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**TECHNICAL MEMORANDUM**

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SUBJECT: Green River Basin Plan  
***Basin Water Use Profile-Industrial***

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**Introduction**

The purpose of this technical memorandum is to provide existing water use information for the major industries in the Green River Basin.

The industries that obtain their primary water supply from surface water are:

1. Electric Power Generation
  - a. Jim Bridger Power Plant (Pacifcorp)-Green River
  - b. Naughton Power Plant (Pacifcorp)-Ham's Fork River
  
2. Soda Ash Production
  - a. FMC Granger-Green River
  - b. FMC Westvaco-Green River
  - c. General Chemical-Green River
  - d. OCI Wyoming-Green River
  - e. Solvay Minerals Inc.-Green River
  
3. Miscellaneous
  - a. Church and Dwight-baking soda production-Green River
  - b. Exxon Shute Creek Plant-natural gas processing-Green River
  - c. FS Industries-chemical fertilizer production-Green River

In this technical memorandum, Appendix 1 provides a summary for each of these ten (10) industrial surface water users. Each summary provides a brief description of the operations; a brief description of the water supply, the water supply system, and discharge system; estimates of annual water use; and a tabulation of principle water rights.

The industries that obtain their primary water supply from groundwater are:

1. Coal Mining
2. Uranium Mining
3. Oil and Gas Industries

## Methodology

### A. Existing Industrial Surface Water Use

Information was obtained from the various industries through direct communication. However, many of the soda ash industries did not have records of their water use. Therefore, some of the estimates of water had to be gleaned from the anecdotal information provided. For example, apparently, there is a "rule of thumb" that it takes 200 gallons of water to produce one (1) ton of soda ash. This soda ash production estimate was used to estimate a portion of the water use, absent more specific water use information. All of the soda ash facilities in the Green River area, with the exception of Solvay Minerals, Inc., have on-site power plants. It was estimated that the on-site power plants used an additional 250 gallons of water to generate the power necessary to produce one (1) ton of soda ash.

All of the industries, with the exception of the Naughton Power Plant, have zero discharge facilities. Therefore, the depletions or impacts to surface water are equal to the amount of water diverted. Depletions for the Naughton Power Plant were calculated by deducting the estimated return flow from the estimated diversions. The estimated surface water depletions for the 10 industries were calculated on a monthly basis to accommodate the modeling efforts for the planning study. However, the soda ash producers typically reported their water demands were relatively constant throughout the year.

### B. Existing Industrial Groundwater Use

There is very limited available information regarding industrial groundwater use. Industries' use of groundwater is typically short-term and intermittent in nature. The best available information relating to industrial groundwater use is water rights issued by the Wyoming State Engineer's Office. Therefore, tabulations of water rights in each of the water districts in the Green River Basin were used as the basis for estimates of existing industrial groundwater use.

The existence of water rights does not necessarily directly relate to water use, particularly for industrial water rights. Therefore, in order to get an indication of existing industrial groundwater use, the following assumptions were made based on discussions with state water officials:

1. It is assumed that 50% of the wells with adjudicated water rights are active and are providing water at their permitted capacity 10% of the time on an average annual basis.
2. It is assumed that 10% of the wells with unadjudicated water rights are active and are providing water at their permitted capacity 10% of the time on an average annual basis.

The assumption that 50% of the adjudicated wells are active, while only 10% of the unadjudicated wells are active, is based on the fact that the well owners with adjudicated rights invested the time and money for the adjudication process, thereby indicating they had more interest in the well and probably plan to use it on a more consistent and longer-term basis.

## Conclusions

### A. Existing Industrial Surface Water Use

Table 1 on the following page lists the ten major (10) industrial surface water users, their source of supply, point of diversion and principal water rights. Table 2 provides the estimated monthly and annual water use (depletions) for the ten users.

The existing estimated industrial surface use for the ten major users is approximately 66,500 acre feet per year. It is interesting to note that industrial water use for 1967 was estimated to be approximately 16,000 acre feet per year and the projected water use for 2000 was estimated to be approximately 86,000 acre feet per year in the "Wyoming Water Planning Report No. 3, Water and Related Land Resources of the Green River Basin, Wyoming," dated September, 1970.

#### 1. Electric Power Production

Power plants are the largest industrial water users in the Green River Basin. The Jim Bridger and Naughton Power Plants, both owned and operated by PacifiCorp, use or deplete approximately 47,800 acre feet of water per year. Both power plants enjoy the security of storage water. PacifiCorp maintains a contract for storage water from Fontenelle Reservoir for use at the Jim Bridger Power Plant during times of severe drought. PacifiCorp owns and operates Viva Naughton Reservoir, which serves as the primary supply for the Naughton Power Plant. In both plants, water is used to produce steam for power production and is used in the cooling processes. The majority of the water is discharged through the cooling towers or lost through evaporation ponds. Some water is used for dust abatement and domestic use.

#### 2. Soda Ash Production

There are five (5) major producers of soda ash in the Green River Basin. FMC Granger, FMC Westvaco, General Chemical, OCI Wyoming, and Solvay Minerals, Inc. produced approximately 11.7 million tons of soda ash in 1999, which represents approximately 37 per cent of the world's demands (Watts, 2000). Under current levels of production, these five producers deplete approximately 17,900 acre feet of water from the Green River and, collectively, are the second highest industrial water users in the Green River Basin. Water is used in the soda ash production process. Typically, the raw mineral (trona) is dissolved in water to remove impurities. The product is dried using centrifuges and steam dryers.

Table 1 - Green River Basin Industrial Surface Water Users

Water User	Industry	Source	Point of Diversion	Principle Water Right
Jim Bridger Power Plant	Power	Green	SW,SW,15,18,107	32112-62.8cfs
Naughton Power Plant	Power	Ham's Fork	Lot 40,27,22,116	22297-10.0cfs
FMC Granger	Trona	Green	NE,NW,16,20,109	22808-7.5cfs
FMC Westvaco	Trona	Green	SE,SE,16,20,109	20077-17.0cfs
General Chemical	Trona	Green	NE,SE,1,19,109	22748-6.5cfs
OCI Wyoming	Trona	Green	NE,SW,23,20,109	22075-8.72cfs
Solvay	Trona	Green	NE,SE,1,19,109	26126-5.0cfs
Church & Dwight	Baking soda	Green	same as Gen.Chem.	6304Enl.-1.78cfs
Exxon Shute Creek	Natural Gas	Green	NE,NW,18,23,111	29509-0.134cfs
FS Industries	Fertilizer	Green	same as RS/GR JPB	NA

Table 2 - Green River Basin Industrial Surface Water Use

Average Monthly Industrial Water Use (Acre-Feet)

Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jim Bridger Power Plant	1,900	1,900	2,850	2,850	3,600	3,750	3,860	3,860	3,100	2,850	1,900	1,900	34,320
Naughton Power Plant	1,100	1,000	1,100	1,100	1,200	1,200	1,200	1,200	1,100	1,100	1,100	1,100	13,500
FMC Granger	250	250	250	250	250	250	250	250	250	250	250	250	3,000
FMC Westvaco	500	500	500	500	500	500	500	500	500	500	500	500	6,000
General Chemical	300	300	300	300	300	300	300	300	300	300	300	300	3,600
OCI Wyoming	250	250	250	250	250	250	250	250	250	250	250	250	3,000
Solvay	190	190	190	190	190	190	190	190	190	190	190	190	2,280
Church & Dwight	15	15	15	15	20	20	25	20	20	20	15	15	215
Exxon Shute Creek	1	1	1	1	2	2	2	2	1	1	1	1	16
FS Industries	110	70	60	100	50	10	10	10	20	40	50	30	560
<i>Total Average Monthly Use</i>	<i>4,616</i>	<i>4,476</i>	<i>5,516</i>	<i>5,556</i>	<i>6,362</i>	<i>6,472</i>	<i>6,587</i>	<i>6,582</i>	<i>5,731</i>	<i>5,501</i>	<i>4,556</i>	<i>4,536</i>	<i>66,491</i>

All of the producers, with the exception of Solvay Minerals, Inc., have on-site power generation facilities, which also use a considerable amount of water. Water is also used for dust abatement and domestic supplies. All of the water at the facilities is discharged through cooling towers and evaporated from holding ponds.

### 3. Other Surface Water Users

While the following are not major water users in comparison to the power generation and soda ash industries, they collectively use approximately 900 acre feet of water per year. Each of the following water users have an interest in storage water from Fontenelle Reservoir.

Church and Dwight purchases soda ash and produces Arm and Hammer Baking Soda. The facility is located adjacent to General Chemical and uses the same diversion and pipeline for its water supply system. Presently, the facility obtains its water through its direct flow right on the Green River. The existing operations use approximately 215 acre feet of water per year. Church and Dwight maintains a contract with the State of Wyoming, through the Wyoming Water Development Commission, for 1,250 acre-feet of water per year from Fontenelle Reservoir as a future potential water supply.

Exxon processes natural gas at its Shute Creek Plant. Presently, the facility obtains its water through its direct flow right on the Green River and groundwater wells. The operations use approximately 16 acre feet of water per year. Exxon maintains a contract with the State of Wyoming, through the Wyoming Water Development Commission, for 300 acre-feet of water per year from Fontenelle Reservoir.

FS Industries produces chemical fertilizer. The facility is located east of Rock Springs. Presently, FS obtains its water through the water rights, diversion, water treatment plant and pipelines of the Rock Springs/Green River/Sweetwater County JPB. The existing facility uses approximately 560 acre feet of water per year. FS Industries maintains a contract with the State of Wyoming, through the Wyoming Water Development Commission, for 10,000 acre-feet of water per year from Fontenelle Reservoir. Apparently, the industry would use this storage water, in part, in the future when the Joint Powers Board needs the water it is currently supplying FS Industries to meet its municipal demands.

Flows in Green River are stored in Fontenelle and Flaming Gorge Reservoirs. Both of these dams have hydroelectric generating facilities. The production of hydropower is basically considered a non-consumptive use of water other than the associated evaporation losses which are considered in other sections of this report.

### 4. Fontenelle Reservoir

The water right for Fontenelle Reservoir indicates its primary purposes are irrigation, domestic, industrial, municipal, stockwatering, fish and wildlife and recreation; and when

not required for the primary purposes, storage water can be used for power generation, the secondary purpose. However, the major existing benefits of Fontenelle Reservoir relate to industry.

The construction of Fontenelle Dam was completed in December, 1967, under water right Permit No. 6629 Res. Fontenelle Reservoir has a total capacity of 345,397 acre feet. Originally, only 190,250 acre feet was designated as active capacity for the above listed purposes and 154,584 acre feet was designated as inactive capacity. The remaining 563 acre feet was the designated dead storage, as it could not be physically released. In 1962, the State of Wyoming contracted with the Bureau of Reclamation for 60,000 acre feet of the active capacity for a price of \$900,000. This amount was loaned to the State of Wyoming at an interest rate of 2.632% at a term of 50 years, plus the state was obligated to share in the actual operation, maintenance and replacement costs for the facilities.

Originally, the purpose of the inactive capacity (154,584 acre feet) was to raise the reservoir surface to an elevation high enough to release water to the proposed East Side and West Side Canals. In 1973, it was apparent that the two canals would not be constructed. Therefore, an enlargement to the original permit was granted (Permit No. 9502). The enlargement serve to move the previously designated inactive capacity to active capacity; thereby increasing the active capacity from 190,250 acre feet to 344,834 acre feet, which could be used for the permitted purposes, previously discussed. In 1974, the State of Wyoming again contracted with the Bureau of Reclamation for 60,000 additional acre feet of active capacity; thereby increasing its total interest in Fontenelle Reservoir to 120,000 acre feet. The price was \$11,410,000 for the additional 60,000 of active capacity, which was loaned to the State of Wyoming at an interest rate of 2.632% at a term of 40 years, plus the state was obligated to share in the actual operation, maintenance and replacement costs for the facilities.

In the 1974 contract, 5,000 acre feet was designated for the Seedskafee Wildlife Refuge. The United States reserved 65,000 acre feet of capacity for its uses, subject to provisions that the Bureau of Reclamation would not compete with the State of Wyoming in the water market. This contract also required the United States and State of Wyoming to ensure operations that would provide for the maintenance of 50 cfs in the Green River at the USGS streamgage near Green River, Wyoming.

Presently, the State of Wyoming, through the Wyoming Water Development Commission, has allocated 46,550 acre feet of its entitlements to Fontenelle water through the following water supply or readiness to serve contracts: Jim Bridger Power Plant (35,000 acre feet per year), FS Industries (10,000 acre feet per year), Church and Dwight (1,250 acre feet per year, and Exxon, USA (300 acre feet per year). The fact that there is unused and unallocated water in Fontenelle Reservoir has caused some to question its value. Fontenelle Reservoir provides hydropower, recreational, and environmental benefits. Further, its present operation supplements natural flow in the Green River. In addition, it can be surmised that the availability of water in Fontenelle Reservoir, and Wyoming's entitlements in the reservoir, were key considerations in the siting of the Jim Bridger Power Plant and the chemical fertilizer plant presently owned

and operated by FS Industries. In addition, and perhaps most importantly, it offers future economic development opportunities for the Green River Basin.

#### B. Existing Industrial Groundwater Use

Coal mines primarily use water for dust abatement. Black Butte Coal Company and Bridger Coal Company provide coal to the Jim Bridger Power Plant. Kemmerer Coal Company provides coal to the Naughton Power Plant. These companies have several permits for groundwater use. The water generally comes from wells or as a by-product of the mining operations. The Bridger Coal Company obtains water from the Jim Bridger Power Plant for domestic and fire protection use. Kemmerer Coal Company obtains domestic and fire protection water from Kemmerer/Diamondville Joint Powers Board.

The uranium industry is presently idle in the Green River Basin. Kennecott Uranium Company holds water rights for several groundwater wells at its inactive mine and processing facility in the Great Basin. The water was used in the process that extracted the uranium from the ore (Watts, 2000).

Oil and gas companies often secure water rights to use the water for on-site purposes, such as producing drilling mud and dust abatement. The actual water use at the wells during the drilling process is typically short term and, often, the terms of the water rights are limited. If the terms of the water rights are not limited, the water rights are depicted in the records as active, while the wells no longer exist.

Groundwater is a by-product of oil and gas production. After an oil or gas well is abandoned, it may continue to produce water. The oil and gas companies will not plug the wells so the landowner can use the resulting water for stock watering or other purposes. It is difficult to determine the extent of this practice by reviewing the water rights. The landowner should apply for a new water right for the purpose which the well is being used, but this may or may not occur.

While these industries may use some surface water for domestic supplies or fire protection, their major water supplies come from groundwater wells or groundwater sources that are by-products of their operations. The permitted capacity of the industrial wells is typically much larger than the actual use, which is relatively small and temporary in nature. The fact that there is a water right for an industrial well cannot be considered a reliable indication of water use. The actual well may no longer be in use, or if it is being used, the duration of the actual pumpage is probably limited. It is unlikely that industrial groundwater use in the Green River Basin has significant impacts on surface water flows due to its limited and sporadic use and the relative distance of most of the operations from major rivers and streams.

Table 3 provides a tabulation of adjudicated and unadjudicated industrial groundwater rights in the study area broken down into the various water districts and drainages. The drainages relating to the Green River are broken into reaches with reach 1 being the highest drainage area and reach 5 being the lowest drainage area.



**Table 3-Industrial Water Rights-Groundwater**

<u>District/Drainage</u>	<u>Adjudicated Rights</u>	<u>Unadjudicated Rights</u>
	(GPM)	(GPM)
Dist. 8/Little Snake Drainage (Div. 1)	100	2,530
Dist. 11/Green River-Reach 1	0	880
Dist. 10/Green River-Reach 2	1,160	2,485
Dist. 5/Green River-Reach 3	105	3,503
Dist. 1/Green River-Reach 4	1,005	22,499
Dist. 3/Green River-Reach 5	50	9,865
Dist. 6/Big Sandy	0	915
Dist. 7/New Fork	0	2,181
Dist. 9/Ham's Fork	1,550	460
Dist. 14/Henry's Fork	0	0
Dist. 15/Black's Fork	165	1,950
<u>Great Divide Basin</u>	<u>1,280</u>	<u>23,440</u>
Totals	5,415	70,708

Table 4 provides estimates of industrial use by water district. The estimates are based on the following assumptions:

1. Fifty percent (50%) of the wells with adjudicated water rights are active and are providing water at their permitted capacity 10% of the time on an average annual basis.
2. Ten percent (10%) of the wells with unadjudicated water rights are active and are providing water at their permitted capacity 10% of the time on an average annual basis.

**Table 4-Estimated Industrial Water Use-Groundwater**

<u>District/Drainage</u>	<u>Estimated Water Use</u>
	(acre feet/year)
Dist. 8/Little Snake Drainage (Div. 1)	49
Dist. 11/Green River-Reach 1	14
Dist. 10/Green River-Reach 2	134
Dist. 5/Green River-Reach 3	64
Dist. 1/Green River-Reach 4	444
Dist. 3/Green River-Reach 5	163
Dist. 6/Big Sandy	15
Dist. 7/New Fork	35
Dist. 9/Ham's Fork	132
Dist. 14/Henry's Fork	0
Dist. 15/Black's Fork	44
<u>Great Divide Basin</u>	<u>481</u>
Total	1,575

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**Green River Basin Planning Study  
Industrial Summary**

**Entity:** Jim Bridger Power Plant (PacifiCorp)

**Industry:** Electric power production.

**Operation:** The plant is located near Point of Rocks in Sweetwater County and has 4-5,000 megawatt units. After start-up, the plant was only operating at an efficiency rate of 60-65%. Presently, it is operating at approximately 90% efficiency. The maximum efficiency achieved was 93%. Increasing the efficiency further would require additional investment at the plant.

**Water Supply:** Green River.

**Water Supply System:** The point of diversion on the Green River just upstream of the Rock Springs/Green River/Sweetwater County Joint Powers Board diversion structure, west of the City of Green River. The water is pumped through a 42-mile pipeline to the surge ponds at the power plant. The water is pumped from the surge ponds to meet the demands of the plant. A minimal amount of water is provided from the power plant to the Bridger Coal Mine, where it is used as a potable supply and for fire protection.

**Discharge System:** The plant is a zero discharge facility. The water is used in the boilers and discharged through the cooling towers. In addition, water is lost to evaporation in the ponds. When additional water was needed for desulphurization, effluent is recycled.

**Estimated Annual Water Use:** As a rule of thumb, in the summer, each cooling tower handles 5,000 GPM. There are four towers for a total use of 20,000 GPM (88.4 AFD). In the winter, each cooling tower handles 2,000 GPM to 2,500 GPM or 8,000 GPM (35.4 AFD) to 10,000 GPM (44.2 AFD) total. Under full load, the plant is diverting between 25,000 GPM (55.7 cfs or 110.5 AFD) and 27,000 GPM (60.2 cfs or 119.3 AFD). Information provided the State Engineer's Office indicated that 35,220 acre feet was diverted in 1998 and 33,360 acre feet was diverted in 1999, which averages 34,320 acre feet of water per year.

**Principal Water Rights:**

Permit No.	Source	Priority	Amount	Remarks
322112.	Green	6/3/1968	62.8 cfs	124.5 AFD
23895	Fontenelle	1/22/1962	35,000 AF	Secondary to 6629 Res.*

\*The State of Wyoming Wyoming Permit No. 6629-Reservoir is held by the Bureau of Reclamation. However, the State of Wyoming has contracted with the Bureau of Reclamation for municipal and industrial storage water in Fontenelle Reservoir. The State of Wyoming, through the Wyoming Water Development Commission, has contracted with PacifiCorp for 35,000 acre-feet per year of its entitlements to Fontenelle Reservoir.

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** Naughton Power Plant (PacifiCorp)

**Industry:** Electric power production.

**Operation:** The plant is located south of Kemmerer in Lincoln County. The plant is comprised of 3-units (350, 210 and 150 MW). Presently, the plant is operating at 92% efficiency. The maximum efficiency achieved was 100%. The plant burns 85-90% coal and 10-15% gas. There are two gas pipelines into the plant.

**Water Supply:** Ham's Fork River.

**Water Supply System:** The primary supply for the power plant is Viva Naughton Reservoir. The reservoir has a permitted capacity of 42,393 acre feet. Reservoir operators attempt to fill the reservoir as late as possible to avoid spills over the emergency spillway and to make excess water available to the Ham's Fork water users. In the summer, approximately 150 cfs is released from reservoir. Less is released if there are no demands from the irrigators. In the winter, a minimum release of thirty (30) cfs is maintained. In the reservoir operating plan, it is assumed that the drought of record will be experienced in consecutive years. The models indicate that the existing reservoir could meet the 30 cfs demand, however, the reservoir is severely drawn down.

The Naughton plant diverts 20 cfs on a year-round basis. The water is diverted from the Ham's Fork River through a pump station, consisting of 5 pumps. In order to effectively divert/pump 20 cfs to the plant, there must be 30 cfs available at the pump station. The remaining 10 cfs serves as an unofficial minimum flow during the winter. The 20 cfs is piped from the river to the plant through two 9-mile pipelines.

**Discharge System:** The vast majority of the water is used in the boilers and discharged through the cooling towers. Some water is treated for domestic use. Some water is used for dust abatement. In addition, water is lost to evaporation in the ponds. However, not all of the water is consumed at the plant site. Water is discharged from two ponds into a tributary to the Ham's Fork River. This discharge can be pumped back to the plant if needed. The estimated discharge back to the river ranges from 0 to 5 cfs.

**Estimated Annual Water Use:** Approximately, 14,475 acre feet of water per year is diverted from the river and approximately 13,500 acre feet of water per year is consumed by the plant operation.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
6418 Res.	Ham's Fork	8/1/1957	42,393 AF	
22297	Ham's Fork	11/7/1960	20.0 cfs	Utah Power Pipelines
30381	V.N. Res.	2/6/1990	156.0 cfs	Secondary permit

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** FMC Granger (formerly Texas Gulf)

**Industry:** Soda ash production.

**Operation:** The permitted capacity of the FMC Granger facility is 1.3 million tons per year. The estimated average actual production is 1.1 million tons per year. There is a power plant on site with coal and gas boilers.

**Water Supply:** Green River.

**Water Supply System:** Water is supplied by a eight mile pipeline from the Green River.

The town of Granger uses a portion of the capacity of this pipeline for its water supply. There is no groundwater pumping at the Granger site. They do have injection wells.

**Discharge System:** The Granger plant is a zero discharge facility. There are evaporation ponds and injection wells.

**Estimated Annual Water Use:** The reported average annual diversions for 1997-1999 were approximately 1,000 million gallons per year or 3,000 acre feet per year.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
22808	Green	7/7/1996	5.0 cfs	Texas Gulf Sulphur P/L.
7032 Enl.	Green	7/1/1992	2.5 cfs	Texas Gulf Sulphur P/L.

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** FMC Westvaco

**Industry:** Soda ash production.

**Operation:** The FMC/Westvaco facility produces 3.2 million tons of soda ash per year.

The FMC Westvaco facility is the largest in the Green River area and has three different soda ash plants. Additional plants were added over time and incorporated new technology when they were built, but the older plants have not been retrofitted with the latest technology. In addition to the three soda ash facilities, FMC also has a sodium bicarbonate plant, a sodium cyanide plant, a sodium hydroxide plant, and a sodium phosphate plant at the Westvaco site. FMC has used solution mining in the past to produce soda ash but does not do so now. FMC operates two 40 MW coal fired electric boilers and several smaller natural gas units. The gas units are used primarily for peak demands and backup. Water uses for conventional soda ash production include dust control, process purge, scrubber purge, process scrubber, evaporation, injecting insolubles back into the mine, sewage systems, and potable water. A small amount of water remains in the soda ash leaving the plant.

**Water Supply:** Green River.

**Water Supply System:** Water is supplied by a ten mile pipeline from the Green River.

**Discharge System:** The Westvaco plant is a zero discharge facility.

**Estimated Annual Water Use:** FMC did a water balance for its Westvaco facility for EPA using 1998 calendar year water use figures. The average water pumped from the river was 5.185 million gallons per day (MGD) or approximately 6,000 acre feet per year with little seasonal variation. The same assumptions used for other soda ash facilities do not relate to the FMC Westvaco operations due to the expanded operations and water uses at the facility.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
20077	Green	8/27/1946	17.0 cfs	Westvaco Pipeline

FMC has a number of permitted wells for 1) solution mining, 2) groundwater monitoring, and 3) injecting insolubles from the conventional soda ash plants back into the mine.

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** General Chemical

**Industry:** Soda ash production.

**Operation:** The General Chemical plant produces 2.6-2.8 million tons of soda ash per year. The following is the sequence of the soda ash processing: 1) crushers-use water for dust abatement; 2) calciners-use heat from power plant; 3) dissolvers-the trona is dissolved in water; 4) clarifiers; 5) evaporators-inject steam; 6) centrifugers; 7) dryers-use steam; and 8) storage/loading. There is an on-site power plant which is used to produce steam for the soda ash (trona) processing.

**Water Supply:** Green River.

**Water Supply System:** Water is diverted from the Green River and delivered to the plant via a 7-mile pipeline.

**Discharge System:** All of the water diverted to the plant is evaporated through ponds and coolers (stacks).

**Estimated Annual Water Use:** If it is assumed that the process to produce soda ash uses 200 gallons per ton of soda ash and the water requirement of the on-site power plant is 250 gallons per ton of soda ash, it can be estimated that the General Chemical plant consumes 1,170 MG/year (2.6 MT x 450 gallons) or approximately 3,600 acre feet per year. The water demand for soda ash processing has been reported to consistent throughout the year.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
22748	Green	12/27/1963	6.50 cfs	Allied Pipeline



**Green River Basin Planning Study  
Industrial Summary**

**Entity:** OCI Wyoming (formerly Rhone-Poulenc)

**Industry:** Soda ash production.

**Operation:** The OCI plant produces 2.1 million tons of soda ash per year. Water is used for the dust control, process water, potable water, tailings disposal and power generation. Power is produced from a 30 megawatt natural gas plant and some power from the plant is sold. Some tepid water from tailings ponds is used in power generation.

**Water Supply:** Green River.

**Water Supply System:** Water for the plant is pumped from the Green River through two, 18-inch, steel pipelines, which are both approximately 7,000 feet long.

**Discharge System:** The OCI plant is a zero discharge facility.

**Estimated Annual Water Use:** If it is assumed that the process to produce soda ash uses 200 gallons per ton of soda ash and the water requirement of the on-site power plant is 250 gallons per ton of soda ash, it can be estimated that the OCI plant consumes 945 MG/year (2.1 MT x 450 gallons) or approximately 3,000 acre feet per year. Water consumption is strictly proportional to soda ash production and does not vary by predictably by season. Variations occur because the plant does not always run at full capacity due to equipment and other processing problems. Also, heavy precipitation will sometimes fill up their tailings ponds and cause a temporary reduction in water pumped from the river.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
22075	Green	2/1/1960	9.13 cfs	Stauffer-Wyoming Pipeline

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** Solvay Minerals Inc.

**Industry:** Soda ash production.

**Operation:** The Solvay plant produces 2.7 million tons of soda ash per year. Water is used for the manufacturing processes including steam, hot process water, condensate, and cooling water. Unlike the other soda ash plants in the Green River area, Solvay Mineral does not have an on-site power plant. The power required to operate the facilities is purchased from PacifiCorp.

Harborlite Corporation is located at the Solvay site. The corporation processes perlite, a lava deposit which swells when wet, and is used for process filters in the soda ash industry. Harborlite has a water right for 0.04 cfs, which is diverted and piped through the Solvay system. However this water is used only for cleanup, laboratory uses and toilet facilities.

**Water Supply:** Green River.

**Water Supply System:** All plant water comes from a 15 mile long pipeline from the Green River. The plant uses a one million gallon surge pond to provide a water buffer for the plant.

**Discharge System:** The Solvay plant is a zero discharge facility.

**Estimated Annual Water Use:** If it is assumed that the process to produce soda uses 200 gallons per ton of soda ash and ancilliary operations use 70 gallons per ton of soda ash, it can be estimated that the OCI plant consumes 729 MG/year (2.7 MT x 270 gallons) or approximately 2,280 acre feet per year. Solvay's water usage is very steady throughout the year -- there is no seasonal variation in water use.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
26126	Green	12/4/1978	5.0 cfs	Solvay Pipeline

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** Church and Dwight

**Industry:** Arm and Hammer Baking Soda production.

**Operation:** The plant is located next to General Chemical. Church and Dwight purchases soda ash from General Chemical and other producers in the area.

**Water Supply:** Green River.

**Water Supply System:** Church and Dwight uses the same point of diversion and pipeline as General Chemical.

**Discharge System:** The plant is a zero discharge facility.

**Estimated Annual Water Use:** The reported average monthly diversions for product processing are: Oct. 98-0.44cfs, Nov. 98-0.25cfs, Dec. 98-0.27cfs, Jan. 99-0.22cfs, Feb. 99-0.25cfs, Mar. 99-0.26cfs, Apr. 99-0.29cfs, May 99-0.32cfs, June 99-0.29cfs, July 99-0.35cfs, Aug. 99-0.32cfs, Sept. 99-0.33cfs. Peak useage is 1.78cfs. The average annual usage is estimated to be 215 acre feet.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
6304 Enl.	Green	10/2/1969	1.78 cfs	Allied Pipeline

Church and Dwight maintains a contract with the State of Wyoming, through the Wyoming Water Development Commission, for 1,250 acre-feet per year of water from Fontenelle Reservoir.

Appendix 1

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** Exxon Shute Creek Plant

**Industry:** Natural gas processing.

**Water Supply:** Green River.

**Water Supply System:** The plants obtains water from the Green River through a 7-mile pipeline.

**Discharge System:** The plant is a zero discharge facility.

**Estimated Annual Water Use:** The reported average annual diversions for product processing are 16 acre feet per year.

**Principal Water Rights:**

<u>Permit No.</u>	<u>Source</u>	<u>Priority</u>	<u>Amount</u>	<u>Remarks</u>
29509	Green	10/23/1986	0.134 cfs	Exxon Shute Ck. PL

Exxon maintains a contract with the State of Wyoming, through the Wyoming Water Development Commission, for 300 acre-feet per year of water from Fontenelle Reservoir.

Exxon also has groundwater rights.

**Green River Basin Planning Study  
Industrial Summary**

**Entity:** FS Industries

**Industry:** Chemical fertilizer production.

**Water Supply:** Green River.

**Water Supply System:** The plants obtains water from the Green River via the Rock Springs/Green River/Sweetwater County JPB water supply system.

**Discharge System:** The plant is a zero discharge facility.

**Estimated Annual Water Use:** Records from the City of Rock Springs and the Rock Springs/Green River/Sweetwater County JPB indicate that the average recent water use of FS Industries is approximately 560 acre feet per year.

**Principal Water Rights:**

FS Industries has no direct flow rights. Presently, it obtains water through the rights of the Rock Springs/Green River/Sweetwater County JPB, which include industrial purposes as a permitted use. However, FS Industries maintains a contract with the State of Wyoming, through the Wyoming Water Development Commission, for 10,000 acre-feet per year of water from Fontenelle Reservoir.