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FOOTHILLS PROJECT:

Comments on Inadequacies, Environmental Impact Analyses and Evaluation of Alternative Actions

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FOOTHILLS PROJECT: COMMENTS ON INADEQUACIES, ENVIRONMENTAL IMPACT ANALYSES AND EVALUATION OF ALTERNATIVE ACTIONS

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ABSTRACT

Important scientific literature (Ward 1974; 1975; 1976), which describe the limnology of the existing riverine environment, were overlooked in the preparation of statements concerning environmental impacts of the proposed action. The river in Waterton Canyon will be profoundly affected by construction of the Strontia Springs Dam. Downstream from the dam the riverine environment will be characterized by compacted substrata (due to sluicing effect of discharge), luxurant growths of benthic algae (due to lack of sediment scour and presence of adequate growth nutrients), and depressed thermal regime (due to thermal stratification in the reservoir and hypolimnial release from the dam). Although a fishery may be sustained in the reservoir tailwaters, these changes should be considered as negative impacts in terms of the existing environment. More environmentally sound sites (i.e. Canyon Mouth and Chatfield Alternatives) for water diversion are located at or downstream from the mouth of Waterton Canyon.

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SECTION 1

INTRODUCTION

People of Denver and sister cities have been fortunate to have a very high quality and almost unlimited muncipal water supply. Only during the recent low water year, 1977, have water shortages of any consequence occured. All figures indicate that without conservation programs the present treatment facilities cannot supply demand, even though raw water supplies exist. An additional 100 mgd delivery to users will be needed by 1988 (BLM, 1978).

The Denver Water Board (DWB) has developed available East Slope raw water supplies (e.g., South Platte Reservoirs) and augmented these with transmountain diversions from the West Slope. Most of this water is delivered via the South Platte River. Diversion via low dams and conduits from the Waterton Canyon area of the river facilitate gravity feed to the treatment plants and much of the city. This has been a major feature in the existing water supply network.

The low diversion dams in Waterton Canyon impound sediments which are periodically sluiced downriver. This procedure, along with severe dewatering in the lower canyon, has severely stressed the riverine habitat. Although nearly all of the river system is regulated by dams or diversions, the areas above Platte Canyon intake sustain a notable trout fishery. Scenery in the canyon is also a valuable resource, especially because of its proximity to the metropolitan area.

In order to supply additional treated waters to Denver, the DWB is proceeding with plans to impound a portion of Waterton Canyon. The 240 foot high Strontia Springs Dam will be used to divert raw water through a new tunnel to a new treatment facility, called Foothills Treatment Plant. These plans exert major environmental consequences on the South Platte River and areas on the west slope that will be used to develop additonal water sources to supply the 500 mgd Foothills Plant.

The proposed project and viable alternatives along with associated environmental impacts were described in an Environmental Impact Statement (BLM, 1978) and subsequent documents (U. S. Army Corps Engin., 1978). However, a variety of environmental problems were either overlooked or not properly addressed. The purpose of this report is to identify and discuss particular points that have significant bearing on what course of action should be taken to minimize further environmental degradation that may be caused by the project alternatives.

SECTION 2

ANALYSIS OF STREAM REGULATION

EXISTING REIVERINE ENVIRONMENT

The South Platte River is a regulated stream and only headwaters are unaffected by augmented flow via transmountain diversions (i.e., Dillon Reservoir - Roberts Tunnel) or discharges from on-channel impoundments (i.e., Antero, Eleven-Mile, Cheesman, and Chatfield Reservoirs). Low diversion dams in Waterton Canyon (i.e., Aurora and Platte Canyon) have been used since the early 1900's to supply municipal waters to Denver. Artificial regulation of flow has profoundly altered the lotic environment of the river by changing physical regima (e.g., temperature, turbidity, bed loading, dissolved solids, etc.) that would otherwise be characteristic of a Front Range stream. Biota have been negatively affected by regulation; populations of indigenous species have been eliminated or reduced. Virtually no portion of the South Platte persists in a "natural" or "pristine" state. However, predictable responses to existing conditions of stream regulation have been documented, but were not considered in the EIS (BLM, 1978).

Ward (1974, 1975, 1976) quantified the downstream effects of hypolimnial discharges from Cheesman Reservoir. He found that regulation had profound effects in Cheesman Canyon, but that discharges from the North Fork tended to dilute these effects in Waterton Canyon. In the stretch of river between Cheesman Reservoir and the North Fork confluence, hypolimnion discharges have armored the river bottom by successive clear-water sluicing. Since turbidity and bed loading associated with spring runoff is retained in the reservoir, no redisposition of substrata is possible in the tailwaters. This armoring effect is accompanied by unchecked growth of attached algae; in unregulated rivers periphyton is periodically scoured from the river bottom by the sand-blasting effect of turbid discharges during spate or spring runoff events. Also, since Cheesman Reservoir is sufficiently deep to stratify thermally, hypolimnial releases are comparatively colder in summer and warmer in winter than would be normally observed. Ward (1976, Fig. 3) showed that the thermal regime in Cheesman Canyon was considerably dampened and delayed over that in Waterton Canyon. Benthic community structure (i.e., numbers of species present) is considerably less complex in Cheesman Canyon than in Waterton Canyon, due to the effects of regulated releases from the bottom of Chessman Reservoir. Certain Ephemeroptera (e.g., Baetis sp. and Ephemerella inermis), Chironomidae, and Gammarus lacustrus are common benthic residents below the dam; in Waterton Canyon Plecoptera, Trichoptera, and other Ephemeropta predominate, and Ward's (1976) species list compares favorably with that reported for the Cache la Poudre River, an un-regulated stream in the Front Range (see Stanford, 1971). However, biomass is much greater in areas influenced by reservoir discharge (see Ward 1976, Fig. 4). Almost identical consequences of hypolimnial releases on benthic ecology of tailwaters have been documented on the South Fork of Flathead River in Montana (see Stanford and Potter, 1976) and elsewhere (see BIBLIOGRAPHY).

High biomass of forage organisms per unit area and availability of refugia in deep pools behind large boulders characterize the South Platte River below Cheesman Reservoir. This may largely account for the productive trout fishery that presently exists in this stretch of the river. The fishery is also apparently successful in the North Fork and Waterton Canyon, at least to the Aurora diversion dam. This structure and the Platte Canyon diversion dam accumulate sediments that are periodically sluiced downstream. The resulting turbidity continues to impact unfavorably on benthos and fish by clogging and abrasive actions, especially downstream from Platte Canyon intake (BLM, 1978; James V. Ward, personal communication). The lower portion of Waterton Canyon has a history of low flow due to upstream diversion, which coupled with sediment deposition, has severly impacted the fishery (BLM, 1978).

Although Ward's work indicates that the riverine environment of the North Fork and Waterton Canyon is much less altered that the South Fork in Cheesman Canyon, little is known about the effects of transmountain diversions via the Roberts Tunnel. During Ward's one year study of the Waterton Canyon section, west-slope water was discharged only on two days. This source has been utilized to a greater extent recently and will be even more of an influence if the proposed project is completed. Associated impacts on fish and invertebrates have not been investigated, but, since the river channel is so narrow, sustained high flows would not likely be advantageous to fish and invertebrates.

STRONTIA SPRINGS ALTERNATIVE

Construction of the Strontia Springs diversion dam is apparently the preferred action from the viewpoint of DWB, because construction of access roads and staging area at Stephen's Gulch is underway. Also, this action provides gravity-flow to the treatment plant, eliminates ice problems at the diversion site, and provides re-regulation capability and precedence for the proposed Two Forks storage reservoir to be located upstream. The EIS (BLM, 1978) was woefully incomplete in accessing the impacts of the Strontia Springs Dam on the riverine environment. The conclusion the river will return to near "normal" conditions after construction (i.e. dam will have no downstream effects) (BLM, 1978, pg. 3-73; similar conclusion reached by U.S. Army Corps Engin., 1978a, pgs. 16-17) is entirely false.

The reservoir will likely stratify thermally. DWB plans to operate the system so that detention time (theoretical, tdt) is ≥ 20 days, except during short periods of high water use in summer (see 12/Nov/78 letter from R. Weir, DWD, to C. Garvey, Corps Eng.). Actually, 20 days is probably a fairly conservative figure based on uncertainties about quantity and timing of transmountain diversions. Pool elevation will remain relatively stable (BLM, 1978) and incoming water masses will reach 15-17° C in late summer and 0-1° C during the winter months. The reservoir will be 243 ft. deep and protected from wind-mixing by steep canyon walls. Stratification will almost certainly occur and since the diversion intake is near the surface to reduce sediment loading, it is likely that warm, less-dense water masses coming into the reservoir during the summer will merely overflow colder, more-dense subsurface waters to the diversion gates. As the dam is presently to be constructed, any water discharged downstream will constitute cold, hypolimnial releases.

The resulting riverine environment downstream from the dam may be compared to that presently existing below Cheesman Dam: the river will not freeze due to discharge of 4.0° C water during the winter; the river bottom will stabilize and become coated with growths of Cladophora and Ulothrix algae; present macrobenthos will be replaced by forms similar to those found downstream of Cheesman (e.g., Chironomidae and Gammarus); and invertebrate biomass per unit area may increase in comparison to pre-impoundment levels.

It is reasonable to assume that a trout fishery would develop below the Strontia Springs Dam, since similar conditions produced viable fishery in Cheesman Canyon. However, the downstream thermal regime may be more profoundly depressed because Strontia Springs Reservoir will be much deeper than Cheesman Reservoir. Thermal shock could be a problem during high flow periods (i.e., due to flooding) when the dam was over-topped. Also, sustained cold water discharge is not conducive to rapid growth of fish. These problems could easily be alleviated by construction of multiple level outlets for thermal management. Also, it is important to remember that substrate structure in Waterton Canyon is less suitable for trout than in Cheesman Canyon, where sluicing around large boulders has created deep pools. Implantation of gabions or other refugia below Stontia Springs would be desirable.

The question of instream flow requirements below Strontia Springs has been addressed as well as possible in light of the paucity of knowledge on the subject in general. Thirty to sixty cfs probably would be sufficient (and is apparently available) to sustain riverine biota, especially since dewatering due to ice formation will likely not occur. The presence of the structure does in itself pose two ultimate problems for management of riverine biota that does establish downstream from the dam: 1) the river could be dewatered completely by diversion, if for any reason it is deemed necessary to do so (e.g., drought, mechanical problems in outlet gates, etc.) and 2) sediments will fill the reservoir basin completely within 75-100 years and disposal without destruction of the downstream habitat will be difficult if not impossible.

CHATFIELD AND CANYON MOUTH ALTERNATIVES

Although other alternatives to the proposed action were presented, only Chatfield and Canyon Mouth proposals merit much consideration. These could be utilized without continued operation of the existing diversion structures at the Aurora and Platte Canyon intakes, which should be eliminated to prevent sedimentation problems. The riverine habitat in lower Waterton Canyon cannot be expected to improve if sediments are sluiced from low diversion dams during periods of low flow. Continued operation of the diversion dams might be possible if sluicing operations were limited to periods of spring runoff, when the river is turbid anyway; however, additional study of this matter would be required.

The Chatfield alternative is the most environmentally sound action, if the objective is to minimize the loss of "natural" qualities of Waterton Canyon. Water and sediments would be stored outside the confines of the canyon, thus eliminating all problems associated with a deep diversion/storage reservoir within the canyon. The existing riverine environment in the canyon could be enhanced by sustained flows from transmountain diversion and Cheesman Reservoir. At peak operation of 500 mgd at Foothills, plus Marston and Kassler treatment plants in full operation, the South Platte would have to sustain flow of 1,170 cfs. Although this volume is not likely before 2000, such flows might prove to be deleterous due to excessive sluicing in the river channel. If enough water were available, controlled releases from Chatfield Reservoir could enhance water quality of the South Platte as it flows through metropolitan Denver.

The Chatfield alternative is criticized in the EIS (BLM, 1978) on the basis of greater productivity of algae which may produce treatment problems due to tastes and odors. Certainly, water stored in Chatfield Reservoir will be more productive than in a deep, cold reservoir like Strontia Springs, but if I am to believe the phosphorus and nitrogen data ($\bar{x}$ $PO_4^{=}$ = 0.05 ppm; $\bar{x}$ $NO_3^{=}$ = 0.08 ppm) presented in the EIS (BLM, 1978), algal growth may be a significant problem in all of the alternatives. It is doubtful these data are accurate. Regardless, such algae problems are easily handled by modern water treatment processes.

The Canyon Mouth Alternative (see U. S. Army Corps Engin., 1978b), like Chatfield, contains significant advantages over Strontia Springs: much of the canyon section would remain free flowing and the riverine environment of the lower section (except that to be impounded) would be improved by sustained discharges; sediments would be retained near the canyon mouth; regulated releases from the reservoir could vastly improve aquatic habitat downstream to Chatfield. A significant advantage of Chatfield over Canyon Mouth is that the former is already built.

TRANSMOUNTAIN DIVERSION

Under the proposed action a sustained discharge of approximately 1,176 cfs would be required to maximize treatment capacity (assuming Marston and Kassler plants were operating at capacity). Both additional west-slope water rights and storage capacity (e.g., Two Forks and/or Eagle-Colorado Reservoirs, see Appendix B) will have to be adjudicated to supply this volume of water. The EIS (BLM, 1978) identified plans involving west-slope diversions that significantly affect the Colorado River system. Very little quantitative information exists pertaining to the environmental quality or ecology of the various Colorado River tributaries that may be dewatered by diversions to supply the ultimate demands of the Foothills Project. It is clear that impacts on wilderness areas (Gore) and probably rare or endangered species are involved in the plans, although such was not stated in the EIS. It is not clear from the EIS that sufficient water is presently available to sustain even 125 mgd operation at the proposed plant. Therefore, discussions pertaining to impacts and mitigation of habitat in Waterton Canyon seem rather inadequate in light of west-slope alterations. I believe a detailed environmental assessment of the situation is needed immediately; one in which all aspects of the proposed action are modeled and studied precisely. This should be done before any additional construction on the Foothills Project is undertaken.

SECTION 3

CONCLUSIONS

1) The present EIS (BLM, 1978) is very inadequate in terms of describing impact of proposed Strontia Springs/Foothills Project because (1) available literature on ecology of Waterton and Cheeseman Canyons was not considered, (2) it is erroneously assumed that no long-term alteration of riverine environment downstream from Strontia Springs will occur (i.e., river will return to "normal" if 30 cfs minimum flow is established) and (3) Chatfield and Canyon-Mouth alternatives were not presented in full light of their reduced impact (compared to Strontia Springs) on the Canyon environment.

2) The reservoir behind Strontia Springs Dam will stratify and the downstream effects of hypolimnial release will manifest similarily to those seen in the South Fork of South Platte below Cheesman Dam. The effects may be more severe, however. The resultant thermal regime in Strontia Springs tailwaters may be depressed compared to Cheesman because Strontia Springs is much deeper and therefore stratification may be more profound (e.g., water released from the bottom of the reservoir would be closer to 4° C year around). Regardless, the riverine environment after construction will not compare to the existing environment for virtually any ecological parameter.

3) Since a productive fishery exists below Cheesman, it is reasonable to assume a similar one might develop below Strontia Springs. This might be maximized by sustained flows in excess of 30 cfs, accompanied by thermal management via selective outlet portals in the dam and placement of rock-gabions or other structures in the river channel to promote development of pool refugia.

4) From an environmental viewpoint the most logical alternative is to locate the diversion structure as far downstream as possible. Impoundment within the canyon will change the nature and quality of the riverine environment and retain large volumes of sediments, that will ultimately have to be sluiced or hauled. The most ecologically sound alternative would be to use the <u>existing</u> Chatfield Reservoir as the diversion point; the only anthropogencic impacts related to recruitment of waters for municipal use would be due to changes on characteristics of flow regima from Cheesman and Dillon Reservoirs. In addition, utilization of existing Chatfield impoundment would ensure minimum flows throughout the entire reach of the canyon. Of the remaining two alternatives, Strontia Springs and the Canyon Mouth, the Canyon Mouth Dam would have the least adverse environmental impacts.

5) The whole environmental picture is greatly confused by the relationship of the proposed project to the overall (especially west-slope) impacts of transmountain diversions to meet ultimate 500 mgd supply to Denver. A complete assessment of the environmental consequences on both slopes should be completed and debated before further construction of the Foothills Project is warranted.

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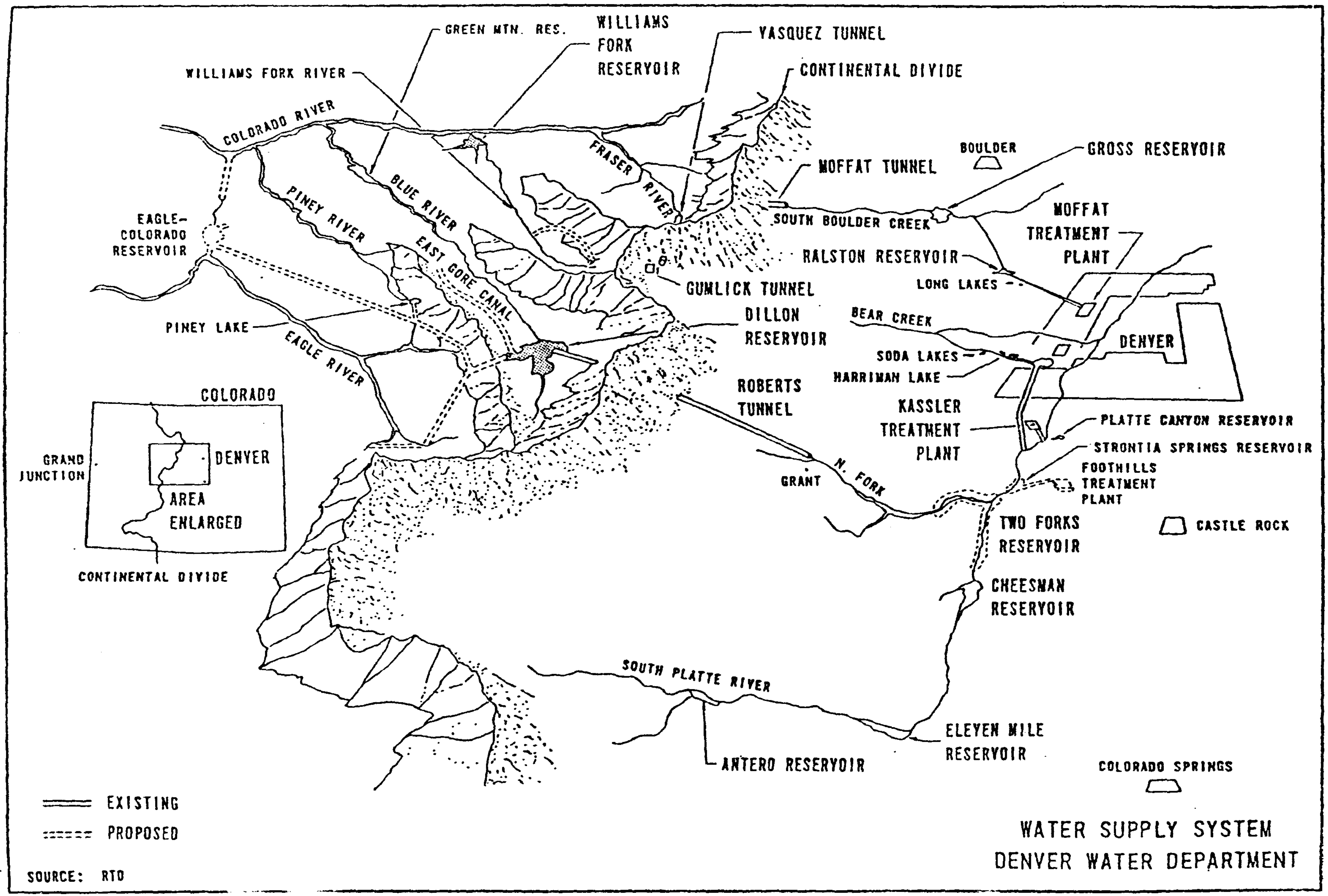
APPENDIX A

Schematic representation of proposed dams and diversions that may be utilized to supply raw water to the Foothills treatment system.



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15. SUPPLEMENTARY NOTES

16. ABSTRACT

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