Supporting Document H-1

Regional Water Planning Handbook

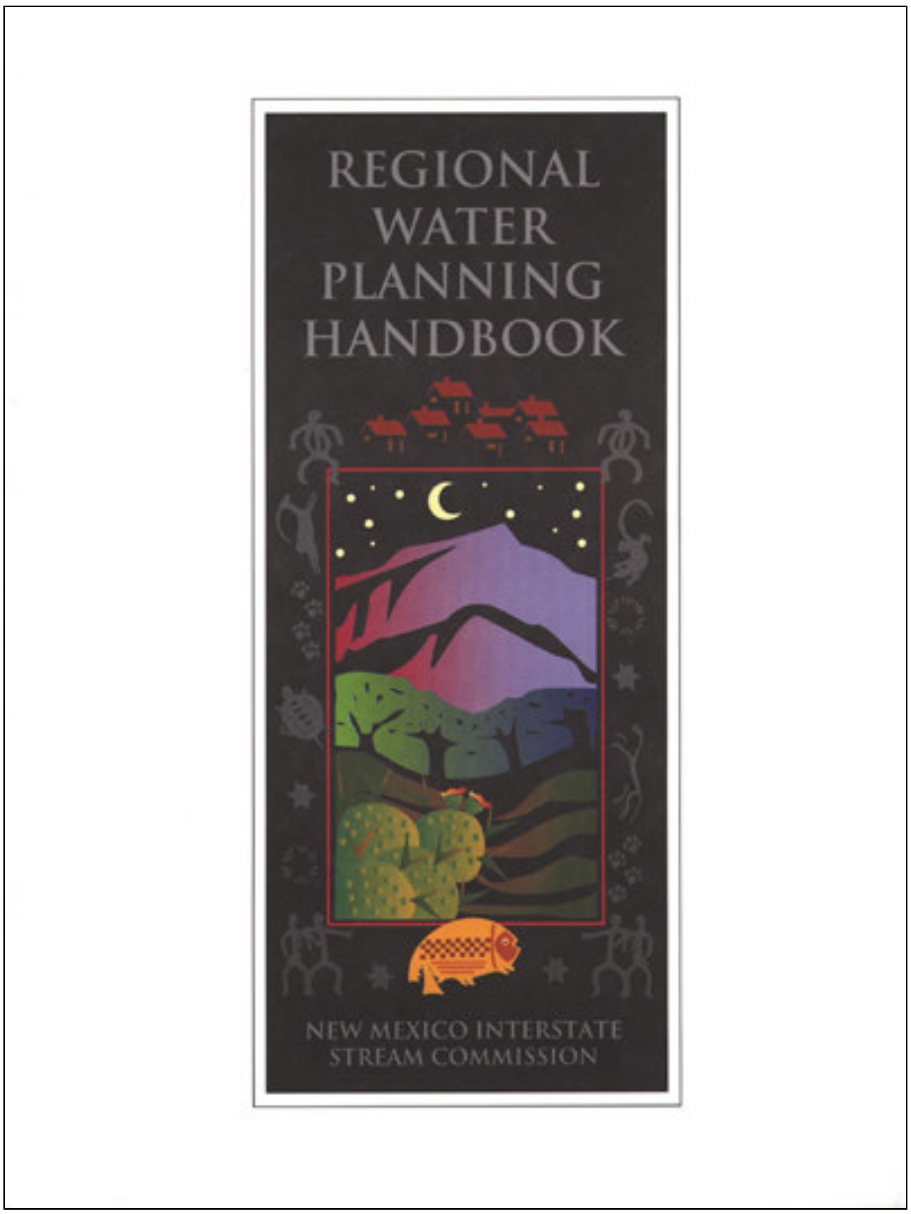
Prepared by the New Mexico Interstate Stream Commission

December 1994

Water Planning

Last Modified: 6/24/99

Regional Water Planning Handbook



New Mexico Interstate Stream Commission

December, 1994

CONTENTS

OPEN LETTER TO REGIONAL WATER PLANNING HANDBOOK USERS

New Mexico has taken a unique approach to planning to protect and preserve its water supply. The legislature recognized and directed that water planning is most effectively done at the local level. Regions, self-defined through hydrological and political common interests, have begun to study their most precious resource. This effort, overseen by the Interstate Stream Commission and funded through the Commission and local entities, now blankets the state.

The original impetus for regional water planning came in 1987, when a federal court ruled that New Mexico's prohibition against out-of-state transfer of New Mexico ground water was unconstitutional. As a result of this ruling, it became evident that New Mexico must actively plan for its water future. The resulting plans, with their forty-year horizon, help to insure the continuity of the water supply.

The diversity of approach in the previous regional water plans confirmed the Legislature's intuition that New Mexico communities relate to their water resources in very different ways. Some regions based their plans on traditional custom and culture; others looked at development needs; still others searched for a balance between the two. All regions struggled to develop effective public participation with limited resources and little infrastructure. In some regions, creative and energetic public involvement demonstrated the value of mobilizing the community to help in water planning. Other regions were unable to generate the public participation they sought. Their experience demonstrated the challenge of attempting democracy in a complex society, and the need for further development would affect their water needs. The great variety of assumptions underlying these projections and the significant gap between projected needs for a unified approach to water planning.

Responding to a request from regional water planners, the Commission appointed a sub-committee of Commissioner Palemon A. Martinez and Commissioner Tracy Seidman Hephner to direct the preparation of a Regional Water Planning Template to guide regional planners to a useful and uniform product. Also, the Commission appointed a volunteer work group to participate in the preparation of the Template and this HandBook. Co-chaired by Commissioners Palemon A. Martinez and Tracy Seidman Hephner, the work group was composed of fourteen individuals from diverse constituencies and regions, all with substantial background in water issues and management. The group was guided by the hands-on experience of the regional water planners and aided by the staffs of both the Commission and the State Engineer Office. Together, they have written this document, the Regional Water Planning Handbook, which has been formally adopted by the Interstate Stream Commission.

The Handbook presents assumptions, guidelines and a template for regional water planning. A workbook, available to regional planners on request, expands on the information with a detailed checklist, providing additional information and advice on the subjects found in the template.

Water is a fragile and finite resource. Water quality controls and conservation are the keys to protecting and preserving our water supply. A third and equally important factor is the participation, awareness and involvement of the people of the region. The planning process should encourage local people to express local concerns and discuss the difficult decisions faced by every community in New Mexico. Successful plans are marked by the support, understanding and consensus generated by the planning process.

We wish you well in your water planning endeavors.

New Mexico Interstate Stream Commission

We wish to thank the following for their assistance in the layout, cover art and formatting of this document: Chris Nunn, Christian Kenesson, the Regional Water Planning Dialogue, and the New Mexico Water Resources Research Institute staff.

I.
PURPOSE OF REGIONAL WATER PLANS

Water planning, the budgeting of an essential and finite resource, is of course valuable in itself. In addition, these regional water plans may have specific applications which will affect how they are developed.

As has been done in other western states, New Mexico may decide to use the regional water plans as a basis for a state water plan, which can in turn influence litigation, water development, and legislation. Thus, the plans need to be written so that they can be merged into one document. To fulfill this purpose, the plans should have a uniform approach to the extent possible.

The Commission strongly encourages regions to negotiate solutions to local water problems.

The State Engineer's mandate is to supervise the measurement, appropriation and distribution of the state's water. The State Engineer's mandate includes considering the public welfare of the state. [1] Public welfare and conservation considerations may differ depending upon local conditions and factors, as well as impacts state wide.

Elements of regional water plans may contain relevant and substantive elements for use by the State Engineer in "public welfare" and "conservation" determinations in actions before the State Engineer within the regional planning area or affecting the area. These elements in a regional water plan would not necessarily be determinative but rather part of a larger set of considerations that are applicable to a given action.

Broad public participation is necessary in the development of regional water plans to enhance their acceptance locally and to increase their potential contribution to state decision making in regard to "public welfare" and "conservation" determinations.

The regional water plans should not be considered substitutes for local zoning and platting decisions made by the appropriate governmental authority. Local zoning decisions shall be given due consideration in regional water planning in determining what "public welfare" interests are for each particular jurisdiction.

New Mexico statutes provide that, for a state to prefer its own citizens over an out-of-state appropriator, there must be a showing of need within the state and the feasibility of supplying that need from particular sources. [2] Water planning by region may well be used as evidence on such issues. Planners should be aware that assertions of need and feasibility of supply may be tested in a court setting, and should therefore be reliable, specific, technically sound, and based on generally acceptable hydrologic and engineering principles. Bare or vague claims of growing water use, or unsupported allegations of rights to, or hopes for, new supply for the region are not useful for sound water planning.

Assessment, as used herein for regional water planning purposes, is best defined by the following:

1. inventory of quantity and quality of water resources;

2. population projections and other water resource demands under a range of conditions;

3. determination of the manner in which water requirements for the projected demands might be met with management and conservation of water supplies available to the region under existing rights, water supplies, interstate agreements, and court decrees.

---

[1] N.M. Stat. Ann. §72-5-5.1, §72-5-6, §72-5-7, §72-5-23, §72-12-3, and §72-12B-1

[2] N.M. Stat. Ann. §72-12B-1 (1985 Repl. Pamp.)

II.
REQUIRED ASSUMPTIONS

All planning shall be done within the following parameters. Exceptions to this are possible, but if an exception is to be made, regional water planners must set forth facts and justifications sufficient to indicate that conditions exist within the region to consider such an exception.

1. An adequate plan for public participation shall be a prerequisite for regional water planning.

2. Plans shall be written on the assumption that New Mexico and federal water law will not change.

   In the section entitled "Suggested Changes in New Mexico Law" regions are invited to propose changes to New Mexico water law. The more specific these proposed changes are, the more helpful they will be. Such proposed changes should not be relied upon in plan recommendations, although the reasons and effects of changes should be presented to justify the recommended change.

3. Plans shall presume all future water needs must be met by management of the water supply currently available to the region. If that is not feasible, as supported by analysis in the planning report, other sources of supply may be proposed if feasible in economic and engineering analysis.

4. Water conservation should be the first item considered among feasible water supply alternatives in the management of water to meet current and future water demands. Regional water plans should demonstrate what portion of the future water demand could be met from projections of conserved water. Regional water plans should outline the responsibilities and authorities of each local governing body.

5. Population projections shall be based on the Bureau of Business and Economic Research (BBER) model, with any deviations from that model justified. BBER projections and any exceptions shall be reviewed within the public participation program and with Commission staff.

6. Analysis of water use shall be broken out into the following categories:

   A. PUBLIC WATER SUPPLY:

      All water utilities, publicly or privately owned, which have at least 15 service connections or regularly serve an average of at least 25 individuals daily at least 60 days out of the year. (Safe Water Drinking Act, 1986.) Water used for the irrigation of self-supplied playing fields, golf courses and parks or to maintain the water level in ponds and lakes owned and operated by a municipality which is a public water supplier is also included in this category.

   B. DOMESTIC:

      Self-supplied residences which may be single family homes or multiple housing units with less than 25 occupants, where water is used for normal household purposes such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens supplied from a domestic source. Also includes water used by that segment of the population which is served by small community water systems for which reliable population and water use data are unavailable.

C. IRRIGATED AGRICULTURE:

All diversions of water for the irrigation of crops grown on farms and ranches.

D. LIVESTOCK:

Water used to raise livestock, maintain self-supplied livestock facilities, and provide for on-farm processing of poultry and dairy products, and evaporation from stock tanks.

E. COMMERCIAL:

Self-supplied businesses (e.g., motels, restaurants) and institutions (e.g., schools and hospitals), public or private, involved in the trade of goods or provision of services. Self-supplied greenhouses and nurseries primarily engaged in selling products to the general public which are produced on the same premises from which they are sold.

F. INDUSTRIAL:

Self-supplied enterprises engaged in the processing of raw materials (organic or inorganic solids, liquids, or gases) or the manufacturing of durable or nondurable goods. Water used for the construction of highways, subdivisions and other construction projects is also included.

G. MINING:

Self-supplied enterprises engaged in the extraction of minerals occurring naturally in the earth's crust; solids, such as coal and smelting ores; liquids, such as crude petroleum; and gases, such as natural gas. Water used for oil and gas well drilling, secondary recovery of oil, quarrying, milling (crushing, screening, and washing, flotation, etc.) and other processing done at the mine site, or as part of a mining activity is included as well as water removed from underground excavations and stored in, and evaporated from, tailings ponds. Mining also includes water used to irrigate new vegetative covers at former mine sites which are being reclaimed. Mine dewatering is included as a use if said water is consumed in some manner such as evaporation ponds. It does not include the processing of raw materials such as smelting ores unless this activity occurs as an integral part of, and is physically contiguous with, a mining operation.

H. POWER:

All self-supplied power generating facilities.

I. RESERVOIR EVAPORATION:

Net evaporation from man-made reservoirs, not including stock tank evaporation.

J. FISH, WILDLIFE AND RECREATION:

All self-supplied playing fields, golf courses and parks, water needed to hold a minimum water level in reservoirs for recreation, fish and wildlife, water used for crops grown for wildlife consumption and self-supplied recreation parks, campgrounds and fish hatcheries.

III.
GENERAL GUIDELINES

In developing the regional water plan, and determining what information is relevant to what level of detail, planners should keep the following things in mind:

1. The heart of the exercise is for the region to provide enough information, analysis and documentation to answer the following questions.

    a. What is the region's available water supply?

    b. What is the region's future water demand?

    c. How will the region undertake to meet demand with supply?

2. Not all items of information in the Regional Water Planning Template apply in every region. Planners should not spend time and money including information that addresses matters that are not applicable to their region.

    For example, if a region does not include Tribal or Pueblo holdings, no information in categories related to such holdings would be included in the plan.

3. The amount of detail included in the plan concerning any category should be reasonably related to the importance of that factor to water planning.

    For example, the Regional Water Planning Template calls for information concerning the location of present water uses. That request does not require a full-fledged hydrographic survey, but does call for a compilation of existing data and documentation on that subject.

4. In assessing what categories are necessary and what should be included, planners shall focus on the following:

    a. Location, quality, and extent of the current water resource supply.

    b. Current water use, including specific categories of use (See II.6.).

    c. Projections of future water use, quantified.

    d. Impacts of conservation on water use, including i.) the suitability of conservation measures for each region, and ii.) the projected water savings for each measure evaluated.

    e. Source and quality of future water supply including i.) cost effectiveness, technical feasibility, and social and political issues of using the identified future water source, and ii.) potential for water supply contamination.

    f. Current water rights status.

    g. Methods used to solicit public involvement in developing the water plan.

The final report shall contain an executive summary that includes the information in items a. through g. above, any other summary information, and the conclusions and recommendations of the report.

5. In determining available water supply, planners must consider both hydrological and legal limitations.

   For example, if water must be delivered downstream under an interstate compact, that water cannot be considered as supply available for the region.

6. All plans shall be developed in consultation with Commission staff.

7. A critical element of the regional water plan is public participation in the planning process. Planners must demonstrate that reasonable and diligent efforts have been made to reach the public so as to invite, value and reflect public comment. These efforts may be tailored in their specifics to fit the particular regions. All regional plans, however, must reflect:

   a. Identification of stakeholders in the planning process, and efforts to make specific invitations to those stakeholders to participate. A list of these entities, together with any support or refusal letters from them, shall be part of the plan's documentation.

   b. Public meetings of a number, time and place calculated to maximize the ability of the public to participate. Notice of these meetings must be widely disseminated, including specific notice to entities on the list generated under a., above. The public meetings shall occur while the plan is being developed.

   c. Post-plan comment period. When a draft plan has been completed, it must be made available to all entities identified on the list. Copies of the draft plan must also be made available at public places, and notice of their availability promulgated. After a sufficient time of study of the draft, public meetings shall be held to receive comments on the draft.

LEGISLATIVE REQUIREMENTS FOR REGIONAL WATER PLANNING

Section 2 of the Act [3] provides as follows:

"

C. The Commission is authorized to make grants or loans of funds for the purpose of regional water planning. Prior to approval of any proposal by a region for planning funds under this section, the Commission shall develop criteria for evaluating such proposals. These criteria at a minimum shall provide for:

1. identification of the region requesting planning funds and why it is hydrologically and politically an appropriate applicant;

2. **use of an appropriate planning process including opportunities for participation by those Indian tribes located within the various regions of the state;**

3. **reasonable proposed costs and time tables for completion of the planning process;**

4. **appropriate provisions for notice, review and comment where applicable;**

5. **adequate review of potential conflict with laws relating to impact on existing water rights;**

6. **adequate review of water conservation and the effect on the public welfare; and**

7. **identification of sources other than the Commission for funding of the proposed regional planning process.**

D. A water planning region eligible for funding under this criteria is an area within the state that contains sufficient hydrological and political interests in common to make water planning feasible. The state as a whole shall not be considered a water planning region for purposes of this section.

E. No entity shall be made a part of a proposal for planning funds under this section without its consent.

F. No funds shall be granted under this act to any party or parties that are not within a water planning region. Whether a proposal for funding falls within a water planning region shall be determined on a case by case basis by the Commission after consultation with the State Engineer and consideration of the following:

1. **whether the source of water and the potential place of use of the water are located within the same hydrologic basin; and**

2. **if there is more than one party and the parties are requesting funds on a joint basis, whether the parties have demonstrated political and economic interests in common by entering into a binding intergovernmental agreement for carrying out the planning process."**

---

[3] N.M. Stat. Ann. §72-14-44 (1993 Cum. Sup.)

IV.
REGIONAL WATER PLANNING TEMPLATE

The template for a regional water plan was designed to provide uniformity in developing regional planning documents. The Commission expects to use the plans to ensure an adequate supply of water for each region of the state. This objective will be enhanced if plans are based on the same format and assumptions and are comparable to one another. The template contains a listing of the topic headings for consideration and, where applicable, addressed by every regional planning entity.

Also, a Regional Water Planning Checklist is available for planners upon request to the Interstate Stream Commission. The checklist is organized to correspond with the Regional Water Planning Template. The checklist is not intended as a list of requirements. Rather, it is intended as a tool to help planners ensure that all pertinent considerations are addressed.

Executive Summary

The Executive Summary is likely to be the part of the plan which will be most widely read and disseminated publicly. The summary should therefore be a brief, clearly presented short version of the findings and recommendations of the plan, which could be read and understood separately from the fully documented version. It should contain a statement on public participation efforts and results, statements on water supply and water demand and the plan's final recommendation to reconcile the two.

- Description of planning process
- Findings
    - Water supply
    - Water demand
- Water plan alternatives
- Recommended water plan for the region

Introduction

The introduction should provide the reader with the following:

- Individuals involved in water plan development
- Previous water planning in the region
- the water plan's contents

Documentation of Public Involvement in Planning Process

- Interstate Stream Commission-sponsored water workshop
- Background summary of region prepared for public dissemination
- List of stakeholders and participants

Strategy chosen to maximize public involvement

- Use of the media
- Press releases
- Outreach effort tailored to specific communities
- Project time table
- Public meetings

Background Information

a. Description of the region
    - Location, boundaries
    - Geography, landscape
    - Climate
    - Natural resources
    - Major surface and groundwater sources
    - Demographics
    - Economic picture
    - Land ownership & land use

b. Historical overview of water use in region

Legal Issues

a. Water laws relevant to region

- state
- federal
- tribal

b. Federal legal issues
   - Federal reservations
     - Indian reservations or pueblos
     - Other federal enclaves
   - Federal environmental law issues
   - Treaties
   - Federal water projects

c. Water quality standards
   - Federal
   - State
   - Municipal
   - Tribal or pueblo

d. Relevant lawsuits
   - Court decrees
   - Pending adjudications

e. Water rights administration policies specific to the region
   - Duty and consumptive use figures
   - Ground water basin criteria
   - Compact obligations

f. Special districts

g. Legal issues needing resolution

h. Local conflicts

Water Resources Assessment for the Planning Region

a. Water supply
    - Surface water
        - Precipitation data
        - Drainage basins and watersheds
        - Streamflow data
        - Evaporation data
        - Surface water yields
        - Storage reservoirs and conveyance canals
            - capacity
            - evaporation
            - useful life
    - Ground water
        - Geologic data
        - Hydrogeology data by aquifer
        - Well field data
        - Ground water yields by aquifer
            - Sustainable yields
            - Drawdowns by level of development

b. Water quality issues
    - Assess quality of water sources
    - Identify sources of contamination
    - Assess feasibility of water quality management plans
        - Improving water and land-use practices

- Water treatment alternatives
- Wastewater treatment

c. Summary of water supply considering legal limitations

Water Demand

a. Present uses

- Type, location and ownership of water rights
- Water rights by category of use
- Water diversions by category of use
- Water depletions by category of use
- Public water supply systems data
- Irrigation practices
- Conveyance losses
- Return flows
- Lake evaporation
- Riparian uses/instream flows

b. Future water uses by 40 year planning horizon

- Projected future demographics
  - Population
  - Future land use
  - Economic growth and jobs
- Projected water demands by category of use
- Future sources of water supply
- Projected changes in water supplies in region
- Management alternatives to increase supply

- Changes to existing works
- Replacement of existing facilities
- Water banking

- Emergency contingency plans
  - Drought considerations
  - Flood considerations

c. Water conservation
   - Conservation measures
   - Suitability of each measure assessed for region
   - Amounts and timing of water saved
   - Effect on return flows
   - Difficulty (including costs) and timing of implementation

d. Summary of present and future water demand

Water Plan Alternatives

a. Each proposed alternative should include a description of specific and practical means by which the supply of the region may be reconciled with the present and future demands of the region, as analyzed above. Alternatives should contain:
   - Management component
   - Water conservation component
   - Water development component
   - Infrastructure development component
   - Water quality management plan

b. Each alternative should be analyzed on the following bases:
   - Social issues and evaluation (public welfare)
   - Political issues and evaluation

- Institutional evaluation

Evaluations

a. Each proposed alternative must be evaluated in accordance with the standards below:

- Technical feasibility
- Political feasibility
- Social and cultural impacts
- Financial feasibility
- Implementation schedule
- Physical, hydrological and environmental impacts

GLOSSARY

ACRE-FOOT:
Volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot, equivalent to 325,851 gallons.

ALLUVIUM:
General term for deposits of clay, silt, sand, gravel, or other particulate material deposited by a stream or other body of running water in a streambed, on a flood plain, on a delta, or at the base of a mountain.

AQUACULTURE:
Art and science of farming organisms that live in water, such as fish, shellfish, and algae.

AQUIFER:
A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

ARTESIAN WATER:
Ground water under sufficient pressure to rise above the level at which the water-bearing bed is reached in a well. The pressure in such an aquifer commonly is called artesian pressure, and the formation contains artesian water is an artesian aquifer.

ARTIFICIAL RECHARGE:
The addition of water to the ground water reservoir by man's activities, such as irrigation or induced infiltration from streams or wells.

AVERAGE ANNUAL YIELD (WATER):
The average annual supply of water produced by a given stream or water development over a period of 12 months.

BANK STORAGE:
Water absorbed and stored in the banks of a stream, lake, or reservoir when the stage rises above the water table in the bank formations and stays there for an appreciable length of time. Bank storage may be returned in whole or in part as seepage back to the water body when the level of the surface water returns to a lower stage.

BASE FLOW:
Sustained or fair-weather runoff--generally that portion of the streamflow derived from discharging ground water or other delayed sources such as lakes or snow fields.

BEDLOAD:
That part of the sediment load in which the particles of material move on or near the stream bed.

BEDROCK:
General term for consolidated (solid) rock that underlies soils or other unconsolidated material.

BENEFICIAL USE OF WATER:
The use of water by man for any purpose which benefits are derived, such as domestic, municipal, irrigation, livestock, industrial, power development, and recreation. Under the New Mexico constitution beneficial use is the basis, the measure and the limit of the right to use water; therefore, beneficial use of public water diverted or impounded by manmade works is an essential element in the development of a water right.

BIOCHEMICAL OXYGEN DEMAND (BOD):
The quantity of oxygen utilized primarily in the biochemical oxidation of organic matter in a specified time and at a specified temperature.

BOLSON:
An alluvium-floored basin, depression, or wide valley, mostly surrounded by mountains and drained by a system that has no surface outlet. Bolson fill is the alluvial detritus that fills a bolson--also commonly called bolson deposits.

CENTER-PIVOT IRRIGATION:
See Irrigation.

CHEMIGATION:
Application of pesticides or fertilizers to farmlands through irrigation systems.

CLOSED BASIN:
A basin is considered closed with respect to surface flow if its topography prevents the occurrence of visible outflow. It is closed hydrologically if neither surface nor underground outflow can occur.

CONFINING BED:
A rock formation that will not readily transmit water and which retards or stops the free movement of water underground. Confining beds have also been called aquicludes, aquitards, or semiconfining beds.

CONJUNCTIVE WATER USE:
Combined use of ground water and surface water.

CONSUMPTIVE IRRIGATION REQUIREMENT (CIR):
The quantity of irrigation water, exclusive of precipitation, stored soil moisture, or ground water that is required consumptively for crop production.

CONSUMPTIVE USE (EVAPOTRANSPIRATION):
The quantity of water used in a given area in transpiration, building of plant tissue, and evaporated from adjacent soil, water surface, snow or intercepted precipitation in a specific period of time.

CONVEYANCE LOSS:
Water that is lost in transit from a canal, conduit, or ditch by leakage or evaporation. Generally, the water is not available for further use; however, leakage from an irrigation ditch, for example, can percolate to a groundwater source and be available for further use.

CUBIC FOOT PER SECOND:
The rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second. It is equivalent to 7.48 gallons per second, or 448.8 gallons per minute.

DECLARED UNDERGROUND WATER BASIN:
An area of the state proclaimed by the State Engineer to be underlain by a ground water source having reasonably ascertainable boundaries. By such proclamation the State Engineer assumes jurisdiction over the appropriation and use of ground water from the source.

DEPLETION:
That part of a withdrawal that has been evaporated, transpired, incorporated into crops or products, consumed by man or livestock, or otherwise removed.

DISCHARGE:
Rate of flow at a given instant in terms of volume per unit of time; pumping discharge equals pumping rate, usually given in gallons per minute (gal/min); stream discharge, usually given in cubic feet per second (ft^3/s). With respect to water underground, the movement of water out of an aquifer. Discharge may be natural, as from springs, as by seepage, or it may be artificial as by constructed drains or from wells.

DISSOLVED OXYGEN:
The amount of free (not chemically combined) oxygen in water. Usually expressed in milligrams per liter.

DISSOLVED SOLIDS:
Chemical compounds in solution.

DIVERSION:
A turning aside or alteration of the natural course of a flow of water, normally considered physically to leave the natural channel. In some States, this can be a consumptive use direct from a stream, such as by livestock watering. In other States, a diversion must consist of such actions as taking water through a canal or conduit.

DOMESTIC WATER USE:

Water for normal household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns, gardens and livestock supplied from a domestic source. Also called residential water use. The water can be obtained from a public supply or be self-supplied.

DRAINAGE BASIN:
A part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

DRAWDOWN (GROUND WATER):
The depression or decline of the water level or potentiometric surface in a pumped well or in nearby wells caused by pumping. At the well, it is the vertical distance between the static and the pumping level.

DRIP IRRIGATION:
See Irrigation.

DRYLAND FARMING:
Practice of crop production without irrigation in semiarid regions usually by using moisture-conserving farming techniques.

EPHEMERAL STREAM:
A stream or portion of a stream which flows only in direct response to precipitation. Such flow is usually of short duration. Most of the dry washes of the region may be classified as ephemeral stream.

EVAPORATION:
Process by which water is changed from the liquid state to the vapor state. See also Evapotranspiration; Transpiration.

EVAPORATION, NET RESERVOIR:
The evaporative water loss from a reservoir after making allowance for precipitation on the reservoir. Net reservoir evaporation equals the total evaporation minus the precipitation on the reservoir surface.

EVAPOTRANSPIRATION:
The process by which water is returned to the air through direct evaporation or by transpiration of vegetation.

FALLOW:
Cropland, either tilled or untilled, allowed to lie idle, during the whole or the greater part of the growing season.

FARM EFFICIENCY:
The consumptive crop irrigation requirement divided by the farm delivery.

FECAL COLIFORM BACTERIA:
Bacteria that are present in the gut or the feces of warm blooded animals; they are indicators of possible sewage pollution.

FLOOD IRRIGATION:

See Irrigation.

FLOOD PLAIN:
Land bordering a stream. The land was built up of sediment from overflow of the stream and is still subject to flooding when the stream is at flood stage.

FREE-FLOWING WELL:
An artesian well in which the potentiometric surface is above the land surface. See also Potentiometric surface.

FRESHWATER:
Water that contains less than 1,000 mg/L (milligrams per liter) of dissolved solids; generally, more than 500 mg/L is considered undesirable for drinking and many industrial uses.

FURROW IRRIGATION:
See Irrigation.

GAGING STATION:
A particular site on a stream, canal, lake or reservoir where systematic observations of gage height or discharge are made.

GAINING STREAM:
A river, or reach of a stream or river, that gains flow from ground water seepage or from springs in, or alongside, the channel--sometimes called an effluent stream.

GRAVITY IRRIGATION:
See Irrigation.

GROUND WATER:
Generally, all subsurface water as distinct from surface water; specifically, that part of the subsurface water in the saturated zone (a zone in which all voids, large and small, ideally are filled with water under pressure equal to or greater than atmospheric).

GROUND WATER MINING:
The condition that exist when the withdrawal of water from an aquifer exceed the recharge causing a decline in the ground water level.

GROUND WATER RECHARGE:
The addition of water to the zone of saturation. Infiltration of precipitation and its movement to the water table is one form of natural recharge.

GROUND WATER RESERVOIR STORAGE:
The amount of water in storage within the defined limit of the aquifer.

HYDRAULIC GRADIENT (GROUND WATER):
The gradient or slope of the water table or potentiometric surface in a specific direction.

HYDROELECTRIC POWER:
Electric energy generated by means of a power generator coupled to a turbine through which water passes.

HYDROGRAPH:
A graph showing the stage, flow, velocity, or other property of water with respect to the passage of time. Hydrographs of wells show the changes in water levels during the period of observation.

IMPERMEABLE:
Not capable of transmitting fluids or gases in appreciable quantities. Few rocks are completely impermeable; but some--such as unweathered granite, dense basalt, welded tuff, dense limestone, and well-cemented conglomerate--may be so considered for practical purposes.

INTERBASIN TRANSFER OF WATER:
See Water exports; Water imports.

INTERMITTENT STREAM:
A stream which flows for only a part of the time. Flow generally occurs for several weeks or months in response to seasonal precipitation, due to ground water discharge, in contrast to the ephemeral stream that flows but a few hours or days following a single storm.

IRRIGATED AREA:
The gross area upon which water is artificially applied.

IRRIGATION:
Generally, the controlled application of water to arable lands to supply water requirements of crops not satisfied by rainfall. (See also Irrigation water use.) Systems used include the following:

Center-pivot:
Automated sprinkler irrigation achieved by rotating the sprinkler pipe or boom, supplying water to the sprinkler heads or nozzles, as a radius from the center of the circular field to be irrigated. The pipe is supported above the crop by towers at fixed spacings and propelled by pneumatic, mechanical, hydraulic, or electric power on wheels or skids in fixed circular paths at uniform angular speeds. Water, which is delivered to the center or pivot point of the system, is applied at a uniform rate by progressive increase of nozzle size from the pivot point of the system to the end of the line. The depth of water applied is determined by the rate of travel of the system. Single units are ordinarily about 1,250 to 1,300 feet long and irrigate about a 130-acre circular area.

Drip:
An irrigation system in which water is applied directly to the root zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe, and so forth) operated under low pressure. The applicators can be placed on or below the surface of the ground or can be suspended from supports.

Flood:
The application of irrigation water where the entire surface of the soil is covered by ponded water.

Furrow:
A partial surface flooding method of irrigation normally used with clean-tilled crops where water is applied in furrows or rows of sufficient capacity to contain the design irrigation stream.

Gravity:

Irrigation in which the water is not pumped but flows in ditches or pipes and is distributed by gravity.

Sprinkler:
A planned irrigation system in which water is applied by means of perforated pipes or nozzles operated under pressure so as to form a spray pattern.

Subirrigation:
A system in which water is applied below the ground surface either by raising the water table within or near the root zone or by using a buried perforated or porous pipe system that discharged directly into the root zone.

Traveling gun:
Sprinkler irrigation system consisting of a single large nozzle that rotates and is self-propelled. The name refers to the fact that the base is on wheels and can be moved by the irrigation or affixed to a guide wire.

IRRIGATION CONVEYANCE LOSS:
The loss of water in transit from a reservoir, point of diversion, or ground water pump to the point of use, whether in natural channels or in artificial ones, such as canals, ditches, and laterals.

IRRIGATION EFFICIENCY:
The percentage of the water diverted from a water source that is consumed. It is the product of the distribution efficiency and the farm efficiency.

IRRIGATION LEACHING REQUIREMENT:
The amount of water required to move residual salts out of the root zone and maintain an adequate soil-salt balance for crop production.

IRRIGATION REQUIREMENT:
The quantity of water, exclusive of precipitation, that is required for production of a specific crop.

IRRIGATION RETURN FLOW:
Part of irrigation water that is not consumed by evapotranspiration and that drains from the irrigated area to an aquifer or surface-water body.

IRRIGATION WATER USE:
Artificial application of water on lands to assist in the growing of crops and pastures or to maintain vegetative growth on recreational lands such as parks and golf courses. See also Irrigation.

KARST:
A type of topography that is formed on limestone, dolomite, gypsum beds, and other rocks by dissolution and is characterized by closed depressions, sinkholes, caves, and underground drainage.

LOSSES INCIDENTAL TO IRRIGATION:
The quantity of water depleted by irrigation in excess of the beneficial irrigation consumptive use.

MILLIGRAMS PER LITER:
The weight in milligrams of any substance contained in 1 liter of liquid. (Equivalent to parts per million for values less than about 7,000 mg/L.)

MILLION GALLONS PER DAY:
A rate of flow of water of one million gallons per twenty four hour period.

OVERDRAFT:
Withdrawals of ground water at rates perceived to be excessive. See also Groundwater mining.

PER CAPITA USE:
The average amount of water used per person during a standard time period, generally per day.

PERCHED GROUND WATER:
Water in a saturated zone of material underlain by a relatively impervious stratum which acts as a barrier to downward flow and which is separated from the main ground water body by a zone of unsaturated material above the main ground water body.

PERENNIAL STREAM:
A stream that normally has water in its channel at all times.

PHREATOPHYTE:
A plant that habitually obtains its water supply from the zone of saturation, either directly or through the capillary fringe.

PLAYA:
Flat-floored bottom of an undrained desert plains basin.

POROSITY:
The ratio of the total volume of pore space (voids) in a rock or soil to its total volume, usually stated as a percentage. Effective porosity is the ratio of the volume of interconnected voids to the total volume. Unconnected voids contribute to total porosity but are ineffective in transmitting water through the rock.

POTABLE WATER:
Water that is safe and palatable for human consumption.

POTENTIOMETRIC SURFACE:
An imaginary surface representing the static head of ground water in tightly cased wells that tap a water-bearing rock unit (aquifer); or in the case of unconfined aquifers, the water table.

PRECIPITATION:
Includes atmospheric hail, mist, rain, sleet and snow which descends upon the earth; the quantity of water accumulated from the above events.

RECHARGE:
The addition of water to an aquifer by infiltration, either directly into the aquifer or indirectly by way of another rock formation. Recharge may be natural, as when precipitation infiltrates to the water table, or artificial, as when water is injected through wells or spread over permeable surfaces for the purpose of recharging an aquifer.

RECOVERABLE GROUND WATER:
The amount of water which may be physically and economically withdrawn from the ground water reservoir.

RECYCLED WATER:
Water that is used more than one time before it passes back into the natural hydrologic system.

RETURN FLOW:
The part of a diverted flow which is not consumptively used and which returns to a water body.

RIPARIAN VEGETATION:
Vegetation growing on the banks of a stream or other body of surface water.

RUNOFF:
The part of the precipitation that appears in surface streams.

SALINE WATER:
Water that contains more than 1,000 milligrams per liter of dissolved solids. It generally is considered unsuitable for human consumption and less desirable for irrigation because of its high content of dissolved solids. Salinity generally is expressed as milligrams per liter (mg/L) of dissolved solids, with 35,000 mg/L defined as seawater. A general salinity scale is:

SALINITY	DISSOLVED SOLIDS (MG/L)
Slight	1,000-3,000
Moderate	3,000-10,000
Very	10,000-35,000
Brine	more than 35,000

SALTWATER INTRUSION:
Replacement of freshwater by saline water in an aquifer or body of water.

SALVAGED WATER:
The part of a particular stream or other water supply that is saved from loss and made available for use.

SEWAGE:
Waste matter carried off by sewers and drains.

SEWAGE TREATMENT:
The processing of wastewater for the removal or reduction in the level of dissolved solids or other undesirable constituents.

SEWAGE-TREATMENT RETURN FLOW:
Water returned to the hydrologic system by sewage-treatment facilities.

SPECIFIC CAPACITY:
In ground water hydrology, the yield of a well in gallons per minute per foot of drawdown after a period of sustained pumping.

SPRINKLER IRRIGATION:
See Irrigation.

STOCK POND/TANK:

Any manmade or natural catchment used exclusively for livestock watering. Generally, for purposes of determining permitting requirements, a stock pond/tank either within a water course or off-stream that is used exclusively for livestock, of 10 acre-feet or less regardless of height, does not require a permit. However, there are basins in the state that require permitting in any case, so checking with the State Engineer is advised.

STREAM, PERENNIAL:
A stream that flows continuously.

STREAMFLOW:
The discharge that occurs in a natural channel of a surface stream course.

SUBIRRIGATION:
See Irrigation.

SURFACE WATER:
An open body of water, such as a stream or a lake.

SUSPENDED SEDIMENT:
Sediment that is transported in suspension by a stream. Fragmental material, both mineral and organic, that is maintained in suspension in water by the upward components of turbulence and currents and (or) by colloidal suspension.

TAILWATER RECOVERY:
Process of collecting irrigation water runoff for reuse.

THERMOELECTRIC POWER:
Electrical power generated by using fossil-fuel (coal, oil, or natural gas), geothermal, or nuclear energy.

TOTAL DISSOLVED SOLIDS (TDS):
An aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, etc., of calcium, magnesium, manganese, sodium, potassium, and other cations which form salts. High TDS concentrations exert varying degrees of osmotic pressures and often become lethal to the biological inhabitants of an aquatic environment. The common and synonymously used term for TDS is "salt".

TOTAL SEDIMENT LOAD:
The sum of the bedload and the suspended sediment load.

TRANSMISSIBILITY (GROUND WATER):
The rate at which water at the prevailing water temperature is transmitted through a unit width of the aquifer under a unit hydraulic gradient. It is generally expressed as gallons per day through a vertical strip of the aquifer 1 foot wide under a hydraulic gradient of 1 foot per foot, or more recently as cubic feet per day under the same conditions. It replaces the term "coefficient of transmissibility".

TRANSPIRATION:
Process by which water absorbed by plants, usually through the roots. The residual water vapor is emitted into the atmosphere from the plant surface. See also Evaporation; Evapotranspiration.

TRAP EFFICIENCY OF RESERVOIRS:

Ratio of sediment retained to sediment inflow expressed as a percentage.

TURBIDITY:
The opaqueness or reduced clarity of a fluid due to the presence of suspended matter.

WASTEWATER:
Water that contains dissolved or suspended solids as a result of human use.

WATER BUDGET:
An accounting of the inflow to, outflow from, and storage changes of water in a hydrologic unit.

WATER EXPORTS:
Artificial transfer (pipe, canals) of water to one region or subregion from another.

WATER RIGHT:
Legal rights to use a specific quantity of water, on a specific time schedule, at a specific place, and for a specific purpose.

WATER TABLE:
The upper surface of zone of saturation. See also Potentiometric Surface.

WETLANDS:
Lands that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions.

WITHDRAWAL:
Water removed from the ground or diverted from a surface-water source for use.

ZONE OF SATURATION:
The zone in which all the connected interstices or voids in permeable rock or soil formation are filled with water under pressure equal to, or greater than atmospheric pressure.

New Mexico Interstate Stream Commission
Bataan Memorial Building,
Room 101 State Capitol
Post Office Box 25102
Santa Fe, New Mexico
87504-5102

Commission Members [1]

Albert E. Utton, Chairman, Albuquerque

J. Phelps White III, Vice-Chairman, Roswell

Eluid L. Martinez, Sectretary, Santa Fe

Tracy Seidman-Hephner, Wagon Mound

Richard C. Johnson, Silver City

Palemon A. Martinez, Valdez

George M. Shoup, Carlsbad

Paulina Salopek, Las Cruces

Elbert Hamblin, La Plata

The Commission wishes to expressly thank the following volunteer work group members that put in many hours of effort to participate in the preparation of the Regional Water Planning Handbook:

Bobby Creel, New Mexico Water Resources Research Institute

Gary Daves, City of Albuquerque

Vickie Gabin, Sierra Club

Debbie Hughes, New Mexico Association of Conservation Districts

Michael Benson, Navajo Nation, Department of Water Resources Management

Thomas Shelley, Phelps Dodge

Tony Mayne, Santa Fe Metropolitan Water Board

Joe Quintana, Middle Rio Grande Council of Governments

Lee Tillman, Eastern Plains Council of Governments

Fred Vigil, New Mexico Acequia Commission

Randy Kirkpatrick, San Juan Water Commission

Consuelo Bokum, New Mexico Environmental Law Center

Michael Riley, Elephant Butte Irrigation District

Hal Engle, New Mexico Rural Water Users Association

[1] **Web Page Note: The above lists reflect individual's positions at the time of this publication in December, 1994.**

New Mexico Interstate Stream Commission
Post Office Box 25102
Santa Fe, New Mexico 87504

Download This Document

To download the entire document (excluding the figures) for printing:

The document in **. DOC** format is a MS Word 97 file that will open and display in Microsoft Word. You can then save to and print from your machine a copy of the document.

The document in **. TXT** format can be selected, then downloaded to your machine with the "SAVE AS" command and then opened in your word processor to print a copy.

Web Page by: Brent Pearce
Office of the State Engineer
June 1999
