

BRIEF NOTES FROM WITHIN THE SUBFLOW REPORT

Notes from several legal documents within Appendix:

The notion of “subflow” is significant in Arizona law, for it serves to mark a zone where water pumped from a well so appreciably diminishes the surface flow of a stream that it should be governed by the same law that governs the stream. In addition, “subflow” is “probably much greater in volume in some cases than the water upon the surface, and is a valuable portion of the well-defined surface stream.”.....

“Thus, it is critical that any test used for determining the boundaries of a subflow zone be as accurate and reliable as possible. Otherwise, use of an inaccurate test to determine whether a well is pumping subflow would not satisfy the clear and convincing evidentiary standard and would improperly shift the burden to the groundwater user to show that its well is not pumping subflow.”

GENERAL NOTES FROM WITHIN SUBFLOW REPORT

I. Chapter 1

A. Background

1. ADWR prepared technical report at the request of the adjudication court in the judicial proceeding known as the Gila River Adjudication that is pending in the Superior Court for Maricopa County.
2. ADWR provides both administrative (data collection, notices, etc) and technical assistance pursuant to statute and court order.
3. The Subflow Zone Delineation Report presents a series of maps that delineate the subflow zones for the San Pedro and Babocomari Rivers, Aravaipa Creek, together with related information.

B. History

1. Pursuant to A.R.S. 45-251 to 264, the adjudication court must determine the extent and priority of the rights of persons to use waters of the Gila River system and source, which includes all appropriable water and water subject to claims based on federal law.
2. Appropriable water includes surface water and certain subsurface water referred to as subflow.
3. This technical report is part of the litigation to identify those wells in the San Pedro River Watershed that are subject to the adjudication.
4. In 1931 – Southwest Cotton
 - a.. Supreme court defined subflow as “those waters which slowly find their way through the sand and gravel constituting the bed of the stream, or the lands under or immediately adjacent to the stream, and are themselves a part of the surface stream. It is subject to the same rules of appropriation as the surface stream itself.
 - b Underground water withdrawn from a well is presumed to be percolating groundwater, and one who asserts that it is subflow must demonstrate that assertion by clear and convincing evidence.

- c. The river bed must continue holding sufficient surface water to support the surface stream, as it were, for otherwise in drawing on the underground flow of the stream it will necessarily draw upon the waters flowing on the surface.
- d. Legal Test – Direct and Appreciable Test – Does drawing off the subsurface water tend to diminish appreciably and directly the flow of the surface stream? If it does, it is subflow, and subject to the same rules of appropriation as the surface stream itself; if it does not, then although it may originally come from the waters of such stream, it is not, strictly speak, a part thereof, but is subject to the rules applying to percolating waters.
5. In 1987 – Court heard hearings on the relationship between surface water and groundwater. Motions filed to exclude certain wells arguing they pumped percolating groundwater rather than subflow.
6. In 1988 – court held that certain wells withdrawing water from the younger alluvium of a stream should be presumed to be pumping appropriable subflow if the volume of stream depletion was 50% or more as the result of 90 days of continuous pumping.
7. In 1991 – ADWR used 50%/90 day test to prepare final San Pedro River Watershed Hydrographic Survey Report.
8. In 1993 – Gila II - Court rejected 50%/90-day test. Court held that whether a well is pumping subflow “turns on whether the well is pumping water that is more closely associated with the stream than the surround alluvium. Reaffirmed Southwest Cotton’s distinction between subflow, which is subject to appropriation, and tributary groundwater, which is not, and set fourth certain criteria that could be used to make this distinction.
9. In 2000 – Gila IV – Reaffirmed the principles set forth in Southwest Cotton regarding the definition of subflow and related Direct and Appreciable Test for determining whether a particular well is actually withdrawing subflow. Also held that the new subflow test proposed by the adjudication court properly applied the criteria listed in Gila II to the San Pedro River Watershed in order to determine the most appropriate subflow zone, and the weight of the evidence supports the adjudication court’s identification of that zone as the “saturated” floodplain Holocene alluvium.
10. In January 2002, ADWR directed to propose steps for implementing the 1994 Subflow Order
11. In March 2002, ADWR submitted response – 2002 Subflow Report
12. July 2004, Special Master issued 39 recommendations to the court for review: 2002 ADWR Subflow report adopted in large with certain modifications.

13. On June 30th, 2004 – Based on evidence presented, and applying the criteria listed in Gila II, the adjudication court formulated a new subflow test that turned on the location of a well vis-à-vis an area referred to as the “subflow” zone, which the adjudication court defined as the saturated floodplain Holocene alluvium. The adjudication court summarized its conclusions as follows:
 1. A “subflow zone is adjacent and beneath a perennial or intermittent stream and not an ephemeral stream.
 2. There must a hydraulic connection to the stream from the saturated “subflow” zone.
 3. Even though there may be a hydraulic connection between the stream and its floodplain alluvium to an adjacent tributary aquifer or basin-fill aquifer, neither of the latter two or any part of them may be part of the “subflow” zone.
 4. That part of the floodplain alluvium which qualifies as a “subflow”, beneath and adjacent to the stream, must be that part of the geologic unit where the flow direction, the water level elevations, the gradations of the water level elevations, and the chemical composition of the water in that particular reach of the stream are substantially the same as the water level elevation and gradient of the stream.
 5. That part of the alluvium that qualifies as part of the “subflow” zone must also be where the pressure of side recharge from adjacent tributary aquifers or basin fill is so reduced that it has no significant effect on the flow direction of the flood plain alluvium (i.e., a 200-foot setback from connecting tributary
 6. Riparian vegetation may be useful in marking the lateral limits of the “subflow” zone particularly where there is observable seasonal and/or diurnal variations in stream flow caused by transpiration. However, riparian vegetation on alluvium of a tributary aquifer or basin fill cannot extend the limits of the “subflow” zone outside of the lateral limits of the saturated floodplain Holocene alluvium.
 7. All wells located in the lateral limits of the “subflow” zone are subject to the jurisdiction of this adjudication no matter how deep or where these perforations are located. However, if the well owners prove that perforations are below an impervious formation which precludes “drawdown” from the floodplain alluvium, then that well will be treated as outside the “subflow” zone.
 8. No well located outside the lateral limits of the “subflow” zone will be included in the jurisdiction of the adjudication unless the “cone of depression” caused by its pumping has now extended to the point where it reaches an adjacent “subflow” as to affect the quantity of the stream.
14. September 2005, adjudication court adopted the 2004 Subflow Decision with certain exceptions. ADWR directed to follow certain procedures to determine the limits of the subflow zone within the San Pedro River Watershed, prepare a map delineating the subflow zone, and submit the map and related information in a technical report.

C. Scope

1. Scope of report limited to delineating the subflow zone, and it does not set forth proposed water right attributes for any individual water right claim or use.
2. Adjudication court specified procedures to be used in delineation.
3. Hydrologic maps in conjunction with geological maps are basis for zones

D. Notice

1. Pursuant to 2005 Subflow Order, upon filing this report, ADWR must send a notice to all claimants in the San Pedro River Watershed and to persons listed on the Gila River Adjudication Court-Approved Mailing List informing them of the scope and availability of the report. Must also inform each claimant of the right to file written objections to the report with the adjud. court and of the deadline which is 180 days of the date report is filed.
2. Objections limited to ADWR's findings regarding the lateral extent of the subflow zone.
3. Adjud. Court will approve a map that delineates the subflow zones.
4. Then ADWR will apply court's cone of depression test to wells located outside the lateral limits of the subflow zone and examine all water right claims to determine de minimis water rights
5. ADWR will publish a Supplemental Final San Pedro River Watershed HSR containing findings and proposed water right attributes on a claim by claim basis, including wells withdrawing subflow, cone of depression analyses, de minimis water rights and all other new or updated information. Claimants will be notified and may file objections within 180 days.

II. Chapter 2 – Criteria

A. Subflow zone – saturated floodplain of the Holocene alluvium

B. Also Determined:

- a. Location of perennial and intermittent streams
- b. Lateral extent of the floodplain Holocene alluvium
- c. Saturated portion of the floodplain Holocene alluvium

C. Hydrologic Criteria

a. Definitions -

- Perennial streams discharge water continuously throughout the year. Their source of supply is normally comprised of both direct runoff from precipitation events or snow melt, and baseflow derived from the discharge of groundwater into the stream.
- Intermittent streams discharge water for long periods of time, but seasonally. For example, an intermittent stream may flow all winter, every winter, but never flow continuously during the summer. During seasons when baseflow is maintained, groundwater is contributing to the stream. During seasons of discontinuous streamflow, natural and cultural losses may be greater than the contribution from groundwater, resulting in a losing stream. Or, the amount of groundwater discharge itself may have decreased due to natural or cultural uses.
- Ephemeral streams discharge water only in response to precipitation events or snowmelt, and do not have a baseflow component at any time of the year; they flow out sporadically. The groundwater system and surface water system do not establish a hydraulic connection in these systems.

- b. Use predevelopment streamflow conditions for subflow analysis .

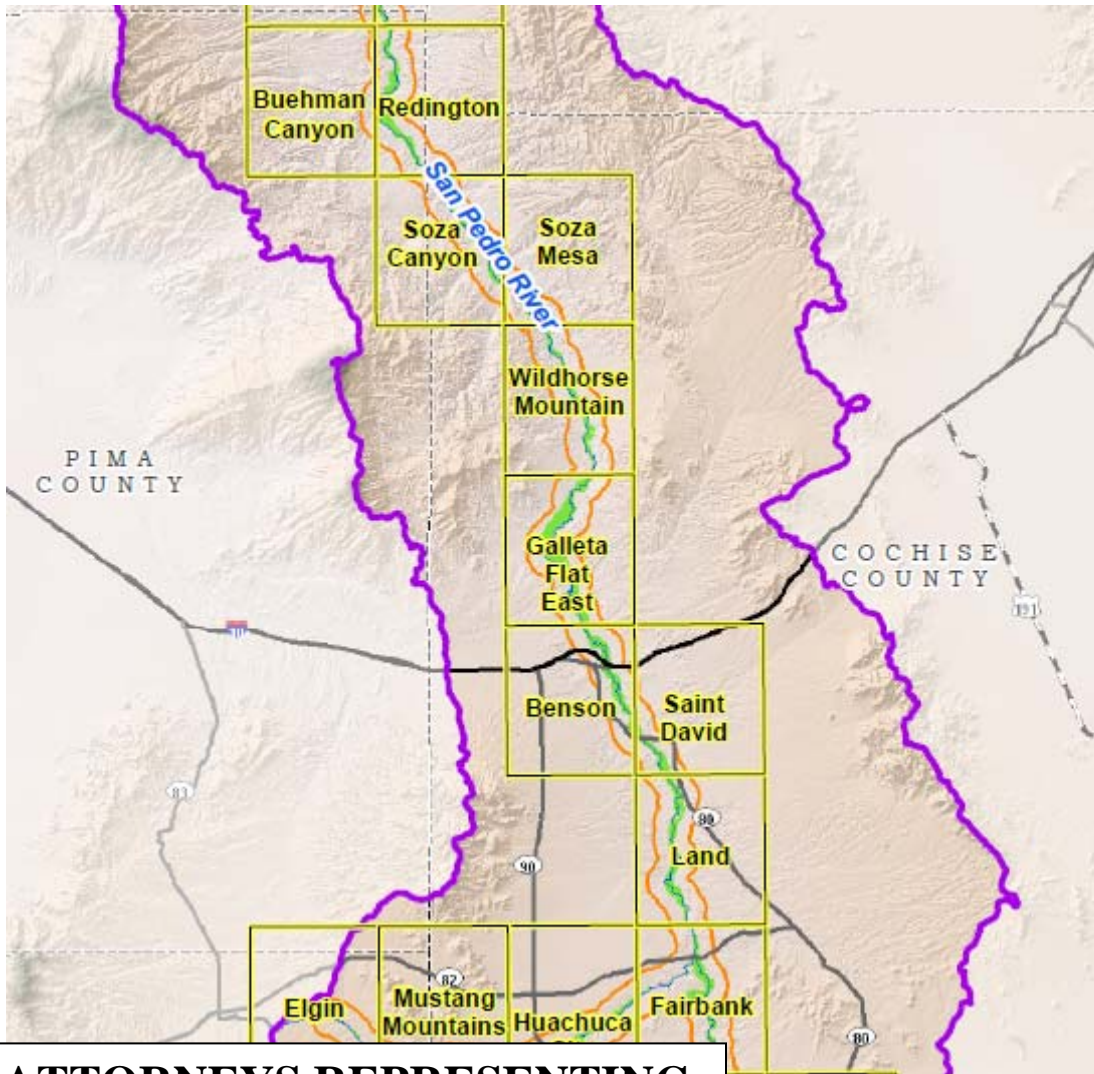
- c. For predevelopment streamflow conditions, use those existing during an identifiable chronological year or range of years immediately prior to take a practical approach and adopt the earliest predevelopment timeframe for which accurate and reliable data is available.
- D. Geologic Criteria
 - 1. Use NRCS soil survey map to delineate the lateral extend of the floodplain Holocene alluvium as one source or indicator, but not exclusive means.
 - 2. Limit subflow analysis to the floodplain Holocene alluvium.
 - 3. Use NRCS Survey AZ671 as source of information for reaches between Border and St. David
 - 4. Also consider mapping methods as criterion, use largest scale versions of source maps, special care in transferring to base map.
- E. Hydrologic Criteria
 - 1. Assume the entire lateral extent of the floodplain Holocene alluvium is saturated for the purpose of delineating the subflow zone.
 - 2. Exclude tributary aquifers, areas of basin fill recharge, and the alluvial plains of ephemeral streams from the subflow zone.
 - 3. If ADWR cannot delineate a reasonably accurate and reliable subflow zone then it should use any other criteria that are geologically and hydrologically appropriate for the particular location and report the rationale.
- III. Chapter 3 Analysis
 - A. Section 3.1 Summarizes the hydrologic setting of streams
 - B. Section 3.2 Evidence of predevelopment flows in streams
 - C. Section 3.3 – More recent evidence
 - D. Section 3.4 – ADWR’s belief of major stream reaches that were either perennial or intermittent before development.

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**QUAD MAPS OF INTEREST
TO CASCABEL,
POMERENE, BENSON, ST.
DAVID**



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