AGENDA

HEALTHY RIVERS AND STREAMS
CITIZENS ADVISORY BOARD
June 17, 2010 - 4 p.m.
Basalt Town Hall
101 Midland Avenue
Basalt, CO 81621

4:00 Public Comment

4:05 Board Comments

4:10 Approval of the Minutes
May 20, 2010 minutes

4:15 FEMA Floodplain Map Project
Catherine Berg
Pitkin County Planning Engineer

5:00 GIS-Based Evaluation Groundwater Resources in Developed and Developable Areas, Pitkin County, Colorado
Kenneth E. Kolm and Paul van der Heijde
Hydrologic Systems Analysis, LLC and Heath Hydrology, Inc.

5:30 Executive Session
Augmentation of stream flows
C.R.S. 24-6-402 (4)(b)

All times are subject to variation without notice

Agenda is subject to change

HEALTHY RIVERS AND STREAMS CITIZENS ADVISORY BOARD
Meeting Minutes
May 20, 2010
Pitkin County Courthouse Annex Plaza One Conference Room
530 E. Main Street Aspen, CO

Board members present: Ruthie Brown, Greg Poschman, Bill Jochems, Lisa Tasker, Andre Wille, Steve Hunter, Rick Neiley Jr.

Board members absent: None

Others present: John Ely, Lisa MacDonald, Dale Will, Cindy Houben, Barb D'Autrechy

---

Public Comment
None

Board Comments
Mr. Poschman has a group of high school students who want to put on a water awareness event in Aspen on the mall either July 31st or August 7th. They would bring in some of the non-profits involved in water awareness. Public performance piece will be by students called Splash Mob. The idea is to inspire people to get involved in water issues in the area.

Approval of Minutes April 15, 2010
Ms. Tasker moved to approve the minutes of April 15, 2010. Mr. Poschman seconded the motion. Motion passed 6 to 0.

Pitkin County Water Resources Investigation
Peter Nichols of Trout, Raley, Montano, Witwer & Freeman, PC along with Kerry Sundeen and Maria Pastore of Grand River Consulting Corp. briefed the Board on the progress of their strategic plan work.

Executive Session
The Board moved into executive session pursuant C.R.S. 24-6-4 402 (4)(b) for the purpose of discussing potential instream flow strategies.
Mr. Wille joined the meeting at approximately 4:35 p.m.
The Board returned from executive session and reconvened at approximately 7:20 p.m.

Adjourn
The Board meeting adjourned at approximately 7:30 p.m.

Approved: **Attest:**

Ruthie Brown – Chairman
Healthy Rivers and Streams
Citizens Advisory Board

Lisa MacDonald

MEMO OF INTEREST

REGULAR MEETING DATE: June 17, 2010

TOPIC: Federal Emergency Management Agency (FEMA) Floodplain Map Project

STAFF RESPONSIBLE: Catherine Berg, Planning Engineer

ISSUE STATEMENT:

The County has been offered a FEMA grant for the digitization and update of our floodplain maps. Currently the majority of our floodplain maps were updated in 1987 and are only in hardcopy form. The total project cost is $517,220. FEMA has committed to providing 75% of the cost, which comes to $387,915. FEMA has accepted an in-kind contribution of $33,150 from our GIS department, and the Colorado Water Conservation Board (CWCB) has put another $20,000 towards the project. The remaining match project cost is $76,155.

The City of Aspen Engineering Dept has verbally committed to a $25,000 contribution to the project, and the Open Space and Trails Board will be discussing the possibility for funding at their next meeting on June 24th.

Snowmass Village, the Town of Basalt, the Forest Service, the Roaring Fork Conservancy, and Redstone Water and Sanitation have been contacted about funding as well, though it appears that these organizations are not in a position to fund this project at this time.

BACKGROUND:

Floodplains link, and play a central role, in maintaining the health of, rivers, lakes, wetlands and estuaries. But in order to function properly, floodplains must be periodically flooded.

Floods and floodplains can bring many benefits to our river system:

- recharges the ground water aquifers,
- makes the soil more fertile ,
- provides nutrients to the soil which is deficient,
- provides much needed water resources in particular in arid and semi-arid regions where precipitation events can be very unevenly distributed throughout the year,
- maintains ecosystems in river corridors,
- maintains floodplain biodiversity,
- floodplains store floodwaters,

- seasonal high flows into floodplains and wetlands help clean water by allowing these areas to filter sediment and pollutants from our rivers,
- natural flow patterns trigger fish spawning and migration in species,
- high flows rejuvenate plant communities, keeping land along rivers scenic and rich as habitat for birds and other wildlife, and
- reduce flood risk for communities downstream.

With this Board and our awareness of the importance of minimum flows through our rivers it is important to establish a baseline from which we can create policy that works to preserve the natural characteristics of our rivers and floodplains.

The project has been broken into two parts, the first would be the digitization of our current maps and the second is the remapping of known developed areas. I believe that remapping the floodplains affected by development will be important, especially as we work to reestablish healthy floodplains as outlined in the "State of the Watershed Report".

With this project the County will gain the following:

- The digitization of all mapped floodplains within Pitkin County.
- New hydraulic studies, and updated floodplain mapping, of the Roaring Fork through the following reaches:
    - Tagert Lakes to Cemetery Lane (11 miles)
    - Jaffee Park to the confluence of Snowmass Creek (7.5 miles)
- New hydraulic studies, and updated floodplain mapping, of the Crystal River through the following reaches:
    - Antelope Drive to North Redstone Blvd. Bridge (3.2 miles)
    - Nettle Creek to the PitCo/Garfield line (5 miles)
- New hydraulic studies, and updated floodplain mapping, of Coal Creek through the following reaches:
    - Forest Service to confluence with the Crystal River (1 mile)
- New hydraulic studies , and updated floodplain mapping, of Castle Creek through the following reaches:
    - Midnight Mine Rd to the confluence of the Roaring Fork (3.6 miles)
- New hydraulic studies of Maroon Creek through the following reaches:
    - Forest Service to confluence with the Roaring Fork (1 mile)
- Work on this project would begin this summer, with new maps to be produced by the summer of 2011. The federal approval process could take up to another year, and would include community outreach.

LINK TO THE BOARD'S OBJECTIVES:

Objectives for the fund:

- *Maintaining and improving water quality and quantity within the Roaring Fork watershed;*

With updated and accurate floodplain maps we will be better able to asses the critical areas to be preserved and reclaimed, and as a result there will be a direct link to the water quality of our watershed.

- *Purchasing, adjudicating changes of, leasing, using, banking, selling, and protecting water rights for the benefit of the Roaring Fork watershed;*
- *Working to secure, create and augment minimum stream flows in conjunction with non-profits, grant agencies, and appropriate State and Federal agencies to ensure ecological health, recreational opportunities, and wildlife and riparian habitat; promoting water conservation; and*

As we continue to work towards maintaining minimum stream flows, it is critical to the river health that we consider the necessity of the flood cycle in maintaining the ecological health and wildlife and riparian habitat of our rivers. With new and updated maps it will be easier for various agencies to model these flows.

- *Improving and constructing capital facilities that contribute to the objectives listed above.*

BUDGETARY IMPACT:

Currently the remaining match project cost is $76,155. With the City's verbal commitment of $25,000 and a potential of approximately $10,000 from the Open Space and Trails Board the remaining balance is $41,155.

ATTACHMENTS:

Summary of Preliminary Flood Hazard Mapping Costs for Pitkin County, CO Map Maintenance, May 14, 2010

Email from Dawn Galdwell dated May 14, 2010.

Table 1 - Summary of Preliminary Flood Hazard Mapping Costs for Pitkin County, CO Map Maintenance

May 14, 2010 – Version 3 (Based upon revised costs by ACE)

By Mark K. Kempton, P.E., Anderson Consulting Engineers, Inc. (970) 226-0120

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
1A	**Roaring Fork River–** Detailed Zone AE Study with BFEs	Tagert Lake downstream to Cemetery Lane Road Crossing **(Total = 11 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study (FIS)	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based upon detailed HEC-RAS Hydraulic Model	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain mapped on 1-foot contour topography – All analyses and mapping to be documented in a floodplain mapping report	Cost per River Mile: 1-Foot Contour Topography = $1,900 (4 miles within existing topo boundary) Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling = $6,000 Floodplain Mapping and DFIRM Production = $1,100 ***Total per River Mile = $10,100*** ***Total Cost* = 7 * $10,100 + 4 * $8,200 = $103,500.**	Meets all FEMA Accuracy Standards

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
1B	**Roaring Fork River–** Detailed Zone AE Study with BFEs	Smith Hill Road Crossing downstream to confluence with Snowmass Creek **(Total = 7.5 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study (FIS)	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based upon detailed HEC-RAS Hydraulic Model	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain mapped on 1-foot contour topography – All analyses and mapping to be documented in a floodplain mapping report	Cost per River Mile: 1-Foot Contour Topography = $1,900 Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling = $6,000 Floodplain Mapping and DFIRM Production = $1,100 ***Total per River Mile = $10,100*** ***Total Cost* = 7.5 * $10,100** **= $75,750.**	Meets all FEMA Accuracy Standards
2A	**Crystal River–** Detailed Zone AE Study with BFEs	Antelope Drive downstream to Redstone Blvd. North crossing **(Total = 3.2 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study (FIS)	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-**	Cost per River Mile: 2-Foot Contour Topography = N/A (All within existing topo	Meets all FEMA Accuracy Standards

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
				upon detailed HEC-RAS Hydraulic Model	**foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain mapped on 2-foot contour topography – All analyses and mapping to be documented in a floodplain mapping report	boundary) Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling = $6,000 Floodplain Mapping and DFIRM Production = $1,100 ***Total per River Mile = $8,200*** ***Total Cost* = 3.2 * $8,200 = $26,240.**	
2B	**Crystal River–** Detailed Zone AE Study with BFEs	Confluence with Nettle Creek downstream to Pitkin/Garfield County boundary **(Total = 5.0 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study (FIS)	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based upon detailed HEC-RAS Hydraulic Model	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain	Cost per River Mile: 2-Foot Contour Topography = $1,500 Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling =	Meets all FEMA Accuracy Standards

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
					mapped on 2-foot contour topography – All analyses and mapping to be documented in a floodplain mapping report	$6,000 Floodplain Mapping and DFIRM Production = $1,100 ***Total per River Mile = $9,700*** ***Total Cost* = 5.0 * $9,700 = $48,500.**	
3	**Coal Creek–** Detailed Zone AE Study with BFEs	Upstream Limit of existing detailed study downstream to Confluence with the Crystal River **(Total = 0.9 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based upon detailed HEC-RAS Hydraulic Model	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain mapped on 2-foot contour topography – All analyses and mapping to be documented in a floodplain	Cost per River Mile: 2-Foot Contour Topography = N/A (All within existing topo boundary) Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling = $7,000 Floodplain Mapping and DFIRM Production =	Meets all FEMA Accuracy Standards

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
					mapping report	$1,500 ***Total per River Mile = $9,600*** ***Total Cost* = 0.9 * $9,600 = $8,640.**	
4	**Castle Creek–** Detailed Zone AE Study with BFEs	Midnight Mine Road crossing downstream to Confluence with the Roaring Fork River **(Total = 3.6 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based upon detailed HEC-RAS Hydraulic Model	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain mapped on 2-foot contour topography – All analyses and mapping to be documented in a floodplain mapping report	Cost per River Mile: 2-Foot Contour Topography = $1,500 (2.4 miles within existing topo boundary) Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling = $6,200 Floodplain Mapping and DFIRM Production = $1,100	Meets all FEMA Accuracy Standards

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
						Total per River Mile = $9,900 ***<u>Total Cost</u>* = 1.2 * $9,900 + 2.4 * $8,400 = $32,040.**	
5	**Maroon Creek–** Detailed Zone AE Study with BFEs	Confluence with Roaring Fork River upstream to Forest Service Boundary **(Total = 1.0 river miles)**	**No** – Use flows from Pitkin County Flood Insurance Study	**Yes – 10-, 50-, 100-year (Zone AE) and 500-year detailed modeling including 1-foot floodway** based upon detailed HEC-RAS Hydraulic Model	**Yes - 100-yr (Zone AE) detailed Floodplain with 500-year Floodplain and 1-foot floodway** with cross sections and Base Flood Elevations (BFEs) – floodplain mapped on 2-foot contour topography – All analyses and mapping to be documented in a floodplain mapping report	<u>Cost per River Mile:</u> 2-Foot Contour Topography = N/A (All within existing topo boundary) Surveying & Field Reconnaissance = $1,100 Hydraulic Modeling = $7,200 Floodplain Mapping and DFIRM Production = $1,100 ***Total per River Mile = $9,400***	Meets all FEMA Accuracy Standards

Option	Flooding Sources	Reach Limits	Hydrologic Analyses	Hydraulic Analyses	Floodplain Mapping	Estimated Cost ($) (See Notes Below)	Accuracy Limitations
						Total Cost = 1.0 * $9,400 = $9,400.	
TOTAL COST (including one time appeals fee of $10,000) = $314,070							

Costs are based upon a grouping of studies. For example; topography will be flown at one time for multiple creeks, surveying and field reconnaissance will be performed for multiple streams at one time.

GENERAL NOTES

1. **All costs are *estimates* only and will need to be refined once a final list of streams to be studied has been decided upon. Topography and Zone AE/A study costs can vary significantly dependent upon the extent of the study areas, and will need to finalized once a list of streams are decided upon.**
2. **Cost to incorporate any new detailed (i.e. 100-year, Zone AE) study or grouping of detailed studies by ACE will be a per study/grouping cost of $10,000 (includes correspondence and co-ordination, the processing of appeals, technical review and revisions, DFIRM revisions, and post preliminary processing related to new BFEs). Cost also includes the identification and mapping of BFEs, additional annotation, flood profiles, floodway data tables, FIS text, possible additional panels, flood hazard area tie-ins, database attribution, and the merging of databases. This cost is included in the above estimates.**

From: Gladwell, Dawn [Dawn.Gladwell@dhs.gov]
Sent: Friday, May 14, 2010 6:56 PM
To: Catherine Berg
Cc: Mark Kempton; Patton, Thuy; Gladwell, Dawn
Subject: Pitkin Project Funding Breakdown

Hi Catherine,

Here is the project breakdown with Mark's new numbers.

Total County Wide project cost with all study priorities: $517,220 (this is with the new study cost estimate of $314,070)
Required 25% match: $129,305
75% : $387,915 - FEMA

In-kind contribution:

Topography = $17,850
GIS = $7,500
Aerial Photography = $7,800

Total in –kind = $33,150

CWCB $20,000 – part of 25% match

Remaining match project cost from Pitkin County Communities: $76,155

Let me know if you have any questions or if we need to cut some scope.

Dawn

HEATH HYDROLOGY, INC. HYDROLOGIC SYSTEMS ANALYSIS, LLC.

GIS-Based Evaluation Groundwater Resources in Developed and Developable Areas, Pitkin County, Colorado.

Introduction

Under a series of agreements with Pitkin County, Hydrologic Systems Analysis, LLC (HSA) of Golden, Colorado, and Heath Hydrology, Inc. (HHI) of Boulder, Colorado, created a GIS-based, step-wise, ground water resources evaluation procedure for use as decision/land use management tools by Pitkin County. The procedure, supported by GIS maps and related data bases, guides the site-specific analysis with respect to: 1) ground water resources availability in terms of sufficient quantities for the purpose of its usage, and economical exploitability (*e.g.*, at reasonable depth and with sufficient permeability); 2) long-term sustainability of the utilization of the resources for water supply (*i.e.*, presence of long term continuous recharge mechanisms, and absence of excessive water table fluctuations, for example, due to spring runoff, upland flood irrigation, and drought); and 3) the vulnerability or susceptibility of the resources to contamination. In addition, the GIS map provides information with respect to wells for which augmentation is required, and shows well applications approved (*i.e.*, permitted wells, drilled or not drilled) or denied, and wells actually drilled. Note that availability and sustainability should be judged in relation to well yield requirements, presence of other resource usages, ecological requirements, water right issues, and physical constraints, such as limitations on drawdown to prevent a pump from running dry. The GIS maps thus far prepared focused on the non-public lands areas (*i.e.*, developed and developable areas) of the Upper and Middle Roaring Fork valleys, and the watersheds of Snowmass Creek, Capitol Creek, Sopris Creek, Brush Creek, Owl Creek, lower section of Woody Creek, and the Crystal River (see Figure 1).

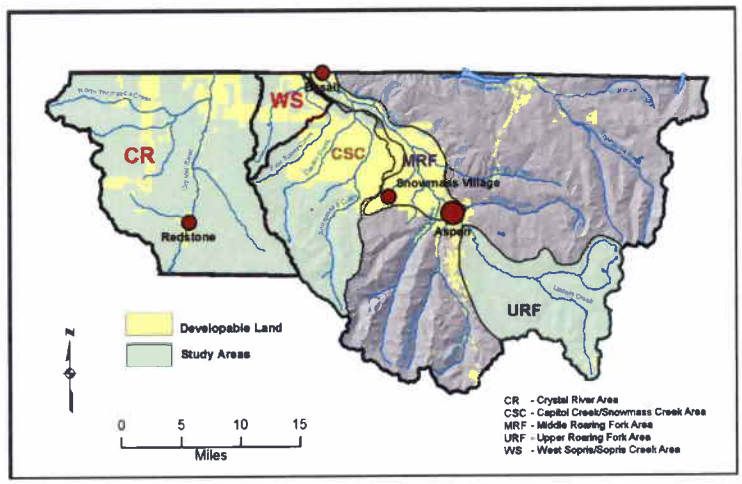

Figure 1: Areas for which GIS-based ground water resources evaluation studies have been completed.

Approach

Key elements in the three projects conducted thus far are: 1) definition of objectives: availability, sustainability, and vulnerability or susceptibility; 2) development of a ten-step ground water resources evaluation procedure; 3) hydrologic systems analysis and subsequent formulation of conceptual hydrogeologic models for representative subsystems in each of the study areas; 4) digitization and interpretation of geologic maps and converting them into hydrogeologic system layers in a GIS; 5) development of supporting GIS maps and data bases from existing data available from disparate sources and in various formats; and 6) design of illustrative example applications of the ground water resources evaluation procedure in conjunction with the developed GIS maps. The incorporated data bases include delineated hydrogeological units created by HSA/HHI, as well as data bases from Pitkin County, the Colorado Division of Water Resources/Colorado Water Conservation Board, and the Natural Resources Conservation Survey (USDA).

Contact: Dr. Kenneth Kolm [kkolm@mines.edu] or Mr. Paul van der Heijde [pvdh@heath-hydrology.com]

Based on field work and hydrologic systems analysis, a number of general conceptual models of hydrogeologic subsystems were identified within the regional scale context of each study area (see Figure 2). Each of these subsystems has a unique set of natural system parameters defining recharge and discharge, ground water levels and fluctuations, ground water flow velocities and direction, and ground water storage. In addition, important anthropogenic hydrologic system parameters include ground water recharge from irrigation and irrigation ditches, and ground water discharge from wells (see Figure 3). If water rights and allocations should change for these ditches or irrigated fields no longer irrigated, the hydrodynamics of the Quaternary glacial and alluvial aquifers would change, and water supplies from ground water may decline or vanish.

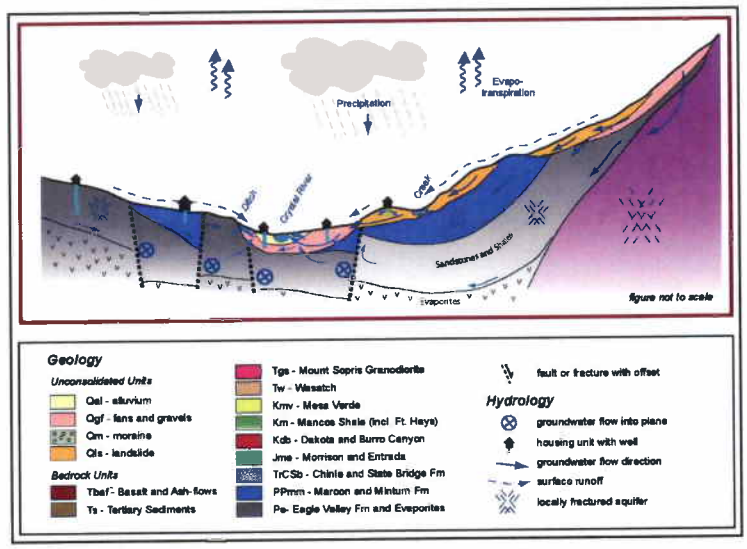

Figure 2: Example cross-section - Central Crystal River Subsystem.

The examples applications show the existing uncertainties in evaluating local ground water resources due to data limitations, and illustrate the variability of drinking water supplies, in availability, sustainability, and vulnerability, dependent on the local hydrogeology and hydrological system (see Figure 3). Most of the example sites are vulnerable to ground water pollution, albeit not at the same level. The examples demonstrate the utility and advantages of the GIS-based analysis procedure and its advantages over simple, one-layer paper maps showing, for example, some general ground water characteristics, and demonstrate the need for site-specific hydrogeologic investigation to obtain quantitative resource management answers and well design parameters.

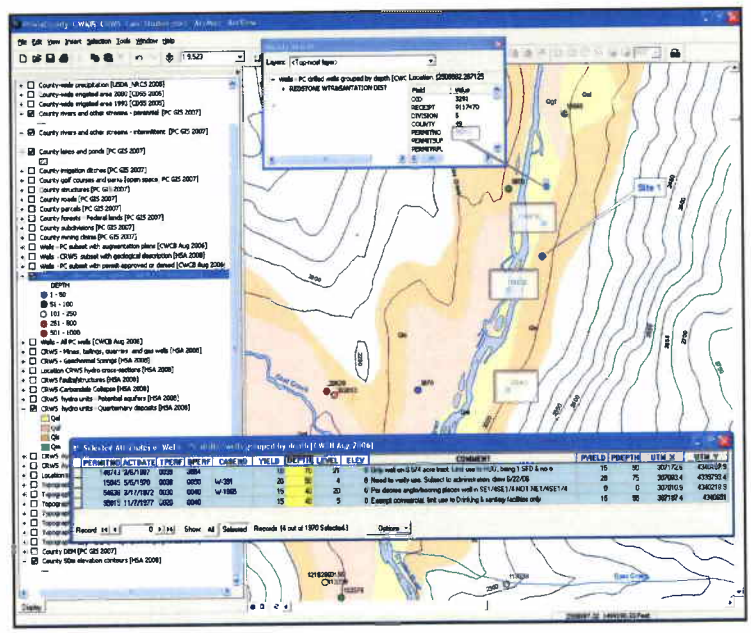

Figure 3: Example application in the Crystal River & West Sopris/Sopris Creek Study Area featuring selected hydrogeologic and well layers.

Recommendations and Utility

It is recommended that for areas in Pitkin County lacking a Hydrologic Systems Analysis (HSA) such analysis should be performed, complete with the preparation of accompanying GIS layers. This pertains in particular to Castle, Maroon, and Woody Creeks, and the Frying Pan River, as well as the Town of Aspen. The Upper Roaring Fork Drainage area has a completed HSA, but lacks the delineation and digitalization of hydrogeologic units. The GIS-based ground water resources evaluation approach developed for Pitkin County can easily be transferred to other counties with similar physiographical characteristics.

Contact: Dr. Kenneth Kolm [kkolm@mines.edu] or Mr. Paul van der Heijde [pvdh@heath-hydrology.com]