

Draft Basin and Range Carbonate Aquifer System Study (BARCASS)

Citizens Education Project Comments

INTRODUCTION

The Basin and Range Carbonate Aquifer System Study (BARCASS) is a congressionally mandated scientific assessment of groundwater resources in ten basins lying in eastern and central Nevada and western Utah. The study was undertaken to assess the viability of a proposal by The Southern Nevada Water Authority to drill, pump and pipe 141,000 acre-feet of groundwater per year from this desert region to the Las Vegas area 285 miles away. The Draft BARCASS was released for public comment in June of 2007.

The Citizen's Education Project (CEP) was founded in 1997 to provide information and advocacy on issues of social and economic justice. The project is rooted in the proposition that every citizen has the right to participate in the democratic process especially in decisions that have impacts on individual welfare and the public good.

COMMENT:

While BARCASS provides important new information about the hydrology of the region, including the Snake Valley in Utah, BARCASS by itself is flimsy evidence upon which to base far-reaching, potentially devastating and likely irrevocable decisions to pump and pipe water out of the region for the benefit of Las Vegas real estate developers. USGS did not consider potential impacts of removal of water from these basins, and further study is necessary to predict those impacts and how and if potential impacts can be mitigated.

After careful review and consultation with hydrologists, geologists and interested parties, the Citizens Education Project has come to the conclusion that the BARCASS Report contains serious flaws and limitations. We believe that the deficiencies in the study are multiple and include:

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BARCASS does confirm earlier studies that found that there is equilibrium in the discharge and recharge in the Snake Valley – the amount of water used in, evaporated and discharged from the valley is essentially the same as recharge from precipitation and recharge from adjacent valleys. This would tend to corroborate what Snake Valley ranchers have maintained all along – that there is no surplus water in the valley.

BARCASS presents a substantial change in previous thinking with regard to inter-basin ground water flow, but fails to discuss in detail the location of groundwater divides with respect to areas of potential flow. This is important because it leaves unanswered the question as to whether pumping on one side of a range could draw flow from the other side by lowering the groundwater divide.

The proposed wells are located in a structurally complex transition zone, where recharge is actively entering the aquifers. The location and depth of the proposed monitoring wells will, therefore, strongly influence whether they capture recharge that would otherwise enter the primary aquifers, and the parts of the aquifers that will be impacted most.

BARCASS does little to answer serious questions on the potential environmental harm posed by the SNWA proposal. Numeric models show a potential ground-water decline from the proposed wells of greater than 100 feet (31 m) in westernmost Millard County, Utah. This magnitude of draw-down would adversely affect both existing and future spring, surface, and groundwater uses in Utah.

BARCASS tells us that there are substantial flows from the Spring and Hamlin Valleys to the Snake Valley but does not quantify how the water withdrawal will propagate eastward to impact discharge at important regional springs in the Wah Wah Valley and Tule Valley.

BARCASS is deficient in that it does not map or delineate the substructures of the Snake Valley ground-water system or under the Confusion Range or the relationship of those water systems to the Fish Springs National Wildlife Refuge.

BARCASS postulates that much of the ground water flow terminates in the Great Salt Lake Basin. This is further evidence that the proposed pumping may change or reverse ground-water flow patterns for much of the east-central Great Basin in Utah and Nevada.

Far from answering questions this conclusion lends credence to those who have warned that substantial pumping might draw brackish waters into the aquifer. Further work is warranted to quantify both the hydro-geologic framework and hydrologic balance of the Snake Valley to accurately predict the effects of the proposed wells.

BARCASS describes the hydraulic parameters of the inter-connected aquifers but their subsurface geometries, extent, and the influence of geologic structures on ground-water flow are left unanswered.

BARCASS acknowledges that faults could either be a conduit or a barrier to water flow. The degree of uncertainty here is basically 100 percent. The study fails to assess the effect of the major and minor faults and fractures and large-scale structure on the movement and occurrence of ground water. The permeability of subsurface formations remains unknown.

It is obvious that additional study is needed before any water agreements are signed between the State of Nevada and the State of Utah. (The new state-funded monitoring wells to be installed in Snake Valley may contribute to greater understanding of the groundwater aquifer there, and further inform decision-making.) To proceed with the pumping and pipeline without obtaining the needed data would demonstrate a break of faith with the citizens of the State of Utah, a reckless disregard for the environment, and an abrupt abandonment of scientific inquiry.

The ranchers of the West Desert and the Citizens Education Project have been repeatedly assured by officials of the State of Utah, including its Governor, that any agreements on shared use of water with the State of Nevada would be based on science and not politics. We were further assured that no agreements would be undertaken until all until scientific studies were completed. The Basin and Range Carbonate Aquifer System Study (BARCASS) does not fulfill or complete the stipulated requirements of needed scientific study. Nor does the current BARCASS report address the serious questions that it has raised.

Many of the questions raised by BARCASS I might be answered by BARCASS II, but that study is not presently funded.

The decision to stop at BARCASS I without proceeding to BARCASS II was not a scientific decision but a political one. The Citizens Education Project believes that BARCASS II study must be funded and go forward before the Southern Nevada Water Authority's pumping project begins.

In addition to the problems with the BARCASS Draft itself, there appears to be an implied conflict of interest in the stated purpose for the study as expressed in the very first paragraph of the document:

Water demands from the lower Colorado River system are increasing with the rapidly growing population of the southwestern United States. To decrease dependence on this over allocated surface-water resource and to help provide for the projected increase in population and associated water supply in the Las Vegas area, water purveyors in southern Nevada have proposed to utilize the ground-water resources of rural basins in eastern and central Nevada. Municipal, land management, and regulatory agencies have expressed concerns about potential impacts from increased

ground-water pumping on local and regional water quantity and quality, with particular concern on water-rights issues and on the future availability of water to support springflow and native vegetation. Before concerns on potential impacts to pumping can be addressed, municipal and regulatory agencies have recognized the need for additional information and improved understanding of geologic features and hydrologic processes that control the rate and direction of ground-water flow in eastern and central Nevada. (emphasis added)

BARCASS seems to accept without question the notion that population growth and development will continue to increase rapidly (line 1). This assumption is not a reasonable basis for a scientific study since further growth might in fact be limited, or severely curtailed by the results of the very study in question. This amounts to a declaration that continued growth is inevitable. Continued growth at the present rate is neither inevitable nor desirable. This premise is also a “hypothesis contrary to fact.” Recent polls taken in Southern Utah indicate that a majority of citizens in Washington County favor “limiting future growth.” An increasing number of residents in the Southwest now recognize that continued growth at the present rate is not desirable. Many are beginning to recognize that growth to some degree is being fed by water projects. BARCASS would be on sounder ground if it sought to determine whether continued growth is advisable given the availability of water.

The Southern Nevada Water Authority uses projected population growth figures to project increased pressure on the Lower Colorado River. This in turn is used to justify the pumping of water from the Basin and Range Carbonate Aquifer System. This in turn is used to justify whatever costs the water project will incur. Ultimately, the project encourages increased population growth. It is a vicious circle. It is also a circular argument and it should not be assumed by BARCASS.

Even the title page of the report raises questions:

“This report is based on work by the U.S. Geological Survey, in collaboration with the Desert Research Institute, and the State of Utah”

To what extent did the State of Utah “collaborate” in preparation of the document? The use of the term “collaboration” in a scientific document implies active participation in the research, co-authorship or at the very least endorsement by the State of Utah in the conclusions drawn. If research data collected by the State of Utah through one of its agencies was used in the preparation of the document that material should rightly be included in the footnotes, not in the title. If employees of the State of Utah were involved in the collection and interpretation of the data, that information could be included on the title page with appropriate citation. But the use of the term “collaboration” implies both co-authorship and endorsement of the contents. The use of the term “collaboration” is confusing, possibly misleading, and needs to be fully explained in the final document.

CONCLUSION:

It is the opinion of the Citizens Education Project that the BARCASS can not be depended on to provide reliable data. In view of the lack of solid scientific information on the volume, direction and destination of the inter-basin flows, many of the conclusions of the BARCASS must be called into question. Some of the deficiencies in the study are obvious and need to be corrected. In many respects, BARCASS raises more questions than are answered in the report.

What the draft BARCASS report does establish is a need for further study. It has revealed large gaps in our understanding of the geology and hydrographic features of the study area. While postulating hitherto unreported inter-basin flows it has not mapped the subsurface features which allow these flows to occur.

NOTES:

**Extracted from the BARCASS review of Tom Myers, PHD, Hydrologic Consultant
For the Great Basin Water Network**

and

**Hydrologic Setting of the Snake Valley Hydrologic Basin etc. by Stefan Kirby and
Hugh Hurlow, Utah Geologic Survey**

1 Application of inappropriate and misleading methodology

“A previous US Geological Survey study had determined that the method employed by BARCASS for estimating water balance and recharge (PRISM) is not appropriate for use in eastern Nevada, particularly in mountainous areas. The method has never been verified as accurately simulating precipitation in eastern Nevada. One study (Jeton et al 2005) goes so far as to say that that the PRISM method used to estimate climate input to drive the model ‘is a black box whose details can not be examined.’ Meyers

This is a significant error since BARCASS states:” Differences between estimates for this study and previous estimates primarily are attributed to variations in the applied methods.” ... Additionally, recharge estimates for this study tend to be higher and discharge estimates tend to be lower than previous estimates Pg. 85. This admission is particularly disturbing when the wrong methodology may have been used by BARCASS in the first place.

2 Reliance on methodologies with high degrees of uncertainty

“Recharge Estimates BARCASS updated the estimates from the recon reports using physically based models of the basins. Recharge was based on a basin characterization model (BCM), a water balance analysis of precipitation, evapotranspiration, soil water storage and runoff for the unsaturated soil above the groundwater table conducted for each of many small cells spread across the basins. Parameters include estimated soil and geologic properties based on remote sensing and climate input is from the PRISM model. The model was solved for recharge... Each parameter and input value is an estimate which includes a significant amount of uncertainty”. Meyers

3 Conclusions unsupported by data

“Interbasin Flow. Because the recharge and discharge were estimated independently, they are not equal and the USGS assumed the difference to be interbasin flow. The BARCASS flow estimates may actually have a higher variability than previous estimates because BARCASS relies on models with many uncertain parameters and inputs. The models are not calibrated or verified.” Meyers

4 Inappropriate use of data

“BARCASS used recent literature values from four separate reports to determine the average ET rate to apply to different types of phreatophytic vegetation (BARCASS, page 54). The range is shown on Figure 27 of BARCASS. Figure 27 also shows a single line for "area-weighted average-annual evapotranspiration rate" which is confusing because it implies there is a single value per ET unit used for the entire BARCASS area. As discussed in the previous paragraph, it appears that a range was used for some ET units rather than a single value;” Meyers

A table with values from each literature source showing the value that could be used for each ET unit from that source would be more useful than the range shown on Figure 27. Our review of the sources suggests that ET units in those sources may have significantly varied from those described in BARCASS or the ET report. In other words, BARCASS may have used inappropriate ET units.” Meyers

5 Insufficient data

BARCASS has been handicapped by a lack of data that might have been provided by BARCASS Two. One of the many areas where more information is needed is in the Confusion Range to estimate the flow east through the Snake Valley. This flow may be the primary inflow to the Fish Springs Flat basin which features the substantial discharge at Fish Springs. Considering the importance of the Wildlife Refuge at Fish Springs, this omission from the BARCASS is especially troubling.

6 Reliance on faulty or deficient scientific models

BARCASS relies on faulty and at times misleading data collected in periods of high precipitation atypical of the normal rainfall for the area.” *The “PRISM” model used in the study does not allow for interflow between cells. Water that exceeds the percolation capacity of the underlying bedrock remains as excess soil water until it percolates when in reality it would flow downgradient where it might become available for recharge or be lost to evapotranspiration....* The rainfall input using the “PRISM” method overestimates precipitation by from 6 to 15 percent over a substantial portion of the BARCASS study area. Meyers

7 Vague or incomplete reporting of data collection.

“BARCASS determined ET rates for 10 units ranging from playa soil to marshland. The ET Rate table in Appendix A shows different rates for marshland, meadowland, grassland, dense desert shrubland, moderately dense desert shrubland. However, for moist bare soil, open water, dry playa and irrigated lands, the same rate is used for all basins and subareas. Many micrometeorological factors are at play and would cause the ET rate to vary for a specific ET unit for different subareas. However, these factors affect the evaporation from all ET units, not just the six mentioned. The USGS makes no effort to explain how the different rates were determined and why site conditions would cause variation in some of the ET units but not in the others.” Meyers

Myers suggests that ET units in those sources may have significantly varied from those described in BARCASS because they used the wrong ET units in the report.

8 Inconsistencies of method

Water Balance Method for Estimating Recharge: The BCM report details the Basin Characterization Model, water balance method, used to estimate recharge. The model divides each basin into 890 foot square cells and balances precipitation and ET to estimate recharge on each cell.... In addition to parameter and input uncertainty, various shortcomings of the model technique as described in the BCM report further increase the variance on the estimated recharge [The model] underestimates runoff by effectively spreading the precipitation and snowmelt out over the month. Second, the BCM model ignores interflow between cells. The BCM model retains until the next month any potential recharge that exceeds the maximum recharge capacity which would, in reality, seep downgradient as interflow. It might become available for recharge at that point, or it might be lost to evapotranspiration. Meyers

9 Incorrect assumptions or assumptions based on faulty data

Open Water: “The USGS includes groundwater discharge from open water area. Presumably, this means playa lakes and open water in wetlands throughout the valleys. The ET rate ranges from 4.6 to 5.6 ft/y and is considered to be discharge from groundwater (BARCASS page 54). Open water accounts for just 0.1 percent of all ET

units and only a few hundred acres. However, the reality is that not all evaporation from open water sources is from groundwater. Surface runoff, especially during storm periods and snowmelt, reaches the open water areas in these valleys. BARCASS assumes that surface water runoff that reaches "fine-grained playa sediments is assumed to evaporate and for the purpose of the water budget does not contribute to either ground-water recharge or discharge" (BARCASS, page 64). It seems that surface water runoff to any open water area would add to area for ET discharge estimates and that the methods used in BARCASS overestimated GW ET discharge by including surface water evaporation"
Meyers

10 Insufficient Documentation

The report contains errors of documentation and specific errors in maps conversions, graphs, that while minor when taken individually are more serious in the aggregate as they indicate casual attitude toward data collection and reporting data.

11 Errors of omission

The BARCASS failed to consider a previous report that the current BCM model may overstate recharge. The BARCASS also failed to assess the potential that ground water withdrawal might changed the direction of flows in the Snake Valley. The BARCASS failed to assess the probable impact of the withdrawals on subsurface flows in the Confusion Range, The Wah Wah Valley and on Fish Springs.

12 Charting errors

The BCM report has a map which shows the precipitation estimated using PRISM for the BARCASS study area (Figure 4). The scale is very hard to read; based on the scale and the amount of blue shown on the map, there are rather large areas in the mountains with more than three feet of precipitation (the top of the scale is 3.5 ft/y, or 42 in/y). Even if the ridges receive this much (they do not), the large area with this amount illustrates how PRISM may overestimate the precipitation.

"BARCASS discusses that the input to the water balance accounting has inherent uncertainties (BARCASS, page 74). However, it does not attempt to put a distribution around the estimated inter-basin flow values. Utilizing the distributions determined for discharge that should be determined for recharge is an error. Failing to do so, the interbasin flow numbers shown on plate 4 will be considered as exact estimates."
Meyers

"Plate 4 shows interbasin flow from the Snake Valley through the Confusion Ranges. This appears to be separate from the inter-basin flow from Snake Valley to the Great Salt Lake Desert. The map shows the entire boundary as likely to transmit groundwater."
Meyers

13 Unexplained discrepancies

“There is an unexplained discrepancy in the total irrigated area in Snake Valley between the value used for ET discharge and the value used for irrigation consumptive use. (SEE table 4 and Appendix A) Similar discrepancies occur in other valleys (Table 5). The biggest discrepancy is for Lake Valley which has 4360 acres with irrigation but none for ET discharge. In addition to Snake Valley, Spring Valley, Steptoe Valley, and White River Valley have substantially higher acreages for ET discharge than for irrigated consumptive use.” Meyers

Parameter and input uncertainty along with the uncertainty imparted by the BCM model assumptions cause a large uncertainty for the overall model predictions which the BARCASS report does not adequately discuss. Concern with the uncertainty is amplified by considering that the same authors using the same model published a separate report just three years ago that had estimated recharge up to 25 percent different (mostly less) than estimated in BARCASS.” Meyers

BARCASS does not even discuss why there is a difference. Such discrepancies are found throughout the report and these errors generally favor of increased water availability.

14 The repeated substitution of hypothesis for fact

We must believe that many of the missing pieces in the puzzle of the Basin and Range Carbonate Aquifer might be answered by BARCASS 2. This problem has been compounded by the apparent belief that the information we have now is the only data we are ever going to get. In the absence of this information the authors have been forced to substitute a series of educated guesses for hard facts. These estimates may have been made in good faith, but a scientific study can not be based on non-existent data. The BARCASS Report reveals serious gaps in our understanding of the geology and hydrographic features of the study area, these gaps can only be resolved by funding BARCASS 2.

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