaries such as city limits, property lines, or county borders. When this occurs protection can be a problem and perhaps this is precisely where Blaine County can help play a role. Many times, a PWS may have its wellhead within its own domain but the

well's recharge area extends beyond its control. For example, a municipality might have its wellheads or springs within its city limits and thus can take administrative steps to protect its TOT zones but only up to the city's legal boundary. A potential source of contamination could easily be active within the 3 year TOT but be beyond the PWS legal authority to control. Since the County oversees those regions not incorporated by cities, then one role the County could play is to insure that portion of the TOT zone outside the city (but within the county) is protected as per the city's wishes.

## Prior Research Projects

A final task called for assessing previous scientific work for any possible light earlier studies might shed on Blaine County's current water quality issues. Searching archives revealed over 20 investigations dealing with selected issues on the County's water quality. In some instances, the researchers were either dead or whereabouts unknown but in many cases it was possible to discuss findings with principal or secondary investigators. In essence, the strategy was to determine if the data were relevant to contemporary groundwater quality issues and available in digitalized format. Limitations of size require these findings be compressed into an abbreviated format and discussed below in chronological order.

1921 Chapman, S.H. *Water Distribution and Hydrometric Work, Districts 7 and 11, Big and Little Wood Rivers* (Ann. Rept. Water Master, Shoshone, Idaho).

A Watermaster Report dealing with selected surface flows and water quantity.

1952 Jones, R.P. *Evaluation of Stream Flow Records in the Big Wood River Basin, Blaine County, Idaho* (USGS Cir. 129).

Not obtained, examines surface flow data on quantity not quality.

1959 Smith, Rex O. *Ground-water Resources of the Middle Big Wood River-Silver Creek Area* (USGS Water Supp. Ppr. 1478).

Data not digitalized but does contain numbers for a possible comparative trend analysis. The primary objective of this study was to determine the quantity of water available for additional irrigation in the middle Big Wood River areas. It focuses on regions slightly south of growth corridor. Interesting geologic profiles and early estimates of transmissivity, conductance and other aquifer properties.

1960 Smith, Rex O. *Geohydrologic Evaluation of Stream flow Records in the Big Wood River Basin, Idaho* (USGS Water Supp. Ppr. 1479).

Data not available in digitalized format and while mostly an examination of surface flows does contain some interesting connective insights.

1972 Castelin, P.M. & S.L. Chapman, *Water Resources of the Big Wood River-Silver Creek Area, Blaine County, Idaho* (Id. Dept. of Water Admin. Water Info. Bull. 28).

Focus: Bellevue Triangle. Objectives were: (1) identify relationship between water table aquifer and artesian aquifer; (2) develop a water budget; (3) examine connection between ground water in study area and the Snake River aquifer; (4) determine reaches of gain and loss in Silver Creek; (5) look at present and predicted future effect of groundwater development on Silver Creek springs.

Data not digitalized. Measurements are for the period of study with some historical information about groundwater well growth over time. Table 3 (page 37) provides the results of groundwater quality samples taken from 36 wells across 22 parameters and the same for surface water. These measurements (and others) might lend themselves to rechecking for changes in value since 1954. Among the author's conclusions of note are: (1) no long term groundwater level decline that would indicate a change in groundwater storage, the system is in equilibrium; (2) surface and groundwater quality are good in the area; (3) the present level of development has not adversely affected water resources in the basin; (4) additional large scale agricultural development could affect the quantity of water withdrawn from the aquifer; and (5) recommended that no restrictions on ground or surface water development be initiated.

1975 Castelin, P.M. & J.E.Winner, *Effects of Urbanization on the Water Resources of the Sun Valley-Ketchum Area, Blaine County, Idaho* (Id. Dept. of Water Admin. Water Info. Bull. 40).

Three years later Castelin added an aquatic biologist (Winner) and they looked at water quality issues in the northern part of the Wood River Valley. This time the objectives were: (1) determine aquifer properties in Sun Valley/Ketchum area; (2) asses surface and groundwater connectivity; (3) describe water use of urbanizing areas; (4) determine quality of surface and groundwater; (5) establish a base of hydrologic data for future use. This report contains solid geologic work and one of the few studies actually doing hammer seismology to determine bedrock depths below alluvium. Field observations for river flows were taken at intervals between 1972 and 1974 and the same for groundwater. Unfortunately, the author warns "the small number and distribution of wells...precludes any accurate representation of groundwater flow pattern...." (p. 25). Measurements for depth from over 100 wells and groundwater quality samples from 14 wells on 17 parameters were taken in the 1972-74 period providing a possibility for trend analysis. Conclusions suggest the ultimate potential for water supply of the aquifers remains unknown and that the rivers and aquifers are highly connected. Groundwater quality is "adequate" for current uses and while bacteria are found in surface waters the river remains free of chemical pollutants. The report recommends the establishment of observation wells would be a big improvement over having to use existing wells. Fecal contamination in Warm Springs Creek and Trail Creek should be investigated and remedied and any new projects using septic tanks in these areas denied. He further recommends not granting building permits near the river along with other scientific work.

1977 Moreland, J.A., *Ground Water-Surface Water Relations in the Silver Creek Area Blaine County Idaho* (Id. Dept. of Water Admin. Water Info. Bull. 45).

An elaborate scientific assessment by USGS probing the connection between surface and groundwater recharge and the tributary springs of Silver Creek. Moreland drilled two test holes to identify lithologic units and define the sequences of deposition in the area. This study is replete with geologic and hydrogeologic data but limited to one region and does not contain groundwater quality information. Has potential for trend analysis in terms of water tables since 88 wells were measured in 1975. No conclusions beyond geohydrologic ones. Excellent data and maps.

1978 Brockway, C. E. & K.P.Grover, *Evaluation of Urbanization and Changes in Land Use on the Water Resources of Mountain Valleys* (Id. Water Resources Research Insti.; Univ. of Id.)

The Idaho Water Resources Research Institute first introduced the use of a mathematical model to study groundwater in Blaine County in the mid 1970s. After selecting the Bellevue Triangle as the appropriate focus 3 objectives were specified: (1) obtain field data on the geohydrology of the region and develop a simulation model to evaluate impacts of land use changes on water resources; (2) make projections of land use changes and their potential effects on aquifer recharge patterns; (3) determine changes in groundwater levels and surface stream flows as affected by projected changes in recharge patterns. While not addressing issues of water quality, this model predicted severe decreases (down 38%) in Silver Creek flows due to the shift from flood and furrow irrigation to sprinkler irrigation. Additionally it said water table and artesian aquifers could drop as much as 16 feet. Admittedly in the early stages of modeling this study made assumptions that may have affected its predictability. Thus far, the dire consequences then projected have not occurred.

1979 Francis, L.J. & T.C. Bjornn, *Aquatic Resources in the Nature Conservancy Portion of Silver Creek* (Forest, Wildlife & Range Exper. Sta.; Univ. of Id.; Tech Rpt. 9)

An investigation enumerating aquatic life in the Nature Conservancy portion of Silver Creek. No water quality data and no conclusions other than recommendations for future study. Excellent treatment of inserts, plants, fish, and stream substrate performed by the Idaho Cooperative Fishery Research Unit.

1982 Luttrell, S.P. & C.E. Brockway, *Impacts of Individual On-Site Sewage Disposal Facilities on Mountain Valleys – Phase I – Technical Completion Report* (Water & Energy Resources Research Instit., Univ. of Id.).

See below.

1984 Luttrell, S.P. & C.E. Brockway, *Impacts of Individual On-Site Sewage Disposal Facilities on Mountain Valleys – Phase II – Water-Quality Considerations* (Water & Energy Resources Research Insti., Univ. of Id.).

In May of 1984 the authors published the findings of a multiple year project. Their earlier (1982) investigation determined current and projected building densities in the study area from the North Fork of the Big Wood River to 3 miles south of Bellevue as well as an evaluation of potential impacts of on-site sewage disposals systems on

groundwater quality. The 1984 objectives were: (1) evaluate current/potential water-quality problems areas identified in Phase I; (2) install a groundwater quality monitoring network of existing wells from which water quality samples could be taken; (3) create a groundwater quality database; (4) evaluate a groundwater flow system and create a water table map; and (5) look at river/aquifer relationships. For the groundwater portion, 50 wells were chosen and sampled in summer 1983 and then a subset (26 wells) monitored every 6-8 weeks through March of 1984. Three chemical parameters were collected, nitrate, chloride and orthophosphate. In addition, data were collected on certain surface water variables. The observation wells were located in East Fork, Warm Springs and Lower Broadford Road. Findings stated no evidence of groundwater contamination was found in any well or surface sample. Wells closer to the river tended to have lower nitrate concentrations and the highest nitrate concentrations were found near an effluent disposal field serving several homes and just south of Bellevue. Lastly, a groundwater contour map was drawn. The authors recommended their data be utilized for any future water quality analyses.

1989 Frenzel, *Water Resources of the Upper Big Wood River Basin, Idaho* (USGS Water Resources Investigation Rpt. 89-4018).

This USGS report centered upon water resources of the Upper Big Wood River Valley. Objectives of this study were: (1) collection of historical geologic, hydrologic, water-use and water quality data; (2) measurement of groundwater levels and aquifer properties; (3) evaluation of surface to groundwater connectivity; (4) collection of groundwater and surface water quality data to determine if urbanization has affected water quality; and (5) estimation of surface water yields. Data on 84 wells were collected during 1986 which might be useful in trend analysis of water tables. Water quality data were collected in November of 1986 and March and August of 1987 at 7 surface and 6 groundwater sites located below populations centers. Groundwater quality values were also drawn on 14 parameters and, interestingly, compared with other studies of nitrate and Orthophosphate for both ground and surface water samples. Most findings were with respect to water quantity but the authors do state that water quality data showed that nutrient concentrations in surface and groundwater were near or below detection levels. They concluded there were "...negligible changes in water quality due to upstream development and sewage disposal."

1993 Schultz, T.S. *Assessing the Impacts of On-Site Sewage Systems on Groundwater Quality Blaine Count, Idaho* (MPH Thesis, Univ. of Washington).

This study is the author's Masters thesis and it seeks to replicate the 1984 work of Luttrell and Brockway. In drawing samples from 18 of the 26 original wells results indicated that levels of nitrates found in 1992 were lower than 1983 while chlorides were slightly elevated (but still far below EPA contaminant thresholds). The findings again present a chance to compare groundwater quality values over time.

1994 Kahlown, M. A. & C.E. Brockway, *Hydrologic Evaluation of the Big Wood River and Silver Creek Watersheds Phase I* (Id. Water Resources Research Insti., Univ. of Idaho).

Phase I sought to collect the data necessary to construct a MODFLOW model of the Big Wood River and Silver Creek watersheds. While an enormous compendium of data, very little information exists with respect to groundwater quality either in the study area or in the Wood River Valley. Some data are recorded, however, with respect to water levels and are available in Unix from IWRRI. See below

1996 Natural Resources Conservation Service, *Silver Creek Watershed Preliminary Investigation* (USDA).

This study was put together by several agencies with the Natural Resources Conservation Service serving as lead. Driven by a request form the Blaine County Soil Conservation District compiled a resource assessment of the water quality problems associated with the Silver Creek watershed. Its objectives were: (1) identify pollution sources impairing beneficial uses; (2) develop alternative solutions to protect beneficial uses in Silver Creek; (3) coordinate activities to minimize duplication and provide a balanced resource management effort; (4) look at future action; (5) look for money; and (6) maintain quality of Silver Creek fisheries. Some water quality information is found here but it is primarily directed toward Silver Creek, not comparative, nor digitalized. Excellent biological insights into the Silver Creek watershed.

2000 Wetzstein, A.B., C.W. Robinson, & C.E. Brockway, *Hydrologic Evaluation of the Big Wood River and Silver Creek Watersheds Phase II* (Id. Water Resources Research Insti., Univ. of Idaho).

Phase II completes the 9 year effort to compile a MODFLOW model of the Silver Creek and Big Wood River aquifers. This model includes aquifer properties, simulated scenarios, and information about data collected during the Reference year of research. No water quality data are contained.

2000 Brown, L., *Summary Report: Hydrologic Evaluation of the Big Wood River and Silver Creek Watersheds* (Id. Water Resources Research Insti., Univ. of Idaho).

Primarily an Executive Summary written to translate technical information from the Phase I and Phase II studies. This report also incorporates new research by the author but does not have groundwater quality data.

## Conclusions

During the past four months this project has required meeting with over 30 water knowledgeable experts and individuals with respect to water quality research activities in Blaine County. In addition, this task has required digesting major government documents and more than 25 scientific investigations dealing with one aspect or another about water in Blaine County. In the paragraphs below are both conclusions that became apparent to this writer as well as some recommendations for the future. I make no assertion these tentative viewpoints are either accurate or represent the final word on the topic. Nonetheless, these observations are tendered in the spirit of presenting the best sense of the matter I can make with the hope of engendering debate, discussion, and further clarification. Since my wife and I live in the Wood River Valley, we, too, have a vested interest in its water quality future.

$C_1$ – Existing historical information on water resources in the growth corridor of the Wood River Valley and the Bellevue Triangle turned out to be more extensive than expected. By far, the preponderance of information deals more with water quantity than water quality, and more with surface water than groundwater.

$C_2$ – Prior to World War II water quality data were sparse but this situation improved in the 1950s. Since then, studies in Blaine County have begun to sample surface and groundwater quality at different points in time providing "snapshots" of water quality at a selected locations. Today, concern for water quality data is emerging and several government agencies and organizations are involved in collected water quality knowledge. For example, The Nature Conservancy just recently established a water quality monitoring protocol on Silver Creek; the USGS/IDWR partnership collects water quality data from both surface streams and wells; and IDEQ records well tests results from 19 community and non-community/non-transient public water systems. While each program has merit, the concern is they do not necessarily directly address the County's concern about water quality degradation in un-incorporated areas where population growth and development is taking place or skip over. In addition, there are gaps in our knowledge about groundwater quality where data/testing are not required from individual domestic wells or septics, especially in older residential areas. What data is collected is often summarized with that particular agency's research purpose in mind: few analyses are shared with either the County or other researchers. Water quality information is warehoused in databanks: EPA (STOret, LDS, SIDWIS-F), IDEQ (DWIMS, TMDL, SIDWIS-S), IDWR (SAGWQN and EDMS), USGS (NWISweb and NAQWA) but the synthesis of this information remains elusive and in some instances not directly available to the general public. In sum, for Blaine County's specific concern with respect to "hot spots" of either biological contamination or growth and development there is no systematic analysis exists of groundwater quality data taken from the same strategically placed wells over time. The closest we have is the water data on Nitrate and other constituents taken by IDWR/USGS in selected wells from Ketchum to Bellevue, but even then there is only one annual monitoring site.

$C_3$ – From the groundwater information we do have it appears quality is not yet at risk in the Wood River Valley/Bellevue Corridor. Certainly the Nitrate studies by IDWR indicate most wells in the region are below the minimal background level for naturally occurring nitrogen and Nitrate levels increased only marginally (+0.24 mg/L) during the 1990s. We accept this tentative conclusion, however, at some risk due to the location, frequency, and period of record for sampling results. The past two years have witnessed sporadic contamination from some subdivisions and private domestic wells in the corridor.

A similar judgment can be made concerning water tables. Data from USGS observation wells show a water table aquifer decline near Ketchum of 1.2 feet between March of 1999 and March of 2000 (-0.5 feet near Bellevue and -2.0 feet at Gannett). But we are not sure what this means? The only way to judge these data would be to examine them from the same wells, over the entire period of record and factoring in precipitation. No such no systematic trend analysis has been undertaken to examine longitudinally water tables in light of key variables such as precipitation, alterations in agricultural practices, and population growth.

$C_4$ – More is understood about the hydrologic water system in the southern part of the growth region than the northern part. Mathematical models, for example, have been constructed for the agricultural region of the Bellevue Triangle in the 1980s and again in the 1990s. In almost all instances, however, this knowledge centers upon aquifer properties, water budgets, flow paths and contours, in a word---water quantity. Existing groundwater quality data are more snapshots in time with no real trend analysis being conducted. While many researchers have recommended his/her data be used in the future for comparison, the fact remains only one researcher (Schultz, 1992) has done so and that was a decade ago.

$C_5$ – At first glance it seems other local government entities in Idaho appear to be further along in their creation of water quality management plans, ordinances, and special districts. Harsh as this might sound, it also can appear as if the motivation for such activity has been driven in an effort to discourage state or federal intervention and regulation by government. Along the same lines, groundwater protection plans of other localities often opt for voluntary rather than regulatory approaches based on the assumption that an informed public will be able to discipline itself and forego short range economic gain for longer range quality of life. This thesis will be tested by time. Lastly, it is apparent in almost all instances the primary impetus to government action has been triggered by diminished and degraded water quality to the point where it is a hazard to human health or the water no longer is capable of meeting its beneficial uses.

## Recommendations

$R_1$ – During the course of this report, it became apparent several agencies and organizations have either already committed resources to probe water quality issues in Blaine County or are willing to do so in the future. Each entity has its own agenda and little communication or coordination exists between them. It is therefore recommended the County help bridge this gap by initiating a summit meeting to explore the possibility of forming a consortium. Such a coalition could enhance the maximum utilization of

scarce resources while creating a final product larger than the sum of its parts. Among parties evincing an interest in such an endeavor are IWRRI, Blaine County, The Nature Conservancy, IDAG, IDEQ, and Blaine County Citizens for Smart Growth.

***$R_2$*** – It is recommended the Source Water Assessment Committee and the County's Water Quality Technical Advisory Committee be merged into a single group charged with completing and implementing a Blaine County Management Plan for Drinking Water Source Protection. Many fine documents and support groups exist to assist in this endeavor. The County clearly has a positive role to play even though it is not, itself, a Public Water System. In particular, the County has the option to help overcome diversity with respect to PWS delineation zones. Not all PWS have the same authority domains. Cities, for example, are PWS who possess strong administrative management tools sanctioned by state law, yet they are limited in authority to their city limits. Often a municipality's wellhead TOT zone may extend beyond city limits yet it has no authority to regulate unwanted practices outside its legal boundaries. A similar situation confronts other forms of community and non-community/non-transient PWS organizations. In light of these exigencies, a Blaine County Drinking Water Source Protection Plan has the potential to support public water systems by underwriting PWS efforts to discourage unwanted practices in their TOT zones beyond their jurisdictional boundaries.

***$R_3$*** – Blaine County Resolution 98-1 "Local Public Interest Water Policy" (January 26th, 1998) states that when the second phase of the aquifer study was completed, the County may "...supplement its 'Local Interest Public Water Policy' where additional data make changes or additions appropriate." Since the aquifer study was completed in the Spring of 2000, it is recommended Resolution 98-1 be reviewed. It is also suggested a training session be established for staff and officials making land use decisions touching upon complex water issues; a review of Resolution 98-1 could be part of this process. It might also be beneficial to reassess County Policy 96-11 "Maintenance and Monitoring of Alterative On-site Sewage Systems."

***$R_4$*** – Some respondents interviewed stated a worry that community PWS as subdivisions were not committed to maintenance and monitoring of their groundwater sources. In other words, once a subdivision or other PWS is completed then maintenance and monitoring can diminish. Idaho Code (IDAPA 58.01.08.554.01) states "*Owners of all community and non-community/non-transient water systems must place the direct supervision of their drinking water system, including each treatment facility and/or distribution system, under the responsible charge of an* ***operator holding a valid certification*** *equal to or greater than the classification of the drinking water system and/or distribution system.* IDEQ is currently pushing for all PWS to have the appropriate level of operator on board by April 2002 but it seems the County could play a role here as well. Perhaps the County could partner with another agency and try to establish a certification/training seminar to held locally once a year. At present, Brown and Caldwell of Boise are assisting in this training and maybe they could approached to offer a remote site seminar? It is also recommended land use project proposals creating, or altering, a PWS be required to include language acknowledging the "certified operator" provision of state law in their application.

$R_5$ – The Idaho Department of Environmental Quality document *Protecting Drinking Water Sources in Idaho* declares the "potential source inventory" aspect of delineation is comprised of two phases. Part I is the "Primary Potential Contaminant Source Inventory" to be conducted by IDEQ which produces reports on each community and non-community/non-transient PWS in Blaine County as well as maps and other GIS tools identifying TOT zones for each system. This phase has been completed. The second part is called an "Enhanced Potential Contaminant Source Inventory" and IDEQ states it is a "...recommended activity for any community interested in source water protection." (P. 10). The Enhanced Inventory allows local parties with hands-on experience to identify sources of contamination not mentioned in IDEQ reports. IDEQ sent copies of the original Source Assessments to the PWS in Blaine County and if they did not hear back from the PWS it was assumed they agreed with the data and the Enhanced Inventory was complete. IDEQ did not conduct original research to make these assessments but instead used historic geologic and hydrologic data from prior studies to determine TOT zones. The County might consider the Enhanced Inventory as an on-going process and seek to determine if the PWS in Blaine County would like any further assistance in "ground-truthing" their respective delineations.

$R_6$ – A constellation of regulatory tools exists for local governments to manage potential sources of contamination within their jurisdiction. The Idaho Local Planning Act of 1975 (codified as Idaho Code Title 67, Chapter 65) provides a firm foundation for local governments to influence land use activities affecting water quality. Aside from purely voluntary measures, regulatory tools are also supported by law. Among these are Zoning Overlay Districts, Zoning Ordinances, Subdivision Ordinances, Source Restrictions, Building Codes, Operating Standards, Design Standards, Site Plan Reviews, Performance Standards, Special Permitting, and Transport Prohibitions.

$R_{6\,(a)}$ – It is recommended the County assess the costs and benefits of creating Overlay Districts conterminal with the boundaries of delineated public water system's TOT zones having the capacity to regulate contaminating practices. The level of regulation could covary appropriately with the type of zone (i.e. 3 year, 6 year, 10 year).

$R_{6\,(b)}$ – It is recommended Subdivision Ordinances be evaluated to protect water quality in regions where the cumulative effects of development are anticipated to become invasive. For example, the practice in Blaine County for plan approval and minimum lot size for septics has been supervised by SCHD but the County could join this effort.

$R_{6\,(c)}$ – It is recommended Subdivision Ordinances be evaluated for adopting the Level 1 Mass-Balance (NP) spreadsheet for proposed subdivision projects with more than 5 residences owned by different property owners. Subdivision Ordinances have been used in Nitrate Priority Areas to compel developers to perform either a Level 1 or Level

2 Nutrient-Pathogen Analysis. Background geochemistry in Blaine County does not appear to warrant the considerable costs involved, but a possible alternative might be to require developers in suspected sensitive areas of Nitrate transport to complete the Level 1 Mass-Balance spreadsheet by an acceptable groundwater professional. This could be required on a case by case basis depending upon location. The use of Performance Standards could also be considered by requiring projects to maintain future water quality indicators at the same or lower levels existent at the time of project proposal.

***$R_7$*** – It is recommended to drill water quality observation/ monitoring wells above and below the historic land fill in Ohio Gulch; at a minimum discuss this prospect with the appropriate public agency (IDEQ or USGS).

***$R_8$*** – It is recommended to evaluate the utility of conducting a trend analysis of historical water quality factors and static water tables in the growth corridor. Also, while the eastern portion of the County was not the primary focus of this report, it did become apparent during its conduct that the area around Carey is experiencing increasing water quality degradation. Any future trend analysis for water quality or quantity should incorporate the Carey region.

***$R_9$*** – It is recommended to assess hiring a Water Quality Technician and equipping a Mobile Water Quality Lab (a trailer). This technique has been adopted by several western communities where the technician provides educational material as well as performs pump efficiency tests, monitors observation wells, and acts as an advisor to County officials. Capital outlay for the lab can be obtained from granting sources while annual support is from general funds, an overlay district, or from "pooled" subdivision fees.

***$R_{10}$*** – It is recommended the County weigh the benefits of establishing its own water quality monitoring protocol. It is true several public agencies currently collect water quality data from wells and public water systems in Blaine County yet this information is often sub optimal because:

a) information acquired is not always available;
b) variation in Quality Assurance of well sampling can occur;
c) only one annual well is sampled in Blaine County;
d.) wells sampled by the IDWR/USGS protocol may (or may not) be in regions of County concern and are on a 5 years resampling schedule;

Recommended is a protocol for three constituents (Nitrate, Fecal Coliform, Chlorides) on a regular basis (once or twice a year) with a wider basis (10 to 20 wells) in regions of concern to the County (i.e. known bacteriological problems or areas of rapid growth). While the use of existing wells with permission overcomes the cost of drilling observation wells, domestic and irrigation wells do not always yield the most accurate results due to pumpage. Estimates of collection and lab fees for 10 wells are $1000 (annual) and $2300 (bi-annual) and double this amount for 20 wells; this estimate includes no provision for transportation, report writing, or consultation.

# APPENDICES

## *Appendix A - Individuals Consulted*

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## Appendix B – Water Quality Documents

*Water Resources Data, Idaho* Vol. 1, (USGS)
*Soil Survey of Blaine County Area, Idaho*, USDA, Natural Resources Conservation Service (1985).

*The 1992 Idaho Water Quality Status Report*, Idaho Division of Environmental Quality; also known as *Idaho Ground Water Quality Plan "Protecting GroundWater Quality in Idaho* By the Ground Water Quality Council in Cooperation with Idaho Division of Environmental Quality, Idaho Dept. of Water Resources, and Idaho Dept. of Agriculture (1996).

*Goals of the National Water-Quality Assessment Program,* USGS

*Idaho Source Water Assessment Plan*, Idaho Division of Environmental Quality, Ground Water Program (1999).

*Protecting Drinking Water Sources in Idaho*, Idaho Division of Environmental Quality, Ground Water Program (2000).

## Appendix C – Water Quality Web Pages

**Idaho Water Resources Research Institute, Univ. of Idaho**
http://www.uidaho.edu/rsrch/iwrri/

**USGS, Water in Idaho**
http://id.water.usgs.gov/

**USGS, Ground Water Levels in America**
http://water.usgs.gov/nwis/gwlevels/?site_no=432657114144801

**USGS, Idaho Stream Flow Conditions**
http://idaho.usgs.gov/rt-cgi/gen_tbl_pg

**The Nature Conservancy's Fresh Water Initiative**
http://www.freshwaters.org/ccwp/lessons.html

**Idaho Division of Environmental Quality**
http://www2.state.id.us/deq/

**US Environmental Protection Agency**
http://www.epa.gov/ebtpages/water.html

**US Environmental Protection Agency, Drinking & Groundwater Regulation**
http://www.epa.gov/safewater/mcl.html

**National Drought Mitigation Center, Univ. of Nebraska**
http://enso.unl.edu/ndmc/index.html

**Idaho Power River Levels and Flows**
http://www.idahopower.com/h2o/h2olevels.htm

**Idaho Dept. of Water Resources**
http://www.idwr.state.id.us/

**Idaho Dept. of Agriculture**
http://www.agri.state.id.us/

**Environmental Protection Agency's "Surf Your Watershed"**
http://www.epa.gov/surf2/hucs/17040219/

**Snake River Basin Adjudication**
http://www.idwr.state.id.us/info/water/srba/main.htm

# ENDNOTES

[1] Quintana, Craig "Idaho Growth Ranks 7th in US," *The Idaho Statesman* December 28, 2001

[2] Computed from personal databank compiled in cooperation with the NOAA National Weather Service and information obtained from the Coop Station at KRS.

[3] ***Proposal*** submitted September 5, 2001 to Blaine County Commissioners

[4] Not all of these Periods of Record are continuous and frequent gaps occur in data records. For example, USGS collected data on Silver Creek beginning in 1920 but only during growing seasons. In the late 1930s they collected flow data year-round but in 1963 ceased gathering information altogether. Flow monitoring was resumed on Silver Creek in 1975 but at a new gauge located several stream miles to the East. Precipitation data was compiled by the author at Ketchum Ranger Station from 1938 through 2001 for both Water Years and Calendar Years.

[5] http://idaho.usgs.gov/rt-cgi/gen_stn_pg?station=13139500; The *Water Resources Data Idaho* can be obtained for any given water year, Volume 1 "Great Basin and Snake River Basin above King Hill" has data on Blaine County. USGS is located at 230 Collins Road in Boise (83702). This information is also available on their WebPages at www.id.water.usgs.gov

[6] See "NWISWeb" at (http://id.water.usgs.gov

[7] For both STORET and LDC see www.epa.gov/storet

[8] For Environmental Information Management System see www.epa.gov/eims

[9] Browse the Region 10 WebPages for a discussion of these topics http://www.epa.gov/r10earth/).

[10] http://yosemite.epa.gov/R10/water.NSF/b...160b57e5ad882564f1004fb92e?OpenDocument

[11] For a map of monitoring well locations in Blaine County see *Water Resources Data, Idaho WY 2000* (USGS WD Report ID-oo-1 Volume 1) p. 238; also see Ken Neely (*et. al) Nitrate in Idaho's Groundwater* Idaho Department of Water Resources Technical Results Summary No. 1 (April 1999).

[12] http://www.idwr.state.id.us/maps/edms/viewer.htm?Title=Statewide%20Ground-water%20Monitoring%20Program

[13] Dr. Balthasar B. Buhidar, Appendix A. *Technical Support Document: Water Quality Data Analysis and Assessment of the Big Wood River Subbasin* (Draft, June 11, 2001, p. 77).

[14] IDAP Chapter 58, Title 1, Chapter 8 Section 002 para. 59 (a) "In general, A system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen (15) service connections or regularly services an average of at least twenty-five (25) individuals at least sixty (60) days out of the year. ...A public drinking water system is either a "community water system" or a non-community water system."

[15] Non-community water system – a public water system that is not a community water system. Transient water system – a non-community water system that does not regularly serve at least 25 of the same persons (employees) over 6 months per year. An example in Blaine County would be the water system at Galena Lodge, or a Recreation District bike path well. Non-transient water system – a non-community water system that regularly serves at least 25 of the same persons (employees) over 6 months of the year, none of which are found in Blaine County.

[16] *Memorandum of Understanding between the Department of Health and Department of Environmental Quality* explains the roles of the Health District and IDEQ. This document clarifies jurisdiction for septic systems, public water systems, solid waste, water pollution/water quality, pumpable wastes, sanitary restrictions for subdivisions and management of complaints. Essentially IDEQ oversees wastewater systems discharging more than 2,500 gallons per day and/or having more than 25 connection while SCHD takes care of PWS systems discharging less than 2,500 gallons per day and/or having between 10 to 25 connections. Water supply systems less than 10 connections or 25 residents are not considered to be PWS.

[17] IDAPA 59.01.08 at 556

[18] Based on personal conversations with IDEQ staff. This is not to say some arrangement might be made for legitimate purposes with state agency database managers.

[19] *Op. cit.,* Idaho Groundwater Quality Plan (1996) pps. 13-14.

[20] IDAPA 58.01.11.300

[21] IDEQ Policy No PM00-4 p. 2

[22] For Nitrate Priority Areas go to http://www2.state.id.us/deq/water/gw/nitrate/Ranking_Final.pdf , for a description of the IDAPA at 58.01.11 Section 300

[23] Rob Howarth, Barry Burnell, and Bruce Wicherski "Nutrient-Pathogen Evaluation Program for On-Site Wastewater Treatment Systems" (IDEQ, June 2001); or see www2.state.id.us/adm/adminrules/rules/IDAPA58/58INDEX.HTM

[24] *Protecting Drinking Water Sources in Idaho* (IDEQ, 2000).

[25] Contact David Risley, Source Water Assessment Program 208.373.0274 or drisley@deq.state.id.us

[26] *Twin Falls County Groundwater Quality Management Plan* (December, 2001).

[27] Valley County Ordinance no. 94-2 (June 25, 1992).