Appendix D

Ground Water Management Areas within the Upper Mid Snake River Subbasin

The following are summaries of ground water management areas that occur wholly or partly within the Upper Mid Snake River Subbasin. This is excerpted from Harrington, H. and S. Bendixen. 1999. Ground water management areas in Idaho: Overview as of 1998. Open File Report, IDWR, Available at: http://www.idwr.state.id.us/planpol/techserv/hydro/GW_Manage_Areas_Rept.htm

BANBURY HOT SPRINGS GROUND WATER MANAGEMENT AREA

Overview of Current Management Status

The Banbury Hot Springs Ground Water Management Area (GWMA) is located in Twin Falls County in southern Idaho (Figure 3). The GWMA was established on April 12, 1983. The resource was declared a GWMA because of declining artesian pressures and concern that over-utilization was being approached.

On December 4, 1985, an order was issued staying the approval of pending water right applications and suspending further development under existing permits. This action essentially established a moratorium on further development. New water appropriations are allowed for domestic uses only.

In April, 1998, a public meeting was held to discuss the status of the GWMA, ground water conditions, and the possible creation of an advisory committee. In November 1998, an advisory committee was formally established with the appointment of 11 people. The objectives of the Advisory Committee are (1) to serve as a forum for collecting and reviewing data; (2) serve as a forum for mediating water related issues within the GWMA; and, (3) develop a ground water management plan for the GWMA.

Hydrogeology

The geothermal aquifer occurs in the Idavada Volcanics and Banbury Basalt. It is a confined system with shut-in pressures ranging from 14 to 250 pounds per square inch or equivalent to 32 to 575 feet above land surface (Street and DeTar, 1987). The recharge area is probably the Cassia Mountains southeast of the area (Street and DeTar, 1987).

A conceptual model developed by Street and DeTar (1987) concluded that the Banbury geothermal system and the Twin Falls geothermal system to the east were hydrologically connected. This opinion was based on well test and monitoring data, water chemistry, and lack of barriers to thermal ground water flow. However, this conceptual model has not been confirmed through data collection or additional modeling. Further analysis of hydrographs is needed to confirm similarity of trends and degree of connection. Barriers

to ground water flow occur as northwest-trending faults in the southwest part of the area (Lewis and Young, 1980).

Current Ground Water Conditions

Hydrographs of ground water levels in wells in the Banbury GWMA are shown in Figure 4. Although similar long-term trends are not apparent among all wells, some general observations can be made. From the late 1970s to mid-1980s, declines in water levels were significant (greater than or equal to 10 feet per year). From mid-1980 to mid-1990, most wells indicated stable water level trends, except for well 09S14E-14BDB1, showed a significant decline during this period (approximately 10 feet per year). From mid-1990s to current, wells in the northwest portion depict declining trends while wells in the southeast portions appear to be relatively stable.

Six wells are monitored within the GWMA. IDWR monitors three wells on a quarterly basis. USGS monitors two wells bi-monthly and one well on a monthly basis. The oldest monitoring data is from about 1980. An additional well outside of the GWMA, known as the Filer Test well (09S16E-20ADD1), is also monitored as an indicator of the geothermal trends in the Banbury and Twin Falls areas.

REFERENCES

Lewis, R. E., and H. W. Young, 1980, Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho, USGS Water-Resources Investigations Open File Report 80-563, 35 pages.

Street, Leah V., and Robert E. DeTar, 1987, Geothermal Resource Analysis in Twin Falls County, Idaho, IDWR Water Information Bulletin No. 30, Part 15, 46 pages.

Figure 3: Banbury Hot Springs Location Map

Figure 4: Banbury Hot Springs GWMA Hydrographs

BIG WOOD RIVER GROUND WATER MANAGEMENT AREA

Overview of Current Management Status

The Big Wood River GWMA is located in southcentral Idaho in Blaine, Camas, Elmore, and Gooding counties (Figure 7). The Big Wood River GWMA was designated by Order of the Director on June 28, 1991. The area was designated to address the connection between ground and surface water within the Camas Creek, Silver Creek, and Upper Big Wood River drainages above Magic Reservoir. IDWR determined that junior ground water diversions were depleting senior surface water flows in the Big Wood River and Silver Creek.

The Silver Creek and Big Wood River drainages had previously been designated as a CGWA on June 21, 1961; however, the designation was rescinded on January 26, 1966, at the request of local water users.

The management policy associated with the current designation allows for the consideration of new ground water diversions; however, applicants are required to demonstrate there will be no injury or can provide acceptable mitigation to prior rights. An advisory committee has not been established.

Currently, a ground water model is being developed by the University of Idaho, Agricultural Research Service, and The Nature Conservancy. The model will encompass the basin from Hailey to Stanton Crossing, east to the area around Picabo. The final report is expected by September, 1999.

Hydrogeology

The aquifers of the Upper Big Wood River, Silver Creek, and Camas Creek area consist of valley and lake sediments underlain by basalts and bedrock. Sediments were deposited within the valley when the Big Wood River and Camas Creek were blocked by lava flows which occurred intermittently near Picabo in the southeast corner of the basin and near Stanton Crossing in the center portion of the basin. Lake deposits consist of discontinuous layers of fine-grained sediments intermixed with coarse sands and gravels. The fine-grained layers become more continuous in the southern part of the basin (Moreland, 1977).

Water occurs unconfined in the northern portion of the basin where only one aquifer is identifiable. In the southern part of the basin, there are extensive silt and clay layers forming confining layers and producing artesian conditions. Springs and seeps which discharge to Silver Creek and other tributaries occur where shallow ground water overrides discontinuous fine-grained layers (Moreland, 1977). The direction of ground water flow is from north to south.

Ground water in the Camas Creek basin mainly occurs under confined conditions. However, water table conditions occur in some of the shallow alluvial deposits. Many wells flow at the land surface, but the flow is usually less than 1 gallon per minute. Ground water flow direction is generally eastward with discharge occurring into Camas Creek and Magic Reservoir (Walton, 1962).

Current Ground Water Conditions

Figure 8 shows ground water hydrographs. Seasonal fluctuations can vary from a few feet to as much as 40 feet per year. Long-term fluctuations appear to mirror wet and dry climatic cycles, as evidenced by rise in water levels in mid 1980s and mid 1990s. Declines during the 1987-1992 drought are apparent in the hydrographs. No overall downward trend is apparent.

Ten wells are currently monitored by the USGS: two on a bi-monthly basis; four on a quarterly basis; and four on a semi-annual basis. The data in the Bellevue-Hailey area

date back to the 1950's. Data in the Camas Creek-Fairfield area date back to the 1970's, with the exception of one well where the data date back to 1944.

REFERENCES

Castelin, Paul M., and Sherl Chapman, 1972, Water Resources of the Big Wood River-Silver Creek Area, Blaine County, Idaho, IDWR Water Information Bulletin No. 28, 44 pages.

Moreland, Joe A., 1977, Ground Water-Surface Water Relations in the Silver Creek Area, Blaine County, Idaho, IDWR Water Information Bulletin No. 45, 42 pages.

Walton, W. C., 1962, Ground-water resources of Camas Prairie, Camas and Elmore Counties, Idaho, USGS Water-Supply Paper 1609, 57 pages.

Figure 7: Big Wood River GWMA Location Map

Figure 8: Big Wood River GWMA Hydrographs

BLUE GULCH CRITICAL GROUND WATER AREA

Overview of Current Management Status

The Blue Gulch area, located in eastern Owyhee and western Twin Falls counties, was declared a CGWA on December 9, 1970 (Figure 9). This declaration was based on a report by Chapman and Ralston (1970) which stated that discharge was exceeding recharge.

At the time, the area was being considered for increased agricultural development through the federal Desert Land Entry program. This would have increased ground water diversions for irrigation. Outstanding water appropriation permits at the time were anticipated to divert over four times the usage. Designation as a CGWA stopped the processing of new applications while allowing the development of existing permits. A management plan has not been developed nor has an advisory committee been formed.

Hydrogeology

Two aquifers provide ground water in the Blue Gulch area. The Idavada Volcanics form the primary aquifer. The Idavada Volcanics composed mainly of silicic, welded ash flows and predominates the surface geology in the southern half of the area. The Banbury Basalt, consisting of three members, occurs in the area. The middle and upper members are important sources of ground water (Chapman and Ralston, 1970).

Depth to ground water varies from approximately 50 to 450 feet. Ground water flows from southeast to northwest with a gradient of approximately 11 feet per mile (Bendixsen, 1993). Ground water discharge occurs to the Salmon Falls Creek and Snake

River. Recharge is from precipitation on uplands and the Jarbidge Mountains to the south.

Current Ground Water Conditions

Hydrographs of most wells in the area (Figure 10) depict the effects of agricultural development that began in 1960s. Ground water levels declined in the Blue Gulch area as agricultural development continued through the 1970's. Government programs in the early 1980's encouraged land to be taken out of production. These programs resulted in a decrease of more than 80% of previously irrigated acreage. Ground water levels began recovering in 1986 with the implementation of the Conservation Recovery Program (CRP). These lands were contracted to be out of production for 10 years. Lands are now being put back into production; it is unknown how much land will be returned to production and if current changes will impact ground water levels.

Water levels in the northwest portion of the area remained unchanged. Shallow wells near Magic Water Canal (08S13E-23CCD1) appear stable. Probably due to its shallow depth, it receives recharge directly from the canal.

Ground water levels are monitored in ten wells. USGS monitors six wells: two on a bi-monthly basis, and four on a semi-annual basis. Prior to 1998, IDWR monitored wells on a semi-annual basis. Beginning in 1998, IDWR began monitoring on a quarterly basis. Data for most wells date back to the late 1960's.

REFERENCES

Bendixsen, Shane, 1993, Summary of Ground-Water Conditions in the Blue Gulch Critical Ground Water Area Eastern Owyhee and Western Twin Falls Counties, Idaho, Idaho Department of Water Resources Open File Report, 22 pages.

Chapman, S. L., and Ralston, D. R., 1970, Ground Water Resources of the Blue Gulch Area in eastern Owyhee and western Twin Falls Counties, Idaho: Water Information Bulletin No. 20, Idaho Department of Water Administration, 36 pages.

Shaff, D., 1979, Memorandum to Norm Young, re: Blue Gulch C.G.A. Irrigation Data, Idaho Department of Water Resources, 3 pages.

Figure 9: Blue Gulch CGWA Location Map

Figure 10: Blue Gulch CGWA Hydrographs

OAKLEY FAN CRITICAL GROUND WATER AREAS

Overview of Current Management Status

The Oakley Fan is located in northeastern Twin Falls and western Cassia Counties (see Figure 23). Originally declared as the Goose Creek-Rock Creek CGWA on January 16, 1962, the boundaries were modified on September 6, 1967, creating three separate CGWAs: Artesian City, Cottonwood, and Oakley-Kenyon. On January 19, 1982, the West Oakley Fan CGWA was established. The four areas create a contiguous tract and have been managed as a single unit.

The order modifying the boundaries and establishing the initial three areas stated "there does not appear to be available unappropriated ground water within the boundaries of the three designated areas. Therefore, new appropriations of water shall not be allowed." The West Oakley Fan order did not specifically prohibit new diversions; however, the order stated that a study had indicated that the available ground water was limited. A management plan has not been developed nor has an advisory committee been formed.

A ground water recharge demonstration project has been ongoing in the region since the early 1990's; however, only limited volumes have been recharged.

Hydrogeology

There are four main aquifers in the Oakley Fan area: limestone, rhyolite, basalt and alluvium (Bendixsen, 1994). The limestone aquifer is confined and yields large supplies. The rhyolite aquifer is confined with yields of small to moderate amounts. Small to large quantities of ground water are supplied from the unconfined basalt aquifer. The unconfined alluvial aquifer yields small to moderate supplies of ground water (Crostwaite, 1969). There are several perched aquifers that are probably the result of surface runoff, storage facilities and surface irrigation.

Faults and surface water bodies affect the ground water flow direction. Ground water flow direction between two northwest trending faults is north to northwest with probable flow restrictions across the faults (Bendixsen, 1994). Murtaugh Lake gains or loses water apparently related to ground water pumpage. The area is bounded on the north by the Snake River. However, river elevations and ground water levels indicate that flow passes under the Snake River to join the Eastern Snake Plain Aquifer at some point between Milner Dam and a point north of Murtaugh Lake (Bendixsen, 1994).

Recharge to the Oakley Fan comes from runoff from streams flowing from the south, surface irrigation, and the Snake River.

Current Ground Water Conditions

Figures 24 through 27 present ground water hydrographs for the four areas. The overall trend in ground water levels thoughout the Oakley Fan is downward. However, individual wells reflect different degrees of responsiveness to climatic fluctuations relating to dry and wet periods.

Water levels in most wells in the Oakley-Kenyon area reflect the wet period in early-mid 1980s. Declines are evident during the drought of 1987-1992. Water levels in this area have stabilized or slightly increased during the recent wet period from 1995 to present.

Water levels in the Artesian City are less responsive to wet and dry periods than water levels in other areas. Most levels in the southern and eastern parts of the area reflect steep declines, while most levels in the north and west parts are more stable.

Water levels in the West Oakley are less sensitive to climatic changes, but are still evident on a smaller scale.

Steep declines in water levels in the Cottonwood area during the 1960s stabilized in the 1970s. However, declines began again in the 1980s and have continued at a less severe rate coinciding with the drought of the late 1980s and early 1990s.

While declines are not as significant as in other areas, water levels in the West Oakley area reflect wet (early-mid 1980s and 1995 to present) and dry cycles (1987-1992).

IDWR monitors 20 wells on a quarterly basis. USGS monitors 14 wells: two wells monthly, nine wells bi-monthly, and three wells semi-annually.

REFERENCES

Bendixsen, Shane, 1994, Summary of Ground Water Conditions in the Oakley Fan Area, IDWR Open File Report, 15 pages.

Crostwaite, E. G., 1969, Water Resources of the Goose Creek-Rock Creek area, Idaho, Utah, and Nevada: Idaho Department of Reclamation, Water Information Bulletin 8, 73 pages.

Edwards, T. K., and Young, H. W., 1984, Ground Water Conditions in the Cottonwood-West Oakley Fan area, south central Idaho: USGS Water Resources Investigations Report 84-4140, 32 pages.

Young, H. W., 1984, Potentiometric-surface Contours, Directions of Ground Water Movement, and Perched Water Zones, Oakley Fan, southeastern Idaho, March-April 1984: USGS Water Resource Investigations Report 84-4231, 44 pages.

Young, H. W., and Newton, G. D., 1989, Hydrology of the Oakley Fan Area, South-Central Idaho, USGS Water-Resources Investigations Report 88-4065, 73 pages.

Figure 23: Oakley Fan CGWAs Location Map

Figure 24: Artesian City CGWA Hydrographs

Figure 25: Cottonwood CGWA Hydrographs

Figure 26: West Oakley CGWA Hydrographs

Figure 27: Oakley Kenyon CGWA Hydrographs

TWIN FALLS GROUND WATER MANAGEMENT AREA

Overview of Current Management Status

The Twin Falls GWMA is located in Twin Falls County in southern Idaho (Figure 32). The Twin Falls GWMA was established on January 11, 1984, based on concern that the thermal system was approaching a critical condition evident by declining pressures and well interference may occur. The order specifically excluded the Banbury Hot Springs GWMA.

A moratorium on new geothermal development was established on July 24, 1987, for a limited area within the GWMA. The moratorium was extended in 1992 and again in 1997 because equilibrium had not been established in the geothermal system. A management plan has not been developed nor has an advisory committee been formed.

Hydrogeology

Both cold and geothermal aquifers occur in the area; however, the Twin Falls GWMA covers only the geothermal aquifer. The geothermal aquifer occurs in the Idavada Volcanics with upward ground water movement into the overlying Banbury Basalt. Water temperatures range from 68 to 111 F° (Lewis and Young, 1989).

Ground water flow direction is northwest (Lewis and Young 1989). Recharge is believed to come from the mountains to the south. A conceptual model of the geothermal aquifer developed by Street and DeTar (1987) described a hydrologic connection with the Banbury geothermal aquifer, although it appears to be poorly understood.

Current Ground Water Conditions

Figure 33 presents ground water hydrographs for the areas. In 1990, Baker and Castelin concluded that an equilibrium has occurred between recharge and discharge in the geothermal system. However, water level declines occurred in most wells in the early 1990s, the result of increased pumpage. The USGS Filer Test well (09S16E-20ADD1) is used as an indicator of conditions in the Twin Falls and Banbury geothermal system. Major declines in shut-in pressures in the Filer Test well in the early 1990s have ceased (Neely, 1998). Annual production by geothermal users appears to have stabilized. However, it is not conclusive whether water conditions have stabilized.

A monitoring program was developed when the Twin Falls GWMA was established. USGS, IDWR, and users have collected data since 1984. USGS monitoring was discontinued in 1994. IDWR-Southern Region has been collecting monthly data since 1994 at three wells. The College of Southern Idaho submits monthly monitoring data to IDWR for its two geothermal production wells.

REFERENCES

Baker, Steven J., and Paul M. Castelin, 1990, Geothermal Resource Analysis in Twin Falls County, Idaho, Part 2, IDWR Water Information Bulletin No. 30, Part 16, 36 pages.

Lewis R. E., and H. W. Young, 1989, The Hydrothermal System in Central Twin Falls County, Idaho, USGS Water-Resources Investigations Report 88-4152, 44 pages.

Neely, Ken, 1998, Memo to Tim Luke, Subject: Twin Falls Geothermal, dated May 22, 1998, IDWR Internal Memo, 6 pages.

Street, Leah V., and Robert E. DeTar, 1987, Geothermal Resource Analysis in Twin Falls County, Idaho, IDWR Water Information Bulletin No. 30, Part 15, 46 pages.

Figure 32: Twin Falls GWMA Location Map

Figure 33: Twin Falls GWMA Hydrograph

Mountain Home Ground Water Management Area and Cinder Cone Butte Critical Ground Water Area

Overview of Current Management Status

The Cinder Cone Butte area, located in Elmore County, was declared a CGWA on May 7, 1981 (Figure 20). Following the declaration, a study was conducted to evaluate the entire Mountain Home area. As a result of that study by Norton and others (1982), the Mountain Home GWMA, which surrounds the Cinder Cone Butte area, was designated on November 9, 1982. The Mountain Home GWMA is located in Elmore and western Ada counties. The areas were designated due to declining ground water levels.

New ground water appropriations are not allowed in the Cinder Cone Butte CGWA. The order declaring the Mountain Home area a GWMA states that the area is approaching critical, "although there appear to be subareas where new appropriations could be authorized without injuring existing water rights."

A management policy was not included in the designation of either area. On June 6, 1996, the Director issued an order establishing an advisory committee. The Committee has the following objectives:

a. Collect and review data;

b. Mediate water related issues involving water users;

c. Develop draft ground water management plan;

d. Develop and propose implementation of a ground water recharge program;

e. Serve as a forum for communication of water related issues.

The composition of the Committee is specified in the order. The Committee does not have any formal enforcement authority.

Hydrogeology

The Mountain Home area contains a regional aquifer system that flows west-southwest. Depth to water in the regional system is usually in excess of 300 feet. Two perched aquifer systems are found in the area: one system in the area in and around the City of Mountain Home, and another system northwest of Mountain Home in Township 2 South, Range 5 East (Young, 1977). Water in the perched areas range from om a few feet to several hundred. Ground water flow direction is south to southwest.

Major geologic units in the area are, from youngest to oldest: 1) alluvium and terrace gravels; 2) Snake River Group; 3) Idaho Group; 4) Idavada Volcanics, and 5) Idaho Batholith. The regional aquifer is found primarily in the Bruneau Formation, a unit in the Idaho Group that consists of fluvial-lake deposits, layers of ash, and basaltic lava flows (Ralston and Chapman, 1968). Two northwest trending faults pass through the northeast part of the area (Bond, 1978). The perched aquifers occur primarily in the alluvium and terraces.

Recharge to the perched system in the Mountain Home area is from Rattlesnake and Canyon creeks, local irrigation, and leakage from Mountain Home Reservoir. Recharge to the perched system northwest of Mountain Home is from percolation from intermittent streams. Recharge to the regional system occurs mainly from downward flow from the perched system, precipitation from the uplands and underflow from the north. It has been suggested that the regional system is quite old based on isotope composition (Young, 1977).

Current Conditions

Ground water levels in the regional system in the southern and eastern portions of the area near the Mountain Home Air Force Base show declines of more than 50 feet since 1968 (Figures 21 and 22). Steep declines occurred during the late 1960s and early1970s. Water levels appeared to stabilize in several wells during the mid-1970s and early 1980s. However, declines began again in the mid to late 1980s and have continued to present. In the northcentral part of the Cinder Cone Butte CGWA, water levels have declined as much as 60 feet since 1976. In the north and northwest parts of the area, ground water levels appear to be stable and have increased by as much as 3 to 4 feet since 1966.

The perched system in and surrounding Mountain Home fluctuates in response to seasonal and climatic cycles. Fluctuations can be as much as 50 feet. Overall water levels appear to be relatively stable based on data collected since 1975.

The IDWR monitors 15 wells on a monthly basis. Prior to June 1998, these wells were monitored on a semi-annual basis. USGS monitors 9 wells, two semi-annually and seven bi-monthly. In November 1997, IDWR contracted for seven additional wells to be monitored on a monthly basis by a private consultant.

REFERENCES

Bendixsen, Shane, 1994, Summary of Hydrologic Conditions in the Mountain Home and Cinder Cone Butte Areas, IDWR Open File Report, 30 pages.

Castelin, Paul M., 1988, Review of Factors Affecting Ground-Water Levels in the Mountain Home Plateau Area Elmore and Ada Counties, Idaho, IDWR Open File Report, 5 pages.

Norton, Marc A., Ondrechen, William and Baggs, James L., 1982, Groundwater Water Investigation of the Mountain Home Plateau, Idaho, IDWR Open File Report, 62 pages.

Ralston, Dale R., and Chapman, Sherl L., 1968, Ground-Water Resource of the Mountain Home Area, Elmore County, Idaho, IDWR Water Information Bulletin No. 4, 63 pages.

Ralston, Dale R., and Chapman, Sherl L.,1970, Ground-Water Resource of Southern Ada and Western Elmore Counties, Idaho, IDWR Water Information Bulletin No. 15, 52 pages.

Young, H. W., 1977, Reconnaissance of Ground-Water Resources in the Mountain Home Plateau Area, Southwest Idaho, USGS Water-Resources Investigations 77-108, 40 pages.