5 IMPACTS OF WATER MANAGEMENT STRATEGIES ON KEY PARAMETERS OF WATER QUALITY AND IMPACTS OF MOVING WATER FROM RURAL AND AGRICULTURAL AREAS

5.1 Introduction

The regulations that describe the content and process for the development of regional water plans state that the plan include "a description of the major impacts of recommended water management strategies on key parameters of water quality identified by the regional water planning group . . ." [30 TAC 357.7(a)(12)].

This chapter presents an assessment of the water quality parameters that could be affected by the implementation of water management strategies (WMS) for Region F. Based on this assessment, the key water quality parameters for each type of WMS are identified. From this determination, the specific water management strategies selected for Region F were evaluated with respect to potential impacts to the key water quality parameters.

In addition, this chapter discusses the potential impacts of moving water from rural areas to urban uses.

5.2 Potential Impacts of Water Management Strategies on Key Water Quality Parameters

The key water quality parameters to be evaluated are dependent on the WMS being proposed. Table 5.2-1 summarizes the most pertinent water quality parameters for the types of WMS proposed in this plan.

The implementation of specific WMS can potentially impact both the physical and chemical characteristics of water resources in the region. The following is an assessment of the characteristics of each WMS type that may affect water quality and an identification of the specific water quality parameters that could be affected based on those characteristics.

Table 5.2-1
Key Water Quality Parameters by Water Management Strategy Type [a]

Water Quality Parameter	Voluntary Redistribution	Reuse	New or Expanded Use of Groundwater	Water Conservation	Desalination (Reverse Osmosis)
Total dissolved solids (TDS)	+ / -	+ / -		+	-
Alkalinity				+	
Hardness				+	
Dissolved Oxygen (DO)	+ / -	+ / -		+	
Nitrogen	+ / -	+ / -		+	-
Phosphorus	+ / -	+ / -		+	
Radionuclides			-		
Metals [b]	- [b]	+	- [b]		- [b]

a Water management strategies with no potential impacts to water quality are not shown in this table.
b Only for specific metals where there are significant discharges of the metal.
\+ Positive Impact
\- Negative Impact

5.2.1 Expanded Use of Surface Water Resources

The *Region F Water Plan* does not recommend the expanded use of surface water sources as water management strategies. The plan does recommend the subordination of downstream senior water rights holders to major reservoirs in Region F. This reflects the current operation of the basin, so there are no expected changes in water quality associated with this strategy.

5.2.2 Voluntary Redistribution

If surface waters are transferred from one area of the region to another, there can be a decrease in instream flows below the location of the diversion. The water quality parameters potentially impacted by that action as shown in Table 5.2-1 are possible increases in total dissolved solids (TDS), nutrients, and in some cases, metals, and potential decreases in dissolved oxygen (DO) in stream flows below the diversion.

For users of surface water downstream of voluntary redistribution diversion, changes in alkalinity, hardness, or turbidity due to higher TDS loading can impact water users that require treatment processes that produce high quality waters (for example boiler feed) and water treatment plants. Water treatment processes are tailored to the quality of the water being treated. If the quality of the feed water changes, the treatment process may have to be changed as well.

Changes in nutrient concentrations or water clarity can affect the extent of algal growth or aquatic vegetation in a stream. The same concentration of nutrients can produce different levels of algal growth in different water bodies depending on factors such as water clarity, shading, stream configuration, or other chemical constituents in the waters.

With respect to water clarity, there are also aesthetic considerations. It is generally not desirable to introduce waters with higher turbidity, or color, into high clarity waters.

Voluntary redistribution of groundwater sources will have minimal impacts on water quality parameters assuming there is no relative change in the amount of groundwater pumped. Impacts on key water quality parameters for large increases in groundwater pumpage to meet contractual sales are discussed in Section 5.2.4 (New and/or Expanded Use of Groundwater Resources).

Pending the location and use of the water under voluntary redistribution, changes in locations of return flows (if applicable) could impact flows in receiving streams. Such impacts would be site specific and could be positive or negative, pending the changes.

Generally, these impacts are relative to the quantities of water that are diverted or redistributed. Small quantities are likely to have minimal to no impacts, while large quantities may have measured impacts. In Region F no large surface water volume transfers are expected.

5.2.3 Reuse of Treated Wastewaters

In general, there are three possible water quality effects associated with the reuse of treated wastewaters:

- There can be a reduction in instream flow if treated wastewaters are not returned to the stream, which could affect TDS, nutrients, and DO concentrations of the receiving stream.

- Conversely, in some cases, reducing the volume of treated wastewater discharged to a stream could have a positive effect and improve levels of TDS, nutrients, DO, and possibly metals in the receiving stream.
- Reusing water multiple times and then discharging it can significantly increase the TDS concentration in the effluent and in the immediate vicinity of the discharge in the receiving stream. Total loading to the stream (i.e. the amount of dissolved material in the waste stream) should not change significantly.

These impacts will vary depending on the quality and quantity of treated wastewater that has historically been discharged to the stream and the existing quality and quantity of the receiving stream.

5.2.4 New and/or Expanded Use of Groundwater Resources

Increased use of groundwater can decrease instream flows if the base flow is supported by spring flow. This is not expected to be a concern for the recommended water management strategies in Region F. Most new groundwater development is in areas that have no flowing surface water, such as Winkler County, or from relatively deep portions of aquifers that most likely do not have significant impact on surface flows, such as McCulloch County.

Increased use of groundwater has the potential to increase TDS concentrations in area streams if the groundwater sources have higher concentrations of TDS or hardness than local surface water and are discharged as treated effluent. This is not the case in most areas in Region F. Naturally occurring salt seeps and high TDS waters are common in Region F. The development of new supplies from brackish groundwater is discussed under desalination.

New development of groundwater from the Hickory aquifer could potentially introduce radionuclides to surface water if wastewaters are discharged to local streams. The net concentrations in the receiving streams are expected to be low and should not impact water use from the stream.

5.2.5 Water Conservation

The water conservation measure with the greatest potential for water savings to be implemented in Region F is improvements in the efficiency of irrigation equipment (advanced

irrigation technologies). These recommended strategies are not expected to affect water quality adversely. The results should be beneficial because the demand on surface and groundwater resources will be decreased.

5.2.6 Desalination

Desalination of brackish groundwater is a recommended strategy for CRMWD and the Cities of San Angelo and Andrews. With new technologies, desalination has become a potentially viable option for the treatment of brackish and high nitrate source waters. However, these systems produce a waste stream that may adversely impact waters if discharged to surface waters. Key water quality parameters that may be affected include TDS, nutrients, and metals.

5.3 Impacts of Region F Water Management Strategies on Key Water Quality Parameters

The Region F water plan recommends six major water management strategies:

- Conservation or Drought Management
- Subordination
- Voluntary Redistribution
- New or Expanded Groundwater
- Reuse
- Desalination

Of these, conservation and subordination of downstream water rights do not have any potential impacts to key water quality parameters. A description of each of the other strategies and the potential impacts follows.

5.3.1 Voluntary Redistribution

Voluntary redistribution in Region F involves the sales of water from a source to a water user group or wholesale water provider. None of the recommended strategies listed below involve placing water from one source into another source. The amount of water proposed to be transferred should not significantly impact source reservoir or stream quantities beyond current commitments. Impacts to key water quality parameters are expected to be minimal.

Voluntary Redistribution Strategies:

- City of Midland - renew contract with CRMWD
- City of Ballinger - purchase water from Millersview-Doole WSC and CRMWD
- City of Stanton - renew contract with CRMWD
- CRMWD, City of Midland and City of Andrews - renewal of contracts with University Lands
- Millersview-Doole WSC - renew contract with CRMWD

5.3.2 New or Expanded Groundwater

Much of the groundwater supplies in Region F are fully developed and used for irrigation and local water needs. There is available groundwater from the Pecos Valley, Dockum and Hickory aquifers, which are proposed to meet specific needs in the region. Additional use of these aquifers is not expected to impact stream flows, and water quality is comparable or better than area surface water. Wastewater discharges from new users of the Hickory aquifer may contain radionuclides above the drinking water standards but should not impact the current water uses in the receiving streams. The proposed treatment strategies for Hickory aquifer water will improve water quality from this source. The proposed quantities of new or expanded groundwater use are within the sustainable amount for the respective aquifer and should not impact key water quality parameters within the aquifer formation.

New or Expanded Groundwater Strategies:

- City of Eden – new Hickory aquifer well (replacement well)
- City of Colorado City – new wells in Dockum aquifer (brackish)
- City of Menard – new Hickory aquifer well
- City of Midland – T-Bar Well Field (Pecos Valley aquifer)
- CRMWD – Winkler County Well Field (Pecos Valley aquifer)
- San Angelo – McCulloch County Well Field (Hickory aquifer)

5.3.3 Reuse

Wastewater reuse is a proposed strategy for the City of Winters and CRMWD. The CRMWD project proposes to reuse a portion of the treated wastewater from the cities of Big Spring, Odessa, Midland, and Snyder. The first phase of this project will likely involve Big Spring wastewater. Currently this wastewater is discharged to Beals Creek and diverted

downstream at the Beals Creek chloride control facility. The natural water quality of the receiving stream is high in TDS and salts. Because most of the reject from the treatment process and the remaining treated wastewater is diverted at the chloride control project, this strategy is expected to have little if any impact on key water quality parameters below the Beals Creek diversion. The reuse project will produce high-quality water that will be blended with high TDS water from Spence Reservoir, improving the overall water quality available from that source.

The recommended reuse strategy for the City of Winters calls for reuse of about 25 to 35 percent of the city's treated effluent. The reject from the advanced treatment of the effluent will be blended with the remaining effluent and either discharged or disposed of using land application. The small quantity of water involved in the strategy should have acceptable impacts on water quality. However, site-specific studies will be needed to verify water quality impacts.

5.3.4 Desalination

There are four recommended desalination water management strategies: City of San Angelo, City of Andrews, City of Colorado City and CRMWD. These strategies propose to desalinate brackish groundwater and dispose of the waste stream through deep well injection or evaporation ponds. The proposed treatment process will treat local brackish groundwater and make it suitable for municipal use. The finished water will be of comparable or higher quality than existing supplies and will have no impacts to area surface water.

5.4 Impacts of Moving Water from Rural and Agricultural Areas

Three recommended water management strategies involve taking water from primarily rural areas for use in primarily urban areas all of which already own water rights:

- CRMWD Winkler County Well Field
- City of Midland T-Bar Well Field
- City of San Angelo McCulloch County Well Field

Although all of these well fields are located in rural areas, these strategies are not expected to have significant impact on those areas. The CRMWD and Midland well fields are located in areas where very little groundwater is used for other purposes. The San Angelo well field may impact wells in rural communities that also depend on the Hickory aquifer. However, pumping and well spacing limits set by the Hickory Underground Water Conservation District may

minimize the potential impacts. Further studies may be required to determine the potential impacts of the San Angelo well field.

Another strategy that involves moving water from rural to urban areas is the CRMWD brackish groundwater strategy. This strategy proposes to use water that is not currently usable for rural and agricultural purposes. This strategy would have little to no impacts on rural communities.