EXHIBIT B

SWEPCO'S RESPONSE TO COMMENTS
and
ADEQ'S RESPONSIVE SUMMARY

BEFORE THE ARKANSAS POLLUTION CONTROL AND ECOLOGY COMMISSION

IN RE: REQUEST BY THE SOUTHWESTERN ELECTRIC POWER COMPANY TO INITIATE RULEMAKING TO AMEND REGULATION NO. 2	))))	**DOCKET NO. 14-007-R**

SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO COMMENTS

Southwestern Electric Power Company ("SWEPCO") for its Response to Comments states:

1. On September 26, 2014, the Arkansas Pollution Control and Ecology Commission ("APCEC") granted SWEPCO's Petition To Initiate Third-Party Rulemaking to Amend APCEC Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas. A public hearing was held on November 17, 2014 in Hope, Arkansas. The public comment period ended on December 23, 2014. Eleven written public comments were submitted. No comments were submitted at the public hearing.

2. The comments and SWEPCO's Response to each is as follows:

Comment 1: ADEQ's Water Quality Planning Branch commented on the draft markup of Regulation No. 2 stating that the footnote "† Not applicable for Clean Water Act purposes until approved by EPA" applies and should be used on pages 5-12, A-30, A-31 and A-32 and that the phrase "no domestic drinking water supply use" on page A-30 should be replaced with "no domestic water supply use."

Response 1: SWEPCO agrees and will make the revisions in the final version of the replacement pages.

Comment 2: Two commenters objected to the removal of the designated domestic water supply use from the Little River.

Response 2: SWEPCO is not asking to remove the designated domestic water supply use from the Little River.

Comment 3: One commenter objected to the removal of the domestic water supply use designation from the Red River.

Response 3: The domestic water supply use designation was previously removed from the upper portion of the Red River (from the Arkansas/Oklahoma state line to the mouth of the Little River) twenty years ago because the river historically did not meet secondary drinking water standards for minerals. The lower portion of the Red River, which is affected by SWEPCO's current request to amend APCEC Regulation No. 2, also has historically not met secondary drinking water standards for minerals. The entire Arkansas portion of the Red River is frequently in excess of the secondary drinking water standards because it contains elevated levels of minerals caused primarily by input from natural salt springs and seeps in Oklahoma and Texas. This prevents the Red River from being used as a drinking water source without extensive treatment. The Arkansas Department of Health confirmed that the lower portion of the Red River has not been approved for, nor is it under consideration for use as a public water system source. The Arkansas Natural Resource Commission confirmed that there are no existing or planned public water supply uses documented for this portion of the Red River and that the removal of the domestic water supply use designation does not conflict with the Arkansas Water Plan.

Comment 4: One commenter objected to allowing increased toxic pollutants into rivers.

Response 4: The subject of this rulemaking, TDS and temperature, are not toxic pollutants at the levels proposed. The toxicity threshold (based on tests of *Ceridaphnia dubia* using the facility's discharge) indicated that the level at which TDS becomes toxic is well above the mineral concentration in the facility's discharge. Based on studies performed and documented in support of the proposed changes to TDS and temperature, there should be no adverse effect on the aquatic life.

Comment 5: Four commenters objected to SWEPCO's being allowed to increase the total dissolved solids (TDS) and temperature it was discharging into the Little and Red Rivers.

Response 5: SWEPCO is seeking criterion which reflects the current ambient conditions in the Red River and to bring consistency to the water quality criterion on the Red River. Although SWEPCO will increase the TDS in its effluent, the proposed TDS criterion raises the existing TDS criterion of 100 mg/L to 138 mg/L in the Little River which is the level that represents no significant difference from the TDS levels one would find in a Gulf Coastal Plain Ecoregion least disturbed reference stream. See APCEC Regulation No. 2, § 2.511 (2014). Ecoregion reference streams are used to define natural background values for constituents that reflect concentrations due to non-anthropogenic sources. SWEPCO takes water out of the Little River for cooling water use and returns the water to the River. The same quantity of minerals taken in are discharged back to the River. The concentration of minerals in the water returned to the river is slightly higher due to the quantity of water evaporated in the cooling process. The concentration change proposed is not toxic and based on studies performed and documented in support of the proposed changes to TDS and temperature, there should be no adverse effect on the aquatic life.

The proposed temperature criteria change is based on existing temperature levels upstream of the facility and will correct the existing temperature criterion which was set lower than existing conditions. The affected segment of the Little River is the segment between Millwood Lake and the Red River. The temperature criterion for Millwood Lake and for the Red River is 32° C (89.6° F) while the affected segment of the Little River has a lower temperature criterion of 30° C (86° F). The ambient temperature of that segment often exceeds its temperature criterion and SWEPCO's request is to bring the temperature criterion of that segment up to 32° C (89.6° F) to be consistent with the temperature criterion above and below the segment.

Comment 6: Two commenters expressed concern about the possibility that a temperature increase may impact aquatic life with one commenter suggesting that a biologist should be employed to study the effect of SWEPCO's effluent on the aquatic life.

Response 6: SWEPCO is not seeking to increase the temperature criterion for this reach of the Little River above what is already in the River. Rather it is seeking to increase the temperature criterion to reflect historic and ambient conditions. Historic temperature measurements of the Little River below Millwood Lake and above the facility discharge point show frequent exceedances of the current temperature criterion because of the shallow nature of Millwood Lake and the wide and primarily unshaded nature of that segment of the Little River. The temperature criteria in Millwood Lake and the Red River into which the Little River discharges are currently set at 32° C (89.6° F) which is the temperature criteria SWEPCO is seeking for the segment between Millwood Lake and the Red River. The Technical Justification for a Site-Specific Temperature Criterion (FTN 2014) included field studies conducted by biologists to evaluate the physical, chemical and biological characteristics of the Little River. See Section 3.0 of the Technical Justification. The Technical Justification established that setting the temperature criterion in the Little River below Millwood Lake at 32° C (89.6° F) should have no adverse effect on the aquatic life.

Comment 7: On commenter commented that SWEPCO should not be allowed to change water quality standards by this "end run" stating that if SWEPCO did not disclose its plans to seek a rulemaking in its plant permit application, the rulemaking should be denied and the permit application should be reopened.

Response 7: A third-party rulemaking seeking to amend water quality standards set forth in APCEC Regulation No. 2 is not an end run around the permit application process. The third-party rulemaking process is provided for under both state and federal law and regulations and is unrelated to the permit application process. Here, SWEPCO is seeking to change the water quality standards (minerals and temperature) to reflect long-standing historic ambient conditions or Ecoregion values. *See also* Response 10 on page 6 below.

Comment 8: The Department of Arkansas Heritage expressed concerns about the implications of changes in TDS and temperature criteria to species of conservation concern known to occur in the Red River and the Little River. The Arkansas Natural Heritage Commission (ANHC) indicated the following species occurred in the referenced reaches of the Little River: *Arkansia wheeleri* (Ouachita rock pocketbook), *Cycleptus elongatus* (blue sucker), *Hiodon alosoides* (goldeye), *Quadrula apiculata* (southern mapleleaf), and *Quadrula metanervra* (monkeyface).

ANHC also stated that the following species occurred in the Red River: *Ammoncypta clara* (western sand darter), *Atractosteus spatula* (alligator gar), *Cycleptus elongates,* (blue sucker), and *Polydon spathula* (paddlefish). The Ouachita rock pocketbook is a federally listed species while the remaining species are all of State concern. Specifically the ANHC comment stated that higher levels of TDS could impair mussel feeding, interfere with fish spawning and prey identification and alter substrate. ANHC also stated that higher water temperature could decrease the dissolved oxygen resulting in shifts in the composition of aquatic organisms.

Response 8: As to TDS, SWEPCO is not proposing to raise TDS levels in the Red River above what currently occurs. The proposed criterion change to the Red River reflects existing concentrations of TDS and is based on years of measured TDS concentrations in the river obtained from the Arkansas Department of Environmental Quality Ambient Monitoring Network. As such, there will be no impact on the existing aquatic community due to the proposed TDS criteria for the Red River. SWEPCO is seeking to increase the TDS criterion in the Little River from 100 mg/L to 138 mg/L. 138 mg/L is a level that represents no significant difference from the TDS levels one would find in a Gulf Coastal Plain Ecoregion least disturbed reference stream. See APCEC Regulation No. 2,§ 2.511 (2014). Ecoregion reference streams are used to define natural background values for constituents that reflect concentrations due to non-anthropogenic sources.

In its comment the ANHC specifically expressed concern that higher levels of TDS in the Little River (up to 138 mg/L) could have adverse effects on the endangered *Arkansia wheeleri* (Ouachita rock pocketbook). Evaluating this potential requires the use of data from surrogate bivalve taxa because direct experimental evidence on *A. wheeleri* could not be found in the published scientific literature. Two published studies on unionid mussels used *Lampsilis siliquoidea* (fat mucket)[1] and *Elliptio complanata* (eastern elliptio)[2] mussels in 7 to 28 day laboratory toxicity tests to evaluate toxic thresholds to TDS as chloride (Cl) and sulfate (SO_4).

Blakeslee et al (2013) reported no significant adverse effect on adult *E. complanata* survival in 7-day exposures to 1,282 mg/L Cl as sodium chloride (NaCl) and no significant effect on metabolic rate in 28-day exposures to 641 mg/L Cl. Kunz et al (2013) reported no significant adverse effect on adult growth of juvenile *L. siliquoidea* in 28-day exposures up to 2,168 mg/L TDS (1,580 mg/L SO_4). Kunz et al also cited unpublished data showing the equivalent of no effect on growth of pink mucket (*L. abrupta*) exposed to 696 mg/SO_4. However, their results also showed a significant reduction in *L. siliquoidea* survival in 28-day exposures ranging from 298 to 643 mg/L TDS (116 to 386 mg/L SO_4, respectively).

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1 Kunz, J. L., Conley, J. M., Buchwalter, D. B., Norberg-King, T. J., Kemble, N. E., Wang, N. and Ingersoll, C. G. (2013), Use of reconstituted waters to evaluate effects of elevated major ions associated with mountaintop coal mining on freshwater invertebrates. Environ. Toxicol. and Chem. 32: 2826–2835.

2 Blakeslee, C. J., Galbraith, H. S., Robertson, L. S. and St. John White, B. (2013), The effects of salinity exposure on multiple life stages of a common freshwater mussel, *Elliptio complanata*. Environ. Toxicol. and Chem. 32: 2849–2854.

Studies on other freshwater bivalve mollusk taxa (fingernail clams *Sphaerium simile* and *Musculium transversum*) have indicated no effects on survival (96-hr acute exposures) in Cl concentrations up to 1,903 mg/L (Soucek et al, 2011) and SO_4 concentrations up to 2,000 mg/L SO_4 (Soucek and Kennedy, 2009).[3]

These studies indicate that sub-lethal TDS thresholds are well above the proposed criteria. Laboratory study results are less definitive regarding survival thresholds but still indicate thresholds above the proposed criteria. These results indicate that mineral concentrations at or near the proposed criteria should impose little, if any, limitation on the distribution and abundance of *A. wheeleri* in the Little River downstream of Millwood Dam.

In regard to temperature, SWEPCO is not proposing to raise the water temperature in the Little River above levels that are currently occurring. The proposed criterion change for temperature in the Little River is based on ambient data collected upstream of the SWEPCO plant discharge. Further, the proposed temperature criterion of 32° C (89.6° F) is consistent with the current temperature criteria of 32 ° C for Millwood Lake (upstream of the reference reach) and the Red River (downstream of the referenced reach). There will be no impact to aquatic life in the Little River due to the proposed temperature criterion.

As to the species of federal concern, small numbers of *Arkansia wheeleri* (Ouachita rock pocketbook) have been documented in the upper reach of the Little River below Millwood Lake, but no live *A. wheeleri* have been collected from the lower reach which extends from a short distance above the SWEPCO plant's intake downstream past the discharge location to the confluence of Little River with the Red River. See UAA Report, § 2.4 (FTN 2014). *A. wheeleri* has never been documented in the Red River downstream from the confluence with the Little River. Suitable habitat and water quality to support *A. wheeleri* is not present in the described reaches of these waterbodies due to construction of Millwood Lake on the Little River in the 1960s, which resulted in changes in flow, water temperature, sedimentation and water quality changes below the reservoir that can never be restored to pre-construction levels. There is little or no evidence that the proposed changes in TDS and temperature standards will further impact those species.

The federally listed Interior Least Tern (*Sterna antillarum athalassos*) which is mentioned by the ANHC is not an aquatic species. The Interior Least Tern is known from a large sandbar at the confluence of the Red River and the Little River. Nesting colonies of this species have been observed there, and at scattered downstream localities on the Red River, for a number of years. This species is found on terrestrial habitats associated with certain major stream channels. Successful nesting for this bird species occurs when predators are absent and when flood waters occur outside the nesting season. The proposed criteria would not be expected to impact terrestrial species such as the Interior Least Tern.

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3 Soucek, D. J. and Kennedy, A. J. (2005), Effects of hardness, chloride, and acclimation on the acute toxicity of sulfate to freshwater invertebrates. Environ. Toxicol. and Chem. Environmental Toxicology and Chemistry, 24: 1204–1210.

Comment 9: The US Fish and Wildlife Service (USFWS) commented that it had no concern with the proposal to increase the TDS water quality standard for the Red River from the mouth of the Little River to the Arkansas/Louisiana state line or on the Little River from Millwood Lake to the Red River and no concern with the proposal to remove the designation of domestic supply use on the Red River. The USFWS expressed a concern that a significant alteration in the thermal regime of the Little River could provide a potential to affect the Ouachita rock pocketbook (*Arcidens wheeleri*).

Response 9: SWEPCO is not proposing to raise the water temperature in the Little River above levels that are currently occurring. The proposed criterion change for temperature in the Little River is based on ambient data collected upstream of the SWEPCO plant discharge. SWEPCO fully understands the lack of information with regard to temperature thresholds of importance to the Ouachita rock pocketbook. SWEPCO believes, however, that the adverse water quality impacts that resulted from construction of Millwood Lake are irreversible and too extensive to expect recovery of the mussel population to preconstruction levels. The construction of Millwood Lake in 1966 on the Little River brought major changes in flow, water temperature, and sedimentation to the reach of Little River between Millwood and the Red River. The surface area of the lake at the top of the conservation pool is 29,200 acres (11,800 ha), and its shoreline length at the top of the conservation pool is 65 miles (105 km). This sizeable impoundment was large enough to cause major changes in water quality following its construction, which resulted in adverse impacts to *A. wheeleri* and its habitat and other aquatic fauna, both above and below the dam.

A change in the temperature criterion is not expected to have further adverse impacts on the Ouachita rock pocketbook. The requested modification of the temperature criterion from 30° to 32° C (from 86° to 89.6° F) would bring the temperature criterion in line with the temperature standard in Millwood Lake and in the Red River.

Comment 10: Some commenters suggested that SWEPCO was not following proper procedure and that the requested water quality criteria changes represented an end run around the permitting process.

Response 10: Both federal and state law and regulations provide procedures for a request to the Arkansas Pollution Control and Ecology Commission to amend water quality standards when there is a scientifically based reason to do so. See, e.g. Ark. Code Ann. §8-4-202(c); APCEC Regulation No. 2, §§ 2.303 Use Attainability Analysis and 2.308 Site Specific Criteria; APCEC Regulation No. 8, § 8.809 Third-Party Petition for Rulemaking; ADEQ's Continuing Planning Process § IX-1 WQS Review and Revision Process and § IX-11 through 15 Use Attainability Analysis; 33 U.S.C.S. § 1313. SWEPCO has followed all of the proper procedures and its request is based upon a Use Attainability Analysis and the Technical Justification which provided the required scientific basis for the rulemaking. *See also* Response 7 on page 3 above.

Comment 11: International Paper Company (IP) commented on certain tables contained in the Use Attainability Analysis (UAA) supporting the requested TDS criterion change in the Red River. The tables are related to inputs into the Red River from the Sulphur River into which IP discharges from its Texas facility. IP provided replacement pages for the UAA.

Response 11: SWEPCO agrees with the replacement pages submitted by IP, but notes that both model simulations (i.e., low flow for Arkansas and harmonic mean flow for Louisiana criteria comparison) assume that the Arkansas TDS criteria is met in the Sulphur River at the Arkansas/Texas state line.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on this 20th day of May, 2015, I served a copy of the foregoing Response to Comments on the following by electronic delivery:

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BEFORE THE ARKANSAS POLLUTION CONTROL AND ECOLOGY COMMISSION

IN THE MATTER OF AMENDMENTS TO	)	
REGULATION NO. 2, REGULATION	)	
ESTABLISHING WATER QUALITY	)	**DOCKET NO. 14-007-R**
STANDARDS FOR SURFACE WATERS	)	
OF THE STATE OF ARKANSAS	)	

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY'S RESPONSIVE SUMMARY FORTHIRD PARTY RULEMAKING TO AMEND REGULATION NO. 2

Pursuant to Minute Order 14-33, the Arkansas Department of Environmental Quality ("ADEQ" or "Department") submits the following Responsive Summary regarding proposed changes to Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas.

On September 26, 2014, the Arkansas Pollution Control and Ecology Commission ("APCEC" or "Commission") granted Third-Party Petition to Southwestern Electric Power Company to initiate rulemaking to amend Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas.

One public hearing was held in Hope on November 17, 2014. The final day to submit written comments was December 3, 2014.The Commission received eleven written comments during the public comment period, including a total of ten signatories. No oral comments were received during the public hearing.

Per Reg. 8.815(A)(2) responses to similar comments were grouped into similar topics and addressed in Part I of this document. Complete comments received during the public comment period including those not addressed in Part I are addressed in Part II.

Part I

Comments, in part, grouped by topic.

Topic 1: Toxicity

Several comments were received regarding "toxic" or "poison" discharge from permittee. Commenters included: Dina Nash, Barbara Jarvis, and Rel B. Corbin.

Response 1:

Per Reg. 2.508, "Toxic substances shall not be present in receiving waters, after mixing, in such quantities as to be toxic to human, animal, or plant or aquatic life or to interfere with the normal propagation, growth and survival of the indigenous aquatic biota." Based on data submitted within the UAA, proposed Total Dissolved Solids (TDS) concentrations at the proposed criteria will not be considered "toxic" and all designated uses will be supported.

TDS is made up of ions, commonly called "salts," such as sodium (Na+), chloride (Cl-), calcium (Ca2+), and magnesium (Mg2+) among others. The amounts and ratios of the different ions are largely dependent on the surrounding soil/geology types and land uses. Therefore, TDS makeup is not the same from one river to next or from one part of the state, or ecoregion, to the next. Because of this, there is no one value that applies to all waterbodies. SWEPCO conducted toxicity testing and presented results within the UAA (Section 4.0 Toxicity Analysis). These results indicate that TDS concentrations from the SWEPCO outfall 001 have no toxic effects as determined by standard whole effluent toxicity testing methods. "Spiked" testing (artificially increasing the concentrations of TDS in a stepwise manner) show that proposed TDS criteria concentrations will not have a toxic effect and will support all designated uses.

Topic 2: Removal of Domestic Water Supply (DWS) designated use in Little River

Several comments were received pertaining to removing the domestic water supply designation in the Little River. Commenters included: Dina Nash, Ginny Masullo, and Robert Walker (I).

Response 2:

There is no proposal to remove the Domestic Water Supply designated use from the Little River below Millwood Reservoir. Proposed TDS criteria will remain below the 500 mg/L concentration threshold for maintaining the DWS designated use.

Topic 3: Temperature in Little River

Several comments were received asking that the temperature not be raised in the Little River. Commenters included: Dina Nash, Ginny Masullo, Rel. B. Corbin, Robert Walker (I) and (II).

Response 3:

Due to warm surface water discharged from Millwood Reservoir (a shallow reservoir) and the widened nature of Little River below this reservoir, water temperatures within this reach are above the current criteria more than 10% of the time. The proposed change in temperature criteria does not "increase the temperature in the Little River"; it simply reflects the existing instream conditions of the Little River below Millwood Reservoir irrespective of any permitted discharger.

Little River lies within the Gulf Coastal Plains (GCP) ecoregion and, as such, was assigned the GCP ecoregion instream temperature criteria of 30 degrees Celsius (86 degrees Fahrenheit). This criterion is protective of "typical" streams within the GCP ecoregion. However, there are streams within the GCP ecoregion where this default criterion is not representative of the actual ambient conditions and thus site specific temperature criteria development may be appropriate. The Red River is an example of this; its instream temperature criterion is 32 degrees Celsius (89.6 degrees Fahrenheit). The temperature criterion is higher due to physical and hydrological conditions of the river and is appropriate. The Little River below Millwood reservoir (reach 001) is another example of a non-typical stream within the GCP ecoregion that could warrant a site specific temperature criterion based on physical and hydrological conditions.

SWEPCO is required by their NPDES permit to submit monthly instream temperature data above and below their outfall 001. They must report the monthly average and the daily maximum for each month from May to September. Discharge Monitoring Report (DMR) data from May 2012 to September 2014 show that the SWEPCO effluent causes no significant increase in temperature in the Little River (Table 1.).

Table 1: Summary of Upstream to Downstream temperature DMR data for SWEPCO Outfall 001.

Monitoring Period End Date	Upstream Monthly Average (°F)	Downstream Monthly Average (°F)	Difference in Monthly Average temperature upstream to downstream (°F)	Upstream Daily Max (°F)	Downstream Daily Max (°F)	Difference in Daily Maximum Temperature Upstream to Downstream (°F)
5/31/2012	80	79	-1	85	85	0
6/30/2012	84	85	1	86	85	-1
7/31/2012	88	89	1	91	90	-1
8/31/2012	88	88	0	92	93	1
9/30/2012	81	81	0	86	86	0
5/31/2013	69	67	-2	75	72	-3
6/30/2013	80	84	4	86	86	0
7/31/2013	84	85	1	86	88	2
8/31/2013	87	86	-1	90	87	-3
9/30/2013	81	81	0	86	87	1
5/31/2014	71	71	0	74	73	-1
6/30/2014	82	82	0	84	84	0
7/31/2014	84	84	0	91	92	1
8/31/2014	82	81	-1	87	87	0
9/30/2014	83	82	-1	88	88	0

Highlighted cells represent data greater than the current instream standard of 30 degrees C (86 degrees F).

Topic 4: Procedures to modify water quality regulations.

Several comments were received asking the Department to "not allow" or to "deny" the change in Regulation No. 2. Commenters included: Ginny Masullo, Barbara Jarvis, Gene Dunaway, Rel B. Corbin, Robert Walker (I).

Response 4:

Arkansas Pollution Control and Ecology Commission's Regulation No. 2 outlines procedures a third party must follow in order to modify water quality criteria in Reg. 2.306. This is a rigorous process in which the third party must show that all existing uses will be maintained as a result of the change in instream criteria.

SWEPCO has followed the process in Reg. 2.306 to proceed with requesting modification of water quality criteria. The proposed TDS and temperature criteria will support existing uses in both the Little and Red Rivers according to the data presented within the UAA.

Topic 5: NPDES Permit program

Several comments were received pertaining to the TURK permit, permit limits, effluent constituents, etc. Commenters included Barbara Jarvis, Gene Dunaway, Rel B. Corbin, and Robert Walker (I) and (II).

Response 5:

Facilities are not "granted permission to dump" their effluent waste. The National Pollutant Discharge Elimination System (NPDES) permit program is authorized by the Clean Water Act and facilitates control of water pollution by regulating point sources. NPDES permits are issued, in Arkansas, by the Arkansas Department of Environmental Quality (ADEQ). The TURK plant operates under NPDES permit AR0051136 which also requires the facility to monitor and report certain parameters including temperature and TDS.

Permit limits were accurately estimated when permit was issued. However, due to the Red River being placed on the 2008 303(d) list, any permitted point source discharging into the Red River (SWEPCO via Little River) received limits of 500 mg/L for TDS (the Red River's TDS criterion). Upon successful modification of Red River's TDS criterion, all permitted dischargers may apply for a permit modification.

Permit limits must allow for maintenance of water quality standards and be protective of all existing uses.

Topic 6: TDS and removal of Domestic Water Supply in the Red River

Several comments were received concerning the increase in TDS and the resulting removal of domestic drinking water supply designated use in the Red River. Commenters included Rel B. Corbin and Robert Walker (I).

Response 6:

The TDS criteria for the Red River, from the mouth of the Little River to the Arkansas/Louisiana state line, is designated as 500 mg/L. ADEQ monitoring data (RED0046 and RED0045) show that the 95th percentile of actual instream TDS concentration is approximately 835 mg/L over the past 15 years (1999 – 2014) within this segment. Elevated TDS concentrations are a result of geology, specifically saltwater springs, seeps, and gypsum outcrops, in Texas and Oklahoma. As such, these elevated concentrations are considered natural. This proposal intends to modify TDS criteria to reflect what is already naturally instream; not to "increase the amount of TDS" in the Red River.

The Domestic Water Supply (DWS) designated use is not an existing use within this segment of the Red River because the water quality does not meet the DWS standard for TDS of 500 mg/L. Because it is not an existing use, a third party may go through the process of removing the designated use from the waterbody. If the TDS criterion is raised above 500 mg/L, the DWS designated use must be removed.

SWEPCO has demonstrated, through data supplied within the UAA, that existing uses will be maintained if the TDS criterion is modified to reflect levels that are found naturally within the Red River in the proposed segment.

Part II

All comments received during the public comment period in their entirety with responses not covered in Part I.

Comment 1: Dina Nash

I would like to say that I have been concerned for several years now and have spoken several times at hearings about the Turk Plant, regarding air quality issues and health consequences.

Now we are responding to the changes to their Water Permit. We know the super-hypercritical plants all have air and water pollution, and it is their faulty engineering if they don't understand how not to negatively impact the air and the water, because the skills do exist to do so.

It is not acceptable for SWEPCO and other owners to now, after the camel's nose is under the tent, to come on in and claim that they cannot control these issues:

1. increased dissolved solids (toxicity at what level?) to be released into Little River
2. increased temperature which will negatively impact all life in Little River and downstream for some distance
3. removing the pristine drinking water status of Little River. We speak for all living things in that water which form the ecosystem that needs to be there.

Please hold the line with this huge industry: they made billions of dollars of profit last year, and they and their shareholders need to pay the external costs of making their emissions clean.

Response 1:

Refer to Topic 1 in Part I regarding toxicity. Refer to Topic 3 in Part I regarding temperature in the Little River. Refer to Topic 2 in Part I regarding the Domestic Water Supply designated use in the Little River.

Comment 2: Ginny Masullo

An ounce of prevention is worth a pound of cure. The proposed regulations changes would only necessitate future clean up of the Little River. Keep the designation of the last two miles of the river as a drinking water source. Do not allow the temp of the river to be increased and do not allow increased dissolved solids.

Why should the State of Arkansas allow these essentially non compliance issues to be waved. The electric industry has the resources and the know how to meet these existing requirements.

It is the job of ADEQ to protect the water quality of Arkansas. Do so by at least not changing the current regulations.

Response 2:

Refer to Topic 2 in Part I regarding the Domestic Water Supply designated use in the Little River. Refer to Topic 3 in Part I regarding temperature in the Little River. Refer to Topic 4 in Part I regarding procedures to modify water quality standards.

Comment 3: Barbara Jarvis

Dear Mr. Szenher, please do whatever you can to keep the Turk coal power plant from increasing its toxic pollutant injections into our rivers, land, and air. If they did not estimate their waste materials accurately when applying for the permit, then they must bear the consequences of their mistake. Our health, our economy, and our future survival are already suffering enough. We cannot allow them to speed the pace at which these deadly effects are accumulating for our future generations.

Response 3:

Refer to Topic 4 in Part I regarding procedures to modify water quality standards. Refer to Topic 1 in Part I regarding toxicity. Refer to Topic 5 in Part I regarding TURK's NPDES permit.

Comment 4: Gene Dunaway

SWEPCO should not be allowed to change water quality standards by this "end run" procedure.

Did they disclose they were going to propose lowering of water quality standards when they applied for the Turk plant? What claims did they make about water quality standards in the plant application? Did they know they would need to degrade water quality standards in the future? If they did not, I suggest denying this rulemaking and reopening the original plant application to find out what other claims they made and knew they would not keep.

They have an existing solution and that is to put in a water treatment plant, but that cost should be borne by investors not ratepayers.

Response 4:

Refer to Topic 4 in Part I regarding procedures to modify water quality standards.

The NPDES permit application can be found here: http://www.adeq.state.ar.us/ftproot/Pub/WebDatabases/PermitsOnline/NPDES/PermitInformation/AR0051136_New_20091218.pdf. Any "disclosures" or "claims" by the permittee would be made there. See also Topic 5 in Part I regarding TURK's NPDES permit.

Comment 5: Rel B. Corbin

To imply that since the Little River aleady has some disolved solids and the Red River already has lots of disolved solids and the Little River already is relatively warm, it is ok to add a lot more disolved solids to those rivers and raise the temperature of both rivers is like saying, since our streets and highways are already littered considerably, it is ok to throw more cigarette butts and hamburger wrappers and soiled diapers out onto our streets. That trash may eventually rot or blow away (to where.) but it definitely is replenished faster than it goes.

One may think, so what, since toxic trash and higher temperatures in the Little and Red Rivers will go on down to the Mississippi and, then, to the Gulf of Mexico. Aquatic life in oceans is not only being overharvested and having habitate destroyed, but being poisoned by our toxic trash like mercury waste from burning coal.

The idea that so many occupants of Arkansas, the whole spectrum of people from poor to well off, from poorly educated to extremely well educated, that it is ok to trash this state is disgusting.

I am a 6th generation Arkansas-er and I guess my body and soul is made from some of this Arkansas dirt and water and air. I value this poor state. (You know, It is really difficult to try to explain to an outsider why we trash our state.)

SWEPCO/AEP got permission to dump Turk's scrubber waste, coal leachate, coal ash leachate, and chemical waste into the Little River during the Turk permitting process. If this plant is so well designed, how is it that SWEPCO/AEP didn't expect this "cooling tower blowdown & previously monitored low volume waste."

For less than 200 permanent good-paying jobs, we keep letting SWEPCO/AEP add to their poisons. (You'll never convince me that those toxic coal ashes will confined to those plastic and clay lined pits indefinitely.)

We have one earth. If one thinks our over- population, pollution, resource depletion problems will be solved by colonizing some distant planet, name one planet that compares to this earth. Name one planet that is actually conceiveable for any number of us to get to in the next few hundreds of years.

Teenage delinquents are much more disciplined than Arkansas power companies. Arkansas power companies get permission to keep doing things the same way, which is obviously dangerous.

Arkansas power companies must be expected to get into clean renewable energy in a big way. Fast.

They can make lots of money and create many jobs with solar PV and thermal facilities.

Are Arkansas power company executives, engineers, accountants and lawyers so simple they can't learn and change?

This is urgent. We have to demand they change.

Response 5:

Refer to Topic 4 in Part I regarding procedures to modify water quality standards. Refer to Topic 3 in Part I regarding temperature in the Little River. Refer to Topic 5 in Part I regarding TURK's NPDES permit. Refer to Topic 1 in Part I regarding toxicity.

Comment 6: Robert Walker (I)

I have received word that SWEPCO /AEP are applying to increase solid waste and temperature of waste they dump into Little River.

1. This is a modification of the original application.

If this modification is approved what other modifications will they apply for?

Assurances were made that there would be only one plant on this site. If modifications can be approved as requested, whenever requested, the next application for modification may be for Turk 2, or Turk 2 and 3.

Most of the power produced by this plant does not benefit Arkansans. We are just the dumping site for the waste. They now want to increase the waste dumped into our river.

They want to change the designation of the River as a drinking water source. They knew it was designated as a drinking water source when they came. Now that they are here they want this changed. This should be denied

They want to alter the temperature of the Little River.

If they want to alter the temperature of the river to increase the crayfish population so game fish will increase in size and become more plentiful I am in favor of it as a beneficial byproduct. Otherwise I am opposed to raising the ambient temperature of the river because in general this will alter the environment for fishes unfavorably.

Response 6:

The NPDES permit issued to the SWEPCO/TURK plant does not allow for discharging "solid waste" into any water body. It does permit the facility to discharge total dissolved solids into the Little River. Also see Topic 5 in Part I regarding TURK's NPDES permit

Refer to Topic 3 in Part I regarding temperature in the Little River.

This proposed third party rulemaking is not a permit modification; this is a modification of water quality standards in Regulation No. 2. While the Department cannot speculate what, if any, water quality criteria a facility may petition for revision, third parties may petition the commission to modify water quality standards at any time. See also, Topic 4 in Part I regarding procedures to modify water quality standards.

Refer to Topic 2 in Part I regarding the Domestic Water Supply designated use in the Little River.

Comment 7: Robert Walker (II)

They want to use the river and streams draining their outflow as a natural pipe because it is cheaper than lengthening their outflow pipe.

The increased temperature may create a dead zone altering the drainage streams and reducing the value of the streams for enjoyment by lovers of the outdoors and fishermen.

As mitigation for this destruction SWEPCO/AEP should fund a wildlife biologist to study the effect of their effluent and pay for access improvements to waterways in the area so that the net effect of this proposal will result in a positive benefit for Arkansans.

Response 7:

As part of their Alternatives Evaluation, SWEPCO investigated several possible alternatives including rerouting their effluent to the Red River (closest large river) to increase dilution. This alternative is not appropriate as the effluent is not limited by Little River water quality standards. SWEPCO's effluent is limited by the Red River water quality standards because the Red River standards do not reflect naturally occurring conditions.

Refer to Topic 5 in Part I regarding TURK's NPDES permit. Refer to Topic 3 in Part I regarding temperature in the Little River.

Comment 8: USFWS

The U.S. Fish and Wildlife Service (Service) has reviewed the notice on a third-party proposal by the Southwestern Electric Power Company John W. Turk, Jr. Power Plant (SWEPCO facility) to change APC&E Regulation 2, the Arkansas Water Quality Standards, for the Little River from Millwood Lake to the Red River and for the Red River from the mouth of the Little River to the Arkansas/Louisiana state line.

The petition to initiate third-party rulemaking to amend Regulation No.2 states the following: The SWEPCO facility discharges treated process wastewater under the provisions of NPDES Perm it No. AR0051136 issued by ADEQ. The SWEPCO facility discharges treated wastewater from a wastewater pond containing primarily cooling tower blowdown and previously monitored low volume waste. The SWEPCO facility is requesting the following amendments to Regulation 2: (1) modification of the total dissolved solids (TDS) and temperature water quality criteria for the Little River from Millwood Lake to the mouth of the Little River as follows: modification of the Total Dissolved Solids (TDS) water quality criterion from 100 milligrams per liter (mg/L) to 138 mg/L and modification of the temperature criterion from 30° C (86° F) to 32° C (89.6° F); (2) modification of the TDS water quality criterion for the Red River from the mouth of the Little River to the Arkansas/Louisiana state line from 500 mg/L to 860 mg/L; and (3) removal of the designated, but not existing, domestic water supply use from the Red River from the mouth of the Little River to the Arkansas/Louisiana state line.

Southwestern Electric Power Company Use Attainability Analysis for Dissolved Minerals in Little and Red Rivers Hempstead & Little River Counties, Arkansas (Exhibit F) *ESA* states "Small numbers of Ouachita Rock Pocketbook *Arcidens wheeleri* have been documented in the upper reach of the Little River below Millwood Lake, but no live *A. wheeleri* have been collected from the lower reach, extending from a short distance above the SWEPCO plant's intake downstream past he discharge location to the confluence of Little River with the Red River. *A wheeleri* has not been documented in the Red River downstream from the confluence with the Little River. Suitable habitat and water quality to support *A. wheeleri* is not present in the described reaches of these waterbodies due to construction of the Millwood Lake on the Little River, which resulted in changes in flow, water temperature, and sedimentation.

Additionally, although the rabbitsfoot, *Quadrula cylindrica cylindrica,* is known from some streams in southwest Arkansas, including the Little River upstream of Millwood Lake, it has not been documented in either the Little River downstream of the Millwood Lake dam or the Red River. The federally listed Interior Least Tem *(Stema antillarum athalassos)* is known from a large sandbar at the confluence of the Red River and the Little River below Millwood Lake. Many aquatic species are particularly vulnerable to changes in flow and water temperature, but these parameters do not impact terrestrial species such as the Interior Least Tern."

The Service has no concerns with the proposal to increase the TDS water quality criterion for the Red River from the mouth of the Little River to the Arkansas/Louisiana state line from 500 mg/L to 860 mg/L as this change will not affect any federally listed species The Service has no concerns with the proposal to remove the designation of domestic water supply use from the Red River from the mouth of the Little River to the Arkansas/Louisiana state line or the proposal to modify TDS water quality criterion from 100 milligrams per liter (mg/L) to 138 mg/L in Little.

The Service has concerns regarding the proposal to modify the temperature criterion from 30° C (86° F) to 32° C (89.6° F). The increase in water temperature standards may not exceed the background low, summer temperatures. Ouachita Rock Pocketbook *(Arcidens wheeleri;* ORP) does occur in the Little River downstream of the outfall pipe, although the main population of concern occurs upstream of the effluent discharge. The trigger for *A. wheeleri* brooding is unknown at this time, but may be related to temperature, water flow, or both factors may contribute. As the ORP may be gravid from mid-November to early January, increased water temperature may have an effect on brooding and reproduction. The direct effect of temperature increase on ORP is not known as the species has not been determined to be thermally tolerant or intolerant, although many mussel species are sensitive to increased temperature.

Despite survey effort, no live *A. wheeleri* (only fresh dead specimens) have been located downstream of the outfall pipe in the Little River. However, the potential exists for small numbers of ORP to occur in this area. If the thermal regime is significantly altered, there is potential to affect *A. wheeleri* . The Service does not have sufficient information regarding the altered thermal regime surrounding the outfall pipe and downstream to make a decision at this time.

Response 8:

According to data provided by the UAA, the aquatic life designated use will be maintained at the proposed temperature and TDS criteria. Please note that an increase in temperature criterion does not equate to an increase in actual ambient temperature. Also, Refer to Topic 3 in Part I regarding temperature in the Little River.

Comment 9: ANHC - regarding Species of Concern

We are concerned about the implications of these changes to species of conservation concern known to occur in these streams.Our records indicate the occurrence of five aquatic species of conservation concern in the Little River and four in the Red River within the referenced reaches (please refer to attachment A) [ANHC Attachment A provided directly below within this comment]. Two species of federal concern occur in and along these streams: the endangered Ouachita rock pocketbook (*Arkansia wheeleri*) in the Little River, and the endangered interior least tern (*Sternula antillarum athalassos*) along the Red River. The proposed changes could have adverse impacts to rare species. Higher levels of TDS could impair mussel feeding, interfere with fish spawning and prey identification, and alter substrate.

Higher water temperature could decrease dissolved oxygen resulting in shifts in the composition of aquatic organisms. Potential adverse impacts to species of conservation concern should be evaluated in advance of granting changes to water quality standards in these streams.

It is of note that prior to construction of the facility, SWEPCO was made aware of the presence of species of conservation concern in these waterways and the need to maintain water quality. Assurances were given by the company that the facility would not adversely impact water quality. It is important that the water quality of the above mentioned rivers be maintained.

ANHC ATTACHMENT A-Aquatic Elements of Conservation Concern

Little River

Arkansia wheeleri, Ouachita rock pocketbook – Federal Concern (endangered)

Cycleptus elongatus, blue sucker – State Concern

Hiodon alosoides, goldeye– State Concern

Quadrula apiculata, southern mapleleaf – State Concern

Quadrula metanevra, monkeyface– State Concern

Red River

Ammocrypta clara, western sand darter – State Concern

Atractosteus spatula, alligator gar – State Concern

Cycleptus elongatus, blue sucker – State Concern

Polyodon spathula, paddlefish – State Concern

Response 9:

The Department is responsible for assessing "aquatic life" as a designated use; this designated use refers to the biological community as a whole, not specific species. Threatened and endangered (T&E) species designations fall under the purview of the US Fish and Wildlife Service (USFWS). The USFWS made comments regarding these criteria modifications and T&E

species saying, "[t]he Service has no concerns with the proposal to increase the TDS water quality criterion for the Red River from the mouth of the Little River to the Arkansas/Louisiana state line from 500 mg/L to 860 mg/L as this change will not affect any federally listed species" and "[i]f the thermal regime is significantly altered, there is potential to affect *A. wheeleri.* The Service does not have sufficient information regarding the altered thermal regime surrounding the outfall pipe and downstream to make a decision at this time."

Refer to Topic 3 in Part I regarding temperature in the Little River

According to the data supplied by the UAA, the aquatic life designated use will be maintained at the proposed temperature and TDS criteria.

Comment 10a: ADEQ-regarding the UAA/Technical Justification

Comments and concerns regarding the SWEPCO UAA for minerals in the Little River and Red River and the technical justification for temperature in the Little River have been previously addressed within the submitted documents. As such. the Planning Branch has no comments on the UAA/Technical Justification at this time.

Response 10a:

This comment is acknowledged.

Comment 10b: ADEQ-regarding the Reg. 2 markup

• The proposed rule change has not yet been approved by EPA, there for the footnote "† Not Applicable for Clean Water Act purposed until approved by EPA" applies.

- On page 5-12 the † asterisk applies and should be added to the table after the 860 proposed for Red River TDS and the 138 proposed for Little River TDS.
- On page A-30 the † asterisk applies and should be added to the end of the text noting no domestic water supply use.

- On page A-31 the † asterisk applies and should be added to the table after the 32(89.6) proposed for Little River temperature
- On page A-32 the † asterisk applies and should be added to the end of the text noting the 860 proposed for Red River TDS, the 138 proposed for Little River TDS, and the 32(89 .6) proposed for Little River temperature.

• On page A-30, the phrase "no domestic drinking water supply use" is not accurate and should be revised to state "no domestic water supply use" as per Reg. 2.302(G)

Response 10b:

This comment is acknowledged.

Comment 11: International Paper

IP has reviewed the Use Attainability Analysis submitted by SWEPCO in support of the proposed rulemaking (UAA) for dissolved minerals in the Little and Red Rivers, and found that the UAA includes references to IP's pulp and paper manufacturing operation in Texarkana, Texas that are inaccurate, in particular with respect to the manner in which the UAA characterizes IP's wastewater discharge and its effect on dissolved minerals in the Sulphur River at its confluence with the Red River. After discussing the inaccuracies with SWEPCO's UAA consultants, FTN Associates, SWEPCO agreed to change the UAA, and has provided IP with the appropriate UAA changes, which are attached hereto and are acceptable to IP. These changes clarify that the Sulphur River will comply with the applicable surface water quality standards for dissolved minerals at its confluence with the Red River. IP cannot support, and must oppose this rulemaking unless the agreed upon changes, attached hereto, are made to the UAA.

Response 11:

Regarding the comment cover letter:

International Paper (IP) states that the UAA "includes references...that are inaccurate...with respect to the manner in which the UAA characterizes IP's wastewater discharge and its effect on dissolved minerals in the Sulphur River at its confluence with the Red River." ADEQ does not regard the original text as inaccurate. The original text does not need to be revised in order to be accurate. Specific text is addressed below.

IP states that the proposed revisions "clarify" that the Sulphur River "will comply" with the applicable surface water quality standards for dissolved minerals at its confluence with the Red River. The proposed revisions do not "clarify" compliance (by IP or the Sulphur River); the proposed revisions merely make an assumption that water quality standards of 120 mg/L for chloride, 100 mg/L for sulfate, and 500 mg/L for TDS are being met for the Sulphur River at the Arkansas/Texas state line. This assumption of compliance was used by FTN to run a harmonic mean model for TDS to "confirm that the proposed criteria in Arkansas will still allow the Louisiana criterion for TDS in the Red River (780 mg/L) to be maintained" (per Section 5.2 of the UAA) to satisfy requirements to investigate impacts and use attainments of downstream waters.

Regarding the strikethrough pages attached to cover letter (found Appendix A within this document):

IP proposes several revisions that would replace specific references to International Paper with a generic label of point source discharger; the Department has the following specific comments. In Tables 5.1 and 5.2 "Int'l Paper" was struck and replaced with "point source discharge to Sulphur River in TX." Similarly, portions of Tables J.2, J.3, and J.5 were edited to replace "IP" with "TX point source" or "point source." And, in Table 5.3 "downstream of point source discharge in TX" was added. These revisions are not necessary and do not correct any "inaccuracy." Removing references to IP removes transparency of the UAA, as IP is the only significant industrial facility discharging into the Sulphur River below the TCEQ station used for values within the models.

In Figure J.1, IP proposed removing "TX0000167 (Int'l Paper)" from the Sulphur River schematic and beginning the schematic "below TX point source discharging to Sulphur River" thus beginning the model downstream of IP. It is not inaccurate to include IP in the model used to calculate instream water quality criteria; this revision is not necessary.

However, SWEPCO may choose to begin their model at the Arkansas state line or at a point upstream of the state line within Texas for the Sulphur River. In the UAA, as presented, they began their model upstream of the AR state line. If SWEPCO wishes to use an alternate approach and rewrite these portions of the UAA they may do so, however the UAA as submitted is not "inaccurate" as IP states. Regardless of where the model starts, replacing references to International Paper with generic "point source" labels removes transparency and the Department does not support such proposed changes.

NOTE: Two models for two flow conditions were presented within the UAA: a 7Q10 model and a Harmonic Mean Flow (HMF) model. Each is discussed independently below:

Specific Comments pertaining to the 7Q10 Model Proposed Revisions

The 7Q10 model was used to estimate a proposed TDS criterion for the Red River that reflected naturally occurring TDS concentrations. The 7Q10 model did support the 95th percentile of 860 mg/L for TDS and is appropriate as presented. Proposed revisions to the 7Q10 model are not supported by the Department. Specifics are highlighted below.

For Table 5.3 column two, IP suggests adding "(7Q10)" after "145.5". The value "145.5" is not based on 7Q10 flow; it is the average TDS concentration from Texas Commission of

Environmental Quality (TCEQ) station 10212. Therefore it is inaccurate to add "(7Q10)" after the 145.5 value. In column three, the addition of "7Q10 conditions (TX point source is not discharging)" is also inaccurate for the same reason. The Department does not support these proposed revisions.

In Table 5.4 it is appropriate to retain the data for IP at 7Q10 as it maintains transparency for the UAA. A footnote specifying no discharge at 7Q10 for clarity is acceptable.

IP has proposed to remove International Paper from the wasteload input dataset in the 7Q10 LA-Qual model (Appendix K). As originally proposed, the 7Q10 model notes 0 cfs flow for IP, thereby showing that IP has no discharge during this flow condition and thus no contribution to minerals concentrations. It is not "inaccurate" to include the IP data from this input list; IP's recommended revision to remove this data is not necessary. It is also not inaccurate to remove it from the list as IP does not discharge at 7Q10 flow conditions; however, doing so makes the UAA less transparent.

Specific Comments pertaining to the HMF Model Proposed Revisions

The HMF model was presented to "confirm that the proposed criteria in Arkansas will still allow the Louisiana criterion for TDS in the Red River (780 mg/L) to be maintained" (per Section 5.2 of the UAA) to satisfy requirements to investigate impacts and use attainments of downstream waters. The use of water quality values of 120 mg/L of chloride, 100 mg/L of sulfate, and 500 mg/L for TDS in this model only assume water quality standards are being met, and this is in no way assurance of compliance. The Department suggests that the HMF model be separated from the 7Q10 model in order to reduce confusion of comingled data within tables. Specifics are addressed below.

For Table 5.3 column two, the addition of "500 (harmonic mean)" is not appropriate. The HMF model is for downstream attainment investigations only and does not belong in this table. It would be more appropriate to include this information in a footnote or other notation. For column three, the addition of "Harmonic mean (TX point source is discharging): Assumed to meet standards at TX-AR state line" is not appropriate for the same reasons stated above. The Department does not support these suggested revisions to Table 5.3 because while it is appropriate to consider downstream water quality standards will be met, models run for the sole purpose of downstream attainment should be kept separate from models used to support criteria development (in this case the 95th percentile of instream data).

In Table 5.4 it is appropriate to remove the data for IP at HMF conditions. However, this data should be retained as a footnote as IP can discharge at HMF conditions. For the HMF model, the TDS concentration for the Sulphur River should be characterized as the Arkansas standard of 500 mg/L, instead of the average of the station data (145.5 mg/L). Setting the input to water quality standards in this model accounts for discharge from IP; however, this method only assumes water quality standards are being met and is in no way an assurance of compliance. For the HMF model (Appendix L), IP proposes to remove the specific input of IP from the wasteload data (Data Type 24) and instead use the water quality criteria values (as opposed to using actual instream data) of 120 mg/L of chloride, 100 mg/L of sulfate, and 500 mg/L for TDS for "headwater" data set (Data Type 20). This revision is not necessary, however if SWEPCO does choose to begin its model below the IP discharge, then this move is acceptable. However, it is not "inaccurate" to include IP data in the wasteload data set, and doing so will make the UAA more transparent. Planning again must stress that the HMF model is only done to "confirm that the proposed criteria in Arkansas will still allow the Louisiana criterion for TDS in the Red River

(780 mg/L) to be maintained" (per Section 5.2 of the UAA) to satisfy requirements to investigate impacts and use attainments of downstream waters. And that the use of water quality values of 120 mg/L of chloride, 100 mg/L of sulfate, and 500 mg/L for TDS in this model only assume water quality standards are being met, and this is in no way an assurance of compliance.

Appendix A

International Paper's proposed changes to UAA.

Table 5.1. Summary of flows used in mass balance for 7Q10 conditions.

Reach	Flow (cfs) from:				Total Flow at Downstream End of Reach (cfs)
	Upstream Reach	Specific Tributaries	Diffuse Inflow	Point Sources	
Red River from OK-AR state line to Little River:					
Red River 11140106-025	1,146 (upstream end of model)	0	3.25	0	1,149.25
Red River 11140106-005	1,149.25	0	2.32	0	1,151.57
Red River 11140106-003	1,151.57	3.69 (Walnut Bayou)	0.58	0	1,155.84
Red River 11140106-001	1,155.84	0	5.29	87.264 (Domtar) + 1.702 (City of Ashdown)	1,250.10
Little River from Millwood Lake dam to Red River:					
Little River	130.15 (just upstream of SWEPCO)	0	0	3.342 (SWEPCO)	133.49
Red River from Little River to AR-LA state line:					
Red River 11140201-011	1,250.10 (Red River) + 133.49 (Little River)	0	1.40	0.077 (City of Fulton) + 0.650 (Tyson River Valley Animal Food)	1,385.72
Red River 11140201-007	1,385.72	1.24 (Bois D'Arc Creek)	1.29	0.116 (City of Garland) + 0.155 (Chieftain Sand)	1,388.52
Red River 11140201-005	1,388.52	0	2.97	0	1,391.49
Red River 11140201-004	1,391.49	1.372 (McKinney Bayou)	0.41	0.004 (Pollution Management) + 1.47 (N. Texarkana)	1,394.75
Red River 11140201-003	1,394.75	23.46 (Sulphur River)	0.33	0 (~~Int'l Paper~~point source discharge to Sulphur River in TX)	1,418.54

Table 5.2. Summary of flows used in mass balance for harmonic mean conditions.

Reach	Flow (cfs) from: Upstream Reach	Specific Tributaries	Diffuse Inflow	Point Sources	Total Flow at Downstream End of Reach (cfs)
Red River from OK-AR state line to Little River:					
Red River 11140106-025	4,209.35 (upstream end of model)	0	11.95	0	4,221.30
Red River 11140106-005	4,221.30	0	8.50	0	4,229.80
Red River 11140106-003	4,229.80	13.56 (Walnut Bayou)	2.13	0	4,245.49
Red River 11140106-001	4,245.49	0	19.44	87.264 (Domtar) + 1.702 (City of Ashdown)	4,353.90
Little River from Millwood Lake dam to Red River:					
Little River	1,156.31 (just upstream of SWEPCO)	0	0	3.342 (SWEPCO)	1,159.65
Red River from Little River to AR-LA state line:					
Red River 11140201-011	4,353.90 (Red River) + 1,159.65 (Little River)	0	13.91	0.077 (City of Fulton) + 0.650 (Tyson River Valley Animal Food)	5,528.19
Red River 11140201-007	5,528.19	79.92 (Bois D'Arc Creek)	12.82	0.116 (City of Garland) + 0.155 (Chieftain Sand)	5,621.20
Red River 11140201-005	5,621.20	0	29.46	0	5,650.66
Red River 11140201-004	5,650.66	91.276* (McKinney Bayou)	4.09	0.004 (Pollution Management) + 1.47 (N. Texarkana)	5,747.50
Red River 11140201-003	5,747.50	728.88* (Sulphur River)	3.27	293.5 (~~Int'l Paper~~point source discharge to Sulphur River in TX)	6,773.15

* See Tables J.3 – J.5 for details concerning ambient flows for McKinney Bayou and Sulphur River.

Table 5.3. TDS concentrations for ambient inflow in mass balance.

Inflow	TDS Concentration (mg/L)	Data Source / Comment for TDS
Red River at OK-AR state line	891	90th percentile of ADEQ data at RED0025 (Red River south of Foreman)
Diffuse inflow to Red River between OK-AR state line and Little River	296.6	Same as 2012 TMDL – average of ADEQ data at RED0064 (Walnut Bayou near Foreman)
Walnut Bayou (tributary to Red River)	296.6	Same as 2012 TMDL – average of ADEQ data at RED0064 (Walnut Bayou near Foreman)
Little River upstream of SWEPCO	98	90th percentile of data collected by SWEPCO and FTN in Little River upstream of SWEPCO during October 2010 through October 2013
Diffuse inflow to Red River between Little River and AR-LA state line	183.5	Same as 2012 TMDL – average of ADEQ data at UWBDK02 (Bois D'Arc Creek)
Bois D'Arc Creek (tributary to Red River)	183.5	Same as 2012 TMDL – average of ADEQ data at UWBDK02 (Bois D'Arc Creek)
Headwater and diffuse inflow for McKinney Bayou (tributary to Red River)	296.6	Same as 2012 TMDL – average of ADEQ data at RED0064 (Walnut Bayou near Foreman)
Sulphur River (tributary to Red River) at TX-AR state line, downstream of point source discharge in TX	145.5 (7Q10) 500 (harmonic mean)	7Q10 conditions (TX point source is not discharging): Same as 2012 TMDL – average of Texas Commission on Environmental Quality (TCEQ) measurements from Sulphur River at Highway 59 bridge (TCEQ station 10212) Harmonic mean (TX point source is discharging): Assumed to meet standards at TX-AR state line
Diffuse inflow to Sulphur River	219	Same as 2012 TMDL – average of ADEQ data at RED0004A (Days Creek southeast of Texarkana)
Days Creek (tributary to Sulphur River)	219	Same as 2012 TMDL – average of ADEQ data at RED0004A (Days Creek southeast of Texarkana)

Table 5.4. TDS concentrations for point sources in mass balance.

Facility	Flow (MGD)	TDS Concentration (mg/L)	Data Source / Comment for TDS
Domtar	56.4	1,638	95th percentile of quarterly discharge monitoring report (DMR) data from 4th quarter 2008 through 3rd quarter 2013
City of Ashdown	1.1	540	Same as 2012 TMDL
SWEPCO	2.16	1,620	Recent estimate by SWEPCO personnel of effluent TDS concentration based on an intake concentration of 98 mg/L (90th percentile of values in Little River upstream of SWEPCO) and full operation of the facility with cycling of cooling water as designed
City of Fulton	0.05	500	Same as 2012 TMDL
Tyson River Valley Animal Food	0.42	2,000	95th percentile of monthly effluent data from August 2008 through September 2013
City of Garland	0.075	500	Same as 2012 TMDL
Chieftain Sand	0.1	500	Same as 2012 TMDL
Pollution Management (discharges to McKinney Bayou)	0.003	480	Same as 2012 TMDL
North Texarkana WWTP (discharges to McKinney Bayou)	0.95	480	Same as 2012 TMDL
~~International Paper Texarkana (discharges to Sulphur River)~~	~~0 for 7Q10; 189.7 for harmonic mean~~	~~855~~	~~Maximum effluent concentration that will allow current TDS criterion to be maintained in Sulphur River in Arkansas with discharge at 100% of upstream flow~~

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FIGURE J.1 LA-QUAL SCHEMATIC DIAGRAM

For simulation of TDS in the Red River, McKinney Bayou, and Sulphur River

LA-QUAL reach numbers are shown in boxes. LA-QUAL reaches correspond to assessment reaches.

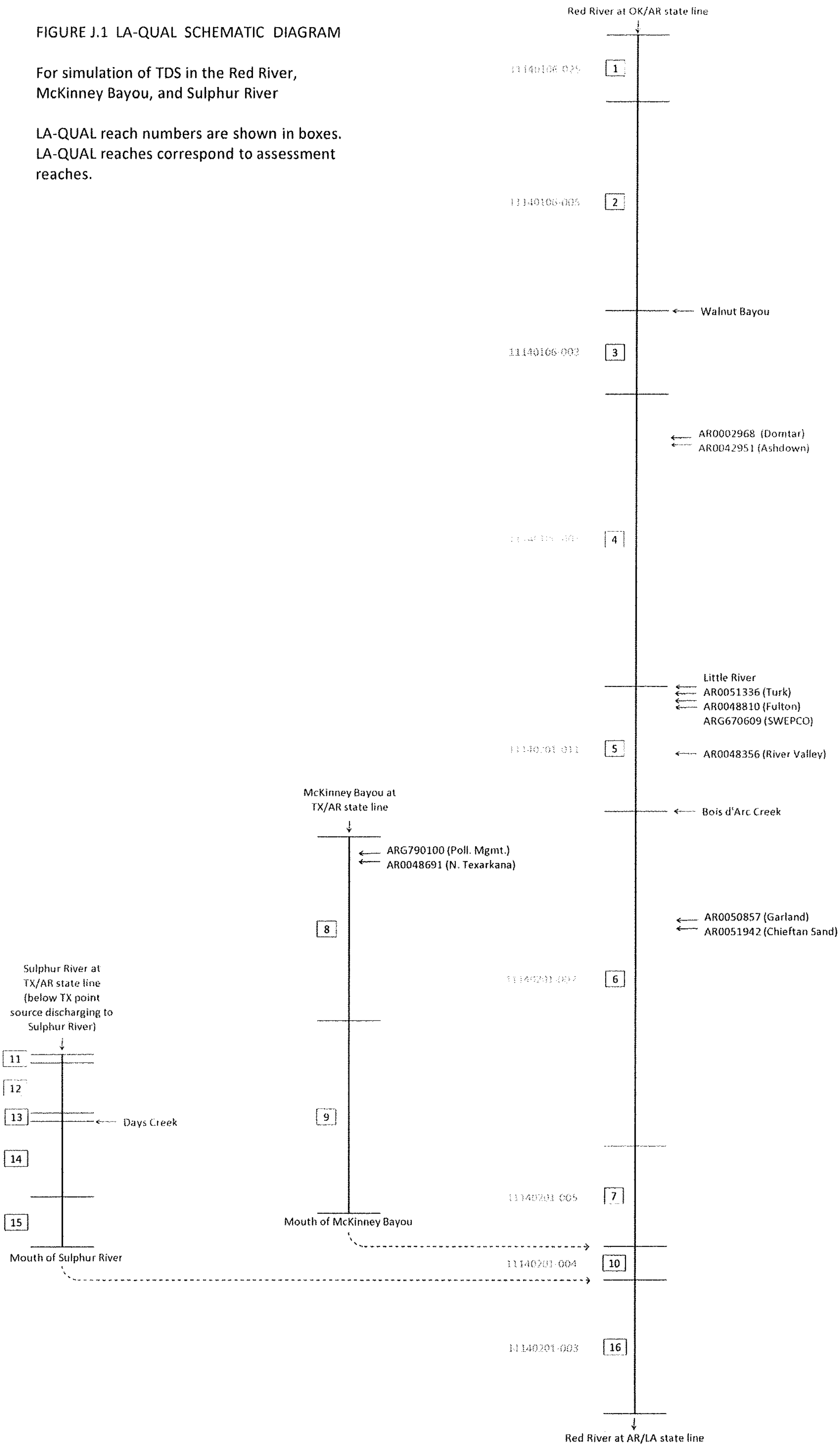

TABLE J.2 FLOW BALANCE FOR RED RIVER IN ARKANSAS -- 7Q10 CONDITIONS

General approach: Use historical conditions to estimate tributary flows and diffuse inflows so that total flows will match 7Q10 flows at USGS flow gages. Then use those ambient inflows with design flows for point sources to get critical conditions for the LA-QUAL model.

Ambient flow per unit area based on USGS flow gage for Red River at Index, AR (calculations in 2012 TMDL have been corrected here):

Published 7Q10 flow for Red River at Index =	1240 cfs	USGS 2008 low flow report
Avg. effl. flow from City of Ashdown = 0.77 MGD =	1.2 cfs	Apr 2008 - Mar 2013 avg from ECHO web site
Avg. effl. flow from Domtar Ashdown = 50.8 MGD =	78.6 cfs	Apr 2008 - Mar 2013 avg from ECHO web site
Ambient portion of 7Q10 flow at Index =	1160.2 cfs	7Q10 minus historical point source flows
Contributing drainage area at Index =	42,094 mi2	USGS drainage area book for Red River basin
Ambient 7Q10 flow per mi2 at Index =	0.02756 cfs/mi2	Ambient flow divided by drainage area

Ambient flow per unit area based on USGS flow gage for Red River at Spring Bank, AR (no change from 2012 TMDL):

Ambient 7Q10 flow per mi2 at Spring Bank =	0.02752 cfs/mi2	7Q10 flow calculated by FTN (1403 cfs) divided by contributing drainage area (50,973 mi2)

Flows from different sources for each reach of the Red River reach:

Equations for columns E, I, K, & N: E = D – C; I = (E – G) * Flow per mi2 at Index or Spring Bank; K = B + H + I + J; N = (Flow at downstream end of prev. reach) + H + I + M

									--- Historical conditions ---		--- "Design" conditions ---	
A	B	C	D	E	F	G	H	I	J	K	M	N
Stream name and reach number	Flow at upstream end of this reach of Red River (cfs)	Contrib. drainage area at u/s end of reach (mi2)	Contrib. drainage area at d/s end of reach (mi2)	Drainage area entering this reach (mi2)	Major trib entering this reach of Red R.?	Drainage area of major trib (mi2)	Ambient flow from major trib (cfs)	Diffuse flow directly entering this reach of Red R. (cfs)	Historical flow for point sources entering this reach or trib. (cfs)	Flow at downstream end of this reach of Red River (cfs)	Design flow for point sources entering this reach or trib. (cfs)	Flow at downstream end of this reach of Red River (cfs)
Red River 11140106-025	1146 41582 mi2 × flow per mi2 at Index gage	41,582	41,700	118	no	0	0	3.25	0	1149.25	0	1149.25
Red River 11140106-005	1149.25	41,700	41,784	84	no	0	0	2.32	0	1151.57	0	1151.57
Red River 11140106-003	1151.57	41,784	41,939	155	Walnut Bayou	134	3.69 134 mi2 × flow per mi2 at Index gage	0.58	0	1155.84	0	1155.84
Red River 11140106-001	1155.84	41,939	42,131	192	no	0	0	5.29	79.8 78.6 (Domtar) + 1.2 (City of Ashdown)	1240.93	88.97 87.264 (Domtar) + 1.702 (City of Ashdown)	1250.1
Red River 11140201-011	1240.93	42,131	46,421	4,290	Little River	4,239	130.15 Flow just upstream of Turk (value specified by ADEQ in comments on draft report)	1.40	0.39 0 (Turk started in 2012) + 0 (SWEPCO started in 2010) + 0.031 (City of Fulton) + 0.356 (River Valley Animal Foods)	1372.87	4.07 3.342 (Turk) + 0 (SWEPCO is void) + 0.077 (City of Fulton) + 0.650 (River Valley Animal Foods)	1385.72
Red River 11140201-007	1372.87	46,421	46,761	340	Bois D'Arc Creek	293	1.24 Bois D'Arc Creek flow at mouth in 2012 TMDL	1.29	0.002 0.002 (City of Garland) + 0 (Chieftain Sand didn't discharge)	1375.4	0.27 0.116 (City of Garland) + 0.155 (Chieftain Sand)	1388.52
Red River 11140201-005	1375.4	46,761	46,869	108	no	0	0	2.97	0	1378.37	0	1391.49
Red River 11140201-004	1378.37	46,869	47,224	355	McKinney Bayou	340	1.372 McKinney B. headwater + diffuse inflow in 2012 TMDL	0.41	1.474 0.004 (Pollution Mgmt.) + 1.47 (N. Texarkana)	1381.63	1.474 0.004 (Pollution Mgmt.) + 1.47 (N. Texarkana)	1394.75
Red River 11140201-003	1381.63	47,224	50,984	3,760	Sulphur River	3,748	23.46 Sulphur R. headwater + diffuse inflow + Days Creek inflow (from 2012 TMDL)	0.33	0 0 (for 7Q10, no discharge to Sulphur River from point source in TX)	1405.42	0 0 (for 7Q10, no discharge to Sulphur River from point source in TX)	1418.54

Check to make sure calculated flows are close to 7Q10 values at USGS flow gages:

Published 7Q10 flow at Index gage (within reach 11140106-001) =	1240 cfs (USGS 2008 report)
Calculated flow at downstream end of reach 11140106-001 =	1240.93 cfs (includes small diffuse inflow downstream of gage)
7Q10 flow for Spring Bank gage data (in reach 11140201-003) =	1403 cfs (calculated by FTN using 1997 - 2011 daily data)
Calculated flow at downstream end of reach 11140201-003 =	1405.42 cfs (includes small diffuse inflow downstream of gage)

Changes from flows used in 2012 TMDLs for dissolved minerals:

* The headwater flow for the Red River was re-calculated. In the 2012 TMDL, the historical point source flow was inadvertently not subtracted from 7Q10 at the gage.
* The flow per unit area for the Index gage was re-calculated using only the ambient portion of the published 7Q10 (this was related to the error in the previous bullet).
* The Little River flow was corrected to be the value upstream of Turk. The 2012 TMDL used the Little River flow rate immediately downstream of Turk's discharge.
* The design flows for Domtar and for Tyson River Valley Animal Foods were corrected. Both values were too high in the 2012 TMDL.

FILE: R:\PROJECTS\06510-0010-002\TECH\MINERAL UAA\MASS BUDGET\FLOW BALANCE FOR LA-QUAL MODEL.XLSX

TABLE J.3 FLOW BALANCE FOR RED RIVER IN ARKANSAS -- HARMONIC MEAN CONDITIONS

Ambient flow per unit area based on USGS flow gage for Red River at Index, AR:

Harmonic mean flow for Red River at Index =	4,341 cfs	Calculated for 40 yrs (Oct 1973 - Sep 2013)
Avg. effl. flow from City of Ashdown = 0.77 MGD =	1.2 cfs	Apr 2008 - Mar 2013 avg from ECHO web site
Avg. effl. flow from Domtar Ashdown = 50.8 MGD =	78.6 cfs	Apr 2008 - Mar 2013 avg from ECHO web site
Ambient portion of harm. mean flow at Index =	4,261.2 cfs	Harmonic mean minus historical point source flows
Contributing drainage area at Index =	42,094 mi2	USGS drainage area book for Red River basin
Ambient harmonic mean flow per mi2 at Index =	0.10123 cfs/mi2	Ambient flow divided by drainage area

Ambient flow per unit area for inflows to Red River between Index gage and Spring Bank gage:

Harmonic mean flow for Red River at Spring Bank =	6,763 cfs	Median of Spring Bank flows when Index is near harmonic mean
Inflow between Index and Spring Bank gages =	2,422 cfs	Harmonic mean flow at Spring Bank minus harmonic mean flow at Index
Contributing drainage area at Spring Bank =	50,973 mi2	USGS drainage area book for Red River basin
Drainage area betw. Index and Spring Bank gages =	8,879 mi2	Drainage area at Spring Bank minus drainage area at Index
Harm. mean flow per mi2 betw. Index & Spring Bank =	0.27278 cfs/mi2	Inflow (2422) divided by drainage area (8879)

Flows from different sources for each reach of the Red River in Arkansas:

Equations for columns E, I, K, & N: E = D – C; I = (E – G) * Flow per mi2 at Index or betw. gages; K = B + H + I + J; N = (Flow at downstream end of prev. reach) + H + I + M

									--- Historical conditions ---		--- "Design" conditions ---	
A	B	C	D	E	F	G	H	I	J	K	M	N
Stream name and reach number	Flow at upstream end of this reach of Red River (cfs)	Contrib. drainage area at u/s end of reach (mi2)	Contrib. drainage area at d/s end of reach (mi2)	Drainage area entering this reach (mi2)	Major trib entering this reach of Red R.?	Drainage area of major trib (mi2)	Ambient flow from major trib (cfs)	Diffuse flow directly entering this reach of Red R. (cfs)	Historical flow for point sources entering this reach or trib. (cfs)	Flow at downstream end of this reach of Red River (cfs)	Design flow for point sources entering this reach or trib. (cfs)	Flow at downstream end of this reach of Red River (cfs)
Red River 11140106-025	4209.35 41582 mi2 × flow per mi2 at Index gage	41,582	41,700	118	no	0	0	11.95	0	4221.3	0	4221.3
Red River 11140106-005	4221.3	41,700	41,784	84	no	0	0	8.5	0	4229.8	0	4229.8
Red River 11140106-003	4229.8	41,784	41,939	155	Walnut Bayou	134	13.56 134 mi2 × flow per mi2 at Index gage	2.13	0	4245.49	0	4245.49
Red River 11140106-001	4245.49	41,939	42,131	192	no	0	0	19.44	79.8 78.6 (Domtar) + 1.2 (City of Ashdown)	4344.73	88.97 87.264 (Domtar) + 1.702 (City of Ashdown)	4353.9
Red River 11140201-011	4344.73	42,131	46,421	4,290	Little River	4,239	1156.31 4239 mi2 × flow per mi2 between Index & Spring Bank	13.91	0.39 0 (Turk started in 2012) + 0 (SWEPCO started in 2010) + 0.031 (City of Fulton) + 0.356 (River Valley Animal Foods)	5515.34	4.07 3.342 (Turk) + 0 (SWEPCO is void) + 0.077 (City of Fulton) + 0.650 (River Valley Animal Foods)	5528.19
Red River 11140201-007	5515.34	46,421	46,761	340	Bois D'Arc Creek	293	79.92 293 mi2 × flow per mi2 between Index & Spring Bank	12.82	0.002 0.002 (City of Garland) + 0 (Chieftain Sand didn't discharge)	5608.08	0.27 0.116 (City of Garland) + 0.155 (Chieftain Sand)	5621.20
Red River 11140201-005	5608.08	46,761	46,869	108	no	0	0	29.46	0	5637.54	0	5650.66
Red River 11140201-004	5637.54	46,869	47,224	355	McKinney Bayou	340	91.276 See footnote #1 below	4.09	1.474 0.004 (Pollution Mgmt.) + 1.47 (N. Texarkana)	5734.38	1.474 0.004 (Pollution Mgmt.) + 1.47 (N. Texarkana)	5747.50
Red River 11140201-003	5734.38	47,224	50,984	3,760	Sulphur River	3,748	728.88 See footnote #2 below	3.27	293.5 293.5 (Discharge to Sulphur River from point source in TX)	6760.03	293.5 293.5 (Discharge to Sulphur River from point source in TX)	6773.15

Notes: 1. Total flow at mouth of McKinney Bayou = 340 mi2 × 0.27278 cfs per mi2 = 92.75 cfs. This consists of 1.474 cfs of effluent and 91.276 cfs of ambient flow. The ambient flow includes 2.685 cfs of headwater inflow and 88.592 cfs of diffuse inflow. See Table J.4 for more details.

2. Total flow at mouth of Sulphur River = 3748 mi2 × 0.27278 cfs per mi2 = 1022.38 cfs. This consists of 293.5 cfs of effluent from TX point source and 728.88 cfs of ambient flow. The ambient flow includes 293.5 cfs upstream of TX point source, 241.87 cfs from Days Creek, and 193.51 cfs of diffuse inflow. See Table J.5 for more details.

Check to make sure calculated flows are close to harmonic mean values at USGS flow gages:

Harmonic mean flow at Index gage (within reach 11140106-001) =	4341 cfs	(calculated using data for Oct 1973 - Sep 2013)
Calculated flow at downstream end of reach 11140106-001 =	4344.73 cfs	(includes some diffuse inflow downstream of gage)
Harmonic mean flow at Spring Bank gage (in reach 11140201-003) =	6763 cfs	(estimated by FTN for Oct 1973 - Sep 2013)
Calculated flow at downstream end of reach 11140201-003 =	6760.03 cfs	

TABLE J.5 CALCULATIONS TO DIVIDE TOTAL FLOW FOR SULPHUR RIVER AMONG INDIVIDUAL REACHES IN LA-QUAL FOR HARMONIC MEAN FLOW CONDITIONS

Total flow at mouth of Sulphur River =	1022.38 cfs	(from Red River flow balance on previous tab of this spreadsheet)
Release from Wright Patman Dam =	293.5 cfs	(7-day avg rel. when Index is at harm. mean)
TX point source discharge to Sulphur R. =	293.5 cfs	(effl. flow can be 100% of dam release in Jan.)
Point sources in Days Creek watershed =	18.95 cfs	(sum of average flows for 6 discharges)
Ambient inflow to Sulphur River in AR =	416.43 cfs	(flow at mouth minus dam release minus Days Creek pt. sources minus TX pt. source discharge to Sulphur R.)
Drainage area of Sulphur River at mouth =	3,748 mi2	(USGS drainage area book)
Drainage area of Sulphur R. at TX/AR state line =	3,479 mi2	(USGS drainage area book)
Drainage area for ambient inflow in AR =	269 mi2	(D.A. at mouth minus D.A. at state line)
Ambient inflow per mi2 for Sulphur River in AR =	1.55 cfs/mi2	(ambient inflow divided by D.A.)
Drainage area at d/s end of reach -008 =	3,480 mi2	
Incremental drainage area for reach -008 =	1 mi2	
Diffuse inflow along reach -008 =	1.55 cfs	(increm. D.A. times inflow per mi2)
Drainage area at d/s end of reach -006 =	3,542 mi2	(USGS drainage area book)
Incremental drainage area for reach -006 =	62 mi2	
Diffuse inflow along reach -006 =	95.98 cfs	(increm. D.A. times inflow per mi2)
Drainage area at d/s end of reach -004 =	3,563 mi2	(USGS drainage area book)
Incremental drainage area for reach -004 =	21 mi2	
Diffuse inflow along reach -004 =	32.51 cfs	(increm. D.A. times inflow per mi2)
Days Creek drainage area =	144 mi2	(USGS drainage area book)
Ambient inflow from Days Creek =	222.92 cfs	(Days Creek D.A. times inflow per mi2)
Total inflow from Days Creek =	241.87 cfs	(ambient inflow + point source flows)
Drainage area at d/s end of reach -002 =	3,742 mi2	(USGS drainage area book)
Incremental drainage area for reach -002 =	35 mi2	(excluding Days Creek drainage area)
Diffuse inflow along reach -002 =	54.18 cfs	(increm. D.A. times inflow per mi2)
Drainage area at d/s end of reach -001 (mouth) =	3,748 mi2	(USGS drainage area book)
Incremental drainage area for reach -001 =	6 mi2	
Diffuse inflow along reach -001 =	9.29 cfs	(increm. D.A. times inflow per mi2)

Compare sum of inflows to the total inflow from Red River flow balance:

293.5	cfs for flow upstream of TX pt. source discharge to Sulphur R.
293.5	cfs for TX point source discharge to Sulphur River
1.55	cfs for diffuse inflow along reach -008
95.98	cfs for diffuse inflow along reach -006
32.51	cfs for diffuse inflow along reach -004
241.87	cfs for Days Creek
54.18	cfs for diffuse inflow along reach -002
9.29	cfs for diffuse inflow along reach -001
1022.38	cfs = sum of calculated inflows

--> Acceptable flow balance (within 0.01 cfs)

FILE: R:\PROJECTS\06510-0010-002\TECH\MINERAL UAA\MASS BUDGET\FLOW BALANCE FOR LA-QUAL MODEL.XLSX

LA-QUAL Version 9.08
Louisiana Department of Environmental Quality

Input file is R:\projects\06510-0010-002\tech\Mineral UAA\Mass budget\RedRv_7Q10_proposed_criteria.txt
Running in steady-state mode using LA defaults
Output produced at ~~14:15~~10:33 on ~~07/23~~10/30/2014

```
$$$ DATA TYPE 1 (TITLES AND CONTROL CARDS) $$$

CARD TYPE         CONTROL TITLES

TITLE01           LA-QUAL Model for Red River/McKinney/Sulphur
TITLE02           Low Flow (7Q10); corrected flow balance; proposed crite
CNTROL03    NO    METRIC UNITS
ENDATA01

$$$ DATA TYPE 2 (MODEL OPTIONS) $$$

CARD TYPE         MODEL OPTION

MODOPT01    NO    TEMPERATURE
MODOPT02    NO    SALINITY
MODOPT03   YES    CONSERVATIVE           Chloride                     mg/L     Cl
MODOPT04   YES    CONSERVATIVE           Sulfate                      mg/L     SO4
MODOPT05    NO    DISSOLVED OXYGEN
MODOPT06    NO    BOD2 BIOC
MODOPT07    NO    NITROGEN
MODOPT08    NO    PHOSPHORUS
MODOPT09    NO    PHYTOPLANKTON
MODOPT10    NO    PERIPHYTON
MODOPT11    NO    COLIFORM
MODOPT12   YES    NONCONSERVATIVE        Total Dissolved Solids       mg/L     TDS
ENDATA02

$$$ DATA TYPE 3 (PROGRAM CONSTANTS) $$$

CARD TYPE         DESCRIPTION OF CONSTANT                      VALUE

PROGRAM           HYDRAULIC CALCULATION METHOD      =        2.00000 (widths and depths)
PROGRAM           MAXIMUM ITERATION LIMIT           =      999.00000
ENDATA03

$$$ DATA TYPE 4 (TEMPERATURE CORRECTION CONSTANTS FOR RATE COEFFICIENTS) $$$

 CARD TYPE      RATE CODE      THETA VALUE

ENDATA04

$$$ CONSTANTS TYPE 5 (TEMPERATURE DATA) $$$
```

CARD TYPE	JUNCTION ELEMENT	UPSTRM ELEMENT	RIVER KILOM	NAME
JUNCTION	1900	1452	119.50	McKinney Bayou to Red River
JUNCTION	2168	1939	115.50	Sulphur River to Red River

ENDATA23

$$$ DATA TYPE 24 (WASTELOAD DATA FOR FLOW, TEMPERATURE, SALINITY, AND CONSERVATIVES) $$$

CARD TYPE	ELEMENT	RMILE	NAME	FLOW m³/s	FLOW cfs	FLOW MGD	TEMP deg C	SALIN ppt	Cl mg/L	SO4 mg/L
WSTLD-1	334	231.40	Walnut Bayou	0.10450	3.69000	2.385	30.00	0.00	44.400	34.900
WSTLD-1	485	216.30	AR0002968 - Domtar	2.47137	87.26400	56.409	30.00	0.00	210.000	591.000
WSTLD-1	486	216.20	AR0042951 - Ashdown	0.04820	1.70200	1.100	30.00	0.00	250.000	200.000
WSTLD-1	780	186.80	Little River	3.68592	130.14999	84.131	30.00	0.00	8.000	7.000
WSTLD-1	781	186.70	AR0051136 - Turk	0.09465	3.34200	2.160	30.00	0.00	250.000	200.000
WSTLD-1	788	186.00	AR0048810 - Fulton	0.00218	0.07700	0.050	30.00	0.00	250.000	200.000
WSTLD-1	789	185.90	ARG670609 - void	0.00000	0.00000	0.000	30.00	0.00	0.000	0.000
WSTLD-1	855	179.30	AR0048356 - Tyson RV	0.02192	0.77400	0.500	30.00	0.00	400.000	800.000
WSTLD-1	932	171.60	Bois d'Arc Creek	0.03515	1.24100	0.802	30.00	0.00	25.000	17.300
WSTLD-1	1059	158.90	AR0050857 - Garland	0.00329	0.11600	0.075	30.00	0.00	250.000	200.000
WSTLD-1	1070	157.80	AR0051942 - Chf Sand	0.00439	0.15500	0.100	30.00	0.00	250.000	200.000
WSTLD-1	1472	42.80	ARG790100 - Poll Mgt	0.00011	0.00400	0.003	30.00	0.00	180.000	60.000
WSTLD-1	1473	42.70	AR0048691 - N Texark	0.04163	1.47000	0.950	30.00	0.00	180.000	60.000
~~WSTLD-1~~	~~1841~~	~~22.70~~	~~TX0000167 - IP Tex~~	~~0.00000~~	~~0.00000~~	~~0.000~~	~~30.00~~	~~0.00~~	~~120.000~~	~~180.000~~
WSTLD-1	2020	14.80	Days Creek	0.29283	10.34000	6.684	30.00	0.00	39.500	33.800

ENDATA24

$$$ DATA TYPE 25 (WASTELOAD DATA FOR DO, BOD, AND NITROGEN) $$$

CARD TYPE	ELEMENT	NAME	DO mg/L	BOD mg/L	% BOD RMVL	ORG-N mg/L	NH3-N mg/L	% NITRIF	NO3-N mg/L	BOD2 mg/L

ENDATA25

$$$ DATA TYPE 26 (WASTELOAD DATA FOR PHOSPHORUS, PHYTOPLANTON, COLIFORM, AND NONCONSERVATIVES) $$$

CARD TYPE	ELEMENT	NAME	PO4-P mg/L	PHYTO CHL A µg/L	COLI #/100mL	TDS mg/L	ORG-P mg/L
WSTLD-3	334	Walnut Bayou	0.00	0.00	0.00	296.60	0.00
WSTLD-3	485	AR0002968 - Domtar	0.00	0.00	0.00	1638.00	0.00
WSTLD-3	486	AR0042951 - Ashdown	0.00	0.00	0.00	540.00	0.00
WSTLD-3	780	Little River	0.00	0.00	0.00	98.00	0.00
WSTLD-3	781	AR0051136 - Turk	0.00	0.00	0.00	1620.00	0.00
WSTLD-3	788	AR0048810 - Fulton	0.00	0.00	0.00	500.00	0.00
WSTLD-3	789	ARG670609 - void	0.00	0.00	0.00	0.00	0.00
WSTLD-3	855	AR0048356 - Tyson RV	0.00	0.00	0.00	2000.00	0.00
WSTLD-3	932	Bois d'Arc Creek	0.00	0.00	0.00	183.50	0.00

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WSTLD-3        1059     AR0050857 - Garland        0.00      0.00      0.00     500.00      0.00
WSTLD-3        1070     AR0051942 - Chf Sand       0.00      0.00      0.00     500.00      0.00
WSTLD-3        1472     ARG790100 - Poll Mgt       0.00      0.00      0.00     480.00      0.00
WSTLD-3        1473     AR0048691 - N Texark       0.00      0.00      0.00     480.00      0.00
WSTLD-3        1941     TX0000167 - IP Tex         0.00      0.00      0.00     355.00      0.00
WSTLD-3        2020     Days Creek                 0.00      0.00      0.00     219.00      0.00
ENDATA26

$$$ DATA TYPE 27 (LOWER BOUNDARY CONDITIONS) $$$

CARD TYPE    CONSTITUENT                    CONCENTRATION

ENDATA27

$$$ DATA TYPE 28 (DAM DATA) $$$

CARD TYPE     ELEMENT   NAME                  EQN      "A"       "B"       "H"

ENDATA28

$$$ DATA TYPE 29 (SENSITIVITY ANALYSIS DATA) $$$

CARD TYPE       PARAMETER     COL 1     COL 2     COL 3     COL 4     COL 5     COL 6     COL 7     COL 8

ENDATA29

$$$ DATA TYPE 30 (PLOT CONTROL CARDS) $$$

PLOT1
RCH   1  2  3  4  5  6  7 10 16
PLOT2
RCH   8  9
PLOT3
RCH  11 12 13 14 15
ENDATA30

$$$ DATA TYPE 31 (OVERLAY PLOT DATA) $$$


OVERLAY1 OVERLAY_Red.ovl
OVERLAY2 OVERLAY_McKinney.ovl
OVERLAY3 OVERLAY_Sulphur.ovl
ENDATA31


     .....NO ERRORS DETECTED IN INPUT DATA
     .....HYDRAULIC CALCULATIONS COMPLETED
     .....TRIDIAGONAL MATRIX TERMS INITIALIZED
     .....CONSTITUENT CALCULATIONS COMPLETED
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.....GRAPHICS DATA FOR PLOT 1 WRITTEN TO UNIT 11
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LA-QUAL Version 9.08
Louisiana Department of Environmental Quality

Input file is R:\projects\06510-0010-002\tech\Mineral UAA\Mass budget\RedRv_HarMean_proposed_criteria.txt
Running in steady-state mode using LA defaults
Output produced at 07:1311:45 on 01/0310/30/2014

$$$ DATA TYPE 1 (TITLES AND CONTROL CARDS) $$$

CARD TYPE        CONTROL TITLES

TITLE01          LA-QUAL Model for Red River/McKinney/Sulphur
TITLE02          Harmonic mean flow with proposed criteria in AR
CNTROL03    NO   METRIC UNITS
ENDATA01

$$$ DATA TYPE 2 (MODEL OPTIONS) $$$

CARD TYPE        MODEL OPTION

MODOPT01    NO   TEMPERATURE
MODOPT02    NO   SALINITY
MODOPT03   YES   CONSERVATIVE             Chloride                 mg/L     Cl
MODOPT04   YES   CONSERVATIVE             Sulfate                  mg/L     SO4
MODOPT05    NO   DISSOLVED OXYGEN
MODOPT06    NO   BOD2 BIOC
MODOPT07    NO   NITROGEN
MODOPT08    NO   PHOSPHORUS
MODOPT09    NO   PHYTOPLANKTON
MODOPT10    NO   PERIPHYTON
MODOPT11    NO   COLIFORM
MODOPT12   YES   NONCONSERVATIVE          Total Dissolved Solids   mg/L     TDS
ENDATA02

$$$ DATA TYPE 3 (PROGRAM CONSTANTS) $$$

CARD TYPE        DESCRIPTION OF CONSTANT                     VALUE

PROGRAM          HYDRAULIC CALCULATION METHOD     =        2.00000 (widths and depths)
PROGRAM          MAXIMUM ITERATION LIMIT          =      999.00000
ENDATA03

$$$ DATA TYPE 4 (TEMPERATURE CORRECTION CONSTANTS FOR RATE COEFFICIENTS) $$$

 CARD TYPE      RATE CODE     THETA VALUE

ENDATA04

$$$ CONSTANTS TYPE 5 (TEMPERATURE DATA) $$$
```

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INCR-3	4	RR	0.00	0.00	0.00	296.60	0.00
INCR-3	5	RR	0.00	0.00	0.00	183.50	0.00
INCR-3	6	RR	0.00	0.00	0.00	183.50	0.00
INCR-3	7	RR	0.00	0.00	0.00	183.50	0.00
INCR-3	8	MK	0.00	0.00	0.00	296.60	0.00
INCR-3	9	MK	0.00	0.00	0.00	296.60	0.00
INCR-3	10	RR	0.00	0.00	0.00	183.50	0.00
INCR-3	11	SR	0.00	0.00	0.00	219.00	0.00
INCR-3	12	SR	0.00	0.00	0.00	219.00	0.00
INCR-3	13	SR	0.00	0.00	0.00	219.00	0.00
INCR-3	14	SR	0.00	0.00	0.00	219.00	0.00
INCR-3	15	SR	0.00	0.00	0.00	219.00	0.00
INCR-3	16	RR	0.00	0.00	0.00	183.50	0.00

ENDATA18

$$$ DATA TYPE 19 (NONPOINT SOURCE DATA) $$$

CARD TYPE	REACH	ID	BOD1 lb/d	ORG-N lb/d	COLI #/day	TDS	DO lb/d	BOD2 lb/d	ORG-P lb/d

ENDATA19

$$$ DATA TYPE 20 (HEADWATER FOR FLOW, TEMPERATURE, SALINITY AND CONSERVATIVES) $$$

CARD TYPE	ELEMENT	NAME	UNIT	FLOW m³/s	FLOW cfs	TEMP deg C	SALIN ppt	Cl mg/L	SO4 mg/L	HDW DISP EXCHG frac
HDWTR-1	1	Red River	0	119.21127	4209.35010	30.00	0.00	269.000	224.000	0.000
HDWTR-1	1453	McKinney Bayou	0	0.07604	2.68500	30.00	0.00	44.400	34.900	0.000
HDWTR-1	1940	Sulphur River	0	~~8.31209~~	~~293.50000~~16.62419	587.1000	30.00	0.00	~~13.700~~	~~1~~[illegible]120.000
100.000	0.000									

ENDATA20

$$$ DATA TYPE 21 (HEADWATER DATA FOR DO, BOD, AND NITROGEN) $$$

CARD TYPE	ELEMENT	NAME	DO mg/L	BOD#1 mg/L	ORG-N mg/L	NH3-N mg/L	NO3-N mg/L	BOD2 mg/L

ENDATA21

$$$ DATA TYPE 22 (HEADWATER DATA FOR PHOSPHORUS, PHYTOPLANKTON, COLIFORM, AND NONCONSERVATIVES) $$$

CARD TYPE	ELEMENT	NAME	PO4-P mg/L	PHYTO CHL A µg/L	COLI #/100mL	TDS mg/L	ORG-P mg/L	
HDWTR-3	1	Red River	0.00	0.00	0.00	891.00	0.00	
HDWTR-3	1453	McKinney Bayou	0.00	0.00	0.00	296.60	0.00	
HDWTR-3	1940	Sulphur River	0.00	0.00	0.00	~~144.000~~[illegible]		0.00

ENDATA22

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$$$ DATA TYPE 23 (JUNCTION DATA) $$$
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CARD TYPE	JUNCTION ELEMENT	UPSTRM ELEMENT	RIVER KILOM	NAME
JUNCTION	1900	1452	119.50	McKinney Bayou to Red River
JUNCTION	2168	1939	115.50	Sulphur River to Red River
ENDATA23				

$$$ DATA TYPE 24 (WASTELOAD DATA FOR FLOW, TEMPERATURE, SALINITY, AND CONSERVATIVES) $$$

CARD TYPE	ELEMENT	RMILE	NAME	FLOW m³/s	FLOW cfs	FLOW MGD	TEMP deg C	SALIN ppt	Cl mg/L	SO4 mg/L
WSTLD-1	334	231.40	Walnut Bayou	0.38403	13.56000	8.765	30.00	0.00	44.400	34.900
WSTLD-1	485	216.30	AR0002968 - Domtar	2.47137	87.26400	56.409	30.00	0.00	210.000	591.000
WSTLD-1	486	216.20	AR0042951 - Ashdown	0.04820	1.70200	1.100	30.00	0.00	250.000	200.000
WSTLD-1	780	186.80	Little River	32.74738	1156.31006	747.453	30.00	0.00	8.000	7.000
WSTLD-1	781	186.70	AR0051136 - Turk	0.09465	3.34200	2.160	30.00	0.00	250.000	200.000
WSTLD-1	788	186.00	AR0048810 - Fulton	0.00218	0.07700	0.050	30.00	0.00	250.000	200.000
WSTLD-1	789	185.90	ARG670609 - void	0.00000	0.00000	0.000	30.00	0.00	0.000	0.000
WSTLD-1	855	179.30	AR0048356 - Tyson RV	0.02192	0.77400	0.500	30.00	0.00	400.000	800.000
WSTLD-1	932	171.60	Bois d'Arc Creek	2.26338	79.92000	51.661	30.00	0.00	25.000	17.300
WSTLD-1	1059	158.90	AR0050857 - Garland	0.00329	0.11600	0.075	30.00	0.00	250.000	200.000
WSTLD-1	1070	157.80	AR0051942 - Chf Sand	0.00439	0.15500	0.100	30.00	0.00	250.000	200.000
WSTLD-1	1472	42.80	ARG790100 - Poll Mgt	0.00011	0.00400	0.003	30.00	0.00	180.000	60.000
WSTLD-1	1473	42.70	AR0048691 - N Texark	0.04163	1.47000	0.950	30.00	0.00	180.000	60.000
~~WSTLD-1~~	~~1941~~	[illegible]	[illegible]	~~8.31209~~	~~293.50000~~	[illegible]	~~30.00~~	[illegible]	[illegible]	[illegible]
WSTLD-1	2020	14.80	Days Creek	6.84990	241.87000	156.348	30.00	0.00	39.500	33.800
ENDATA24										

$$$ DATA TYPE 25 (WASTELOAD DATA FOR DO, BOD, AND NITROGEN) $$$

CARD TYPE	ELEMENT	NAME	DO mg/L	BOD mg/L	% BOD RMVL	ORG-N mg/L	NH3-N mg/L	% NITRIF	NO3-N mg/L	BOD2 mg/L
ENDATA25										

$$$ DATA TYPE 26 (WASTELOAD DATA FOR PHOSPHORUS, PHYTOPLANTON, COLIFORM, AND NONCONSERVATIVES) $$$

CARD TYPE	ELEMENT	NAME	PO4-P mg/L	PHYTO CHL A µg/L	COLI #/100mL	TDS mg/L	ORG-P mg/L
WSTLD-3	334	Walnut Bayou	0.00	0.00	0.00	296.60	0.00
WSTLD-3	485	AR0002968 - Domtar	0.00	0.00	0.00	1638.00	0.00
WSTLD-3	486	AR0042951 - Ashdown	0.00	0.00	0.00	540.00	0.00
WSTLD-3	780	Little River	0.00	0.00	0.00	98.00	0.00
WSTLD-3	781	AR0051136 - Turk	0.00	0.00	0.00	1620.00	0.00
WSTLD-3	788	AR0048810 - Fulton	0.00	0.00	0.00	500.00	0.00
WSTLD-3	789	ARG670609 - void	0.00	0.00	0.00	0.00	0.00
WSTLD-3	855	AR0048356 - Tyson RV	0.00	0.00	0.00	2000.00	0.00

WSTLD-3	932	Bois d'Arc Creek	0.00	0.00	0.00	183.50	0.00
WSTLD-3	1059	AR0050857 - Garland	0.00	0.00	0.00	500.00	0.00
WSTLD-3	1070	AR0051942 - Chf Sand	0.00	0.00	0.00	500.00	0.00
WSTLD-3	1472	ARG790100 - Poll Mgt	0.00	0.00	0.00	480.00	0.00
WSTLD-3	1473	AR0048691 - N Texark	0.00	0.00	0.00	480.00	0.00
~~WSTLD-3~~	~~1541~~	~~TX0000167 - IP Tex~~	~~0.00~~	~~0.00~~	~~0.00~~	[illegible]	~~0.00~~
WSTLD-3	2020	Days Creek	0.00	0.00	0.00	219.00	0.00

ENDATA26

$$$ DATA TYPE 27 (LOWER BOUNDARY CONDITIONS) $$$

CARD TYPE   CONSTITUENT   CONCENTRATION

ENDATA27

$$$ DATA TYPE 28 (DAM DATA) $$$

CARD TYPE   ELEMENT   NAME   EQN   "A"   "B"   "H"

ENDATA28

$$$ DATA TYPE 29 (SENSITIVITY ANALYSIS DATA) $$$

CARD TYPE   PARAMETER   COL 1   COL 2   COL 3   COL 4   COL 5   COL 6   COL 7   COL 8

ENDATA29

$$$ DATA TYPE 30 (PLOT CONTROL CARDS) $$$

PLOT1
RCH 1 2 3 4 5 6 7 10 16
PLOT2
RCH 8 9
PLOT3
RCH 11 12 13 14 15
ENDATA30

$$$ DATA TYPE 31 (OVERLAY PLOT DATA) $$$

OVERLAY1 OVERLAY_Red.ovl
OVERLAY2 OVERLAY_McKinney.ovl
OVERLAY3 OVERLAY_Sulphur.ovl
ENDATA31

.....NO ERRORS DETECTED IN INPUT DATA
.....HYDRAULIC CALCULATIONS COMPLETED
.....TRIDIAGONAL MATRIX TERMS INITIALIZED

Revised October 30, 2014

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RR	7	1383	207.15	207.14	207.13	207.12	207.12	207.11	207.10	207.09	207.08	207.08		
RR	7	1393	207.07	207.06	207.05	207.04	207.04	207.03	207.02	207.01	207.00	207.00		
RR	7	1403	206.99	206.98	206.97	206.96	206.96	206.95	206.94	206.93	206.93	206.92		
RR	7	1413	206.91	206.90	206.89	206.89	206.88	206.87	206.86	206.85	206.85	206.84		
RR	7	1423	206.83	206.82	206.81	206.81	206.80	206.79	206.78	206.77	206.77	206.76		
RR	7	1433	206.75	206.74	206.73	206.73	206.72	206.71	206.70	206.70	206.69	206.68		
RR	7	1443	206.67	206.66	206.66	206.65	206.64	206.63	206.62	206.62	206.61	206.60		
RR	10	1900	204.01	204.01	204.01	204.00	204.00	204.00	203.99	203.99	203.99	203.98		
RR	10	1910	203.98	203.98	203.97	203.97	203.97	203.96	203.96	203.96	203.96	203.95		
RR	10	1920	203.95	203.95	203.94	203.94	203.94	203.93	203.93	203.93	203.92	203.92		
RR	10	1930	203.92	203.91	203.91	203.91	203.90	203.90	203.90	203.89	203.89	203.89		
RR	16	2168	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	186.04	186.04
186.04	186.04	186.04	186.04	186.04	186.04	186.04	186.04							
RR	16	2178	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	~~181.43~~	186.04	186.04
186.04	186.04	186.04	186.04	186.03	186.03	186.03	186.03							
RR	16	2188	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	186.03	186.03
186.03	186.03	186.03	186.03	186.03	186.03	186.03	186.03							
RR	16	2198	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	~~181.42~~	186.03	186.03
186.03	186.03	186.03	186.03	186.02	186.02	186.02	186.02							
RR	16	2208	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	186.02	186.02
186.02	186.02	186.02	186.02	186.02	186.02	186.02	186.02							
RR	16	2218	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	~~181.41~~	186.02	186.02
186.02	186.02	186.02	186.02	186.02	186.01	186.01	186.01							
RR	16	2228	~~181.41~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	186.01	186.01
186.01	186.01	186.01	186.01	186.01	186.01	186.01	186.01							
RR	16	2238	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	~~181.40~~	186.01	186.01
186.01	186.01	186.01	186.01	186.00	186.00	186.00	186.00							
RR	16	2248	~~181.40~~	~~181.40~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	186.00	186.00
186.00	186.00	186.00	186.00	186.00	186.00	186.00	186.00							
RR	16	2258	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	~~181.39~~	186.00	186.00
186.00	186.00	186.00	185.99	185.99	185.99	185.99	185.99							
RR	16	2268	~~181.39~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	185.99	185.99
185.99	185.99	185.99	185.99	185.99	185.99	185.99	185.99							
RR	16	2278	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	~~181.38~~	185.99	185.99
185.99	185.99	185.99	185.99	185.99	185.98	185.98	185.98							
RR	16	2288	~~181.38~~	~~181.38~~	~~181.38~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	185.98	185.98
185.98	185.98	185.98	185.98	185.98	185.98	185.98	185.98							
RR	16	2298	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	185.98	185.98
185.98	185.98	185.98	185.98	185.98	185.97	185.97	185.97							
RR	16	2308	~~181.37~~	~~181.37~~	~~181.37~~	~~181.37~~	~~181.36~~	~~181.36~~	~~181.36~~	~~181.36~~	~~181.36~~	~~181.36~~	185.97	185.97
185.97	185.97	185.97	185.97	185.97	185.97	185.97	185.97							
RR	16	2318	~~181.36~~	~~181.36~~	~~181.36~~	~~181.36~~	~~181.36~~ 185.97	185.97	185.97	185.97	185.97			
MK	8	1453	44.40	44.40	44.40	44.40	44.40	44.40	44.40	44.40	44.40	44.40		
MK	8	1463	44.40	44.40	44.40	44.40	44.40	44.40	44.40	44.40	44.40	44.48		
MK	8	1473	68.01	67.45	66.92	66.41	65.92	65.46	65.01	64.59	64.18	63.78		
MK	8	1483	63.41	63.04	62.69	62.36	62.03	61.72	61.42	61.12	60.84	60.57		
MK	8	1493	60.30	60.05	59.80	59.56	59.33	59.10	58.89	58.67	58.47	58.27		
MK	8	1503	58.07	57.88	57.70	57.52	57.35	57.18	57.01	56.85	56.69	56.54		
MK	8	1513	56.39	56.25	56.10	55.96	55.83	55.70	55.57	55.44	55.32	55.20		
MK	8	1523	55.08	54.96	54.85	54.74	54.63	54.52	54.42	54.32	54.22	54.12		

MK	8	1533	54.02	53.93	53.84	53.75	53.66	53.57	53.49	53.40	53.32	53.24
MK	8	1543	53.16	53.08	53.00	52.93	52.85	52.78	52.71	52.64	52.57	52.50
MK	8	1553	52.44	52.37	52.31	52.24	52.18	52.12	52.06	52.00	51.94	51.88
MK	8	1563	51.82	51.77	51.71	51.66	51.60	51.55	51.50	51.45	51.40	51.35
MK	8	1573	51.30	51.25	51.20	51.16	51.11	51.06	51.02	50.97	50.93	50.89
MK	8	1583	50.84	50.80	50.76	50.72	50.68	50.64	50.60	50.56	50.52	50.48
MK	8	1593	50.44	50.41	50.37	50.33	50.30	50.26	50.23	50.19	50.16	50.12
MK	8	1603	50.09	50.06	50.02	49.99	49.96	49.93	49.90	49.87	49.84	49.81
MK	8	1613	49.78	49.75	49.72	49.69	49.66	49.63	49.60	49.58	49.55	49.52
MK	8	1623	49.50	49.47	49.44	49.42	49.39	49.37	49.34	49.32	49.29	49.27
MK	8	1633	49.24	49.22	49.19	49.17	49.15	49.12	49.10	49.08	49.06	49.03
MK	8	1643	49.01	48.99	48.97	48.95	48.93	48.91	48.89	48.86	48.84	48.82
MK	8	1653	48.80	48.78	48.76	48.75	48.73	48.71	48.69	48.67	48.65	48.63
MK	8	1663	48.61	48.60	48.58	48.56	48.54	48.52				
MK	9	1669	48.51	48.49	48.48	48.46	48.44	48.43	48.41	48.40	48.38	48.37

MK	9	1679	48.35	48.34	48.32	48.31	48.29	48.28	48.26	48.25	48.24	48.22
MK	9	1689	48.21	48.19	48.18	48.17	48.15	48.14	48.13	48.11	48.10	48.09
MK	9	1699	48.07	48.06	48.05	48.04	48.02	48.01	48.00	47.99	47.97	47.96
MK	9	1709	47.95	47.94	47.92	47.91	47.90	47.89	47.88	47.87	47.85	47.84
MK	9	1719	47.83	47.82	47.81	47.80	47.79	47.78	47.77	47.75	47.74	47.73
MK	9	1729	47.72	47.71	47.70	47.69	47.68	47.67	47.66	47.65	47.64	47.63
MK	9	1739	47.62	47.61	47.60	47.59	47.58	47.57	47.56	47.55	47.54	47.53
MK	9	1749	47.52	47.51	47.50	47.50	47.49	47.48	47.47	47.46	47.45	47.44
MK	9	1759	47.43	47.42	47.41	47.41	47.40	47.39	47.38	47.37	47.36	47.36
MK	9	1769	47.35	47.34	47.33	47.32	47.31	47.31	47.30	47.29	47.28	47.27
MK	9	1779	47.27	47.26	47.25	47.24	47.23	47.23	47.22	47.21	47.20	47.20
MK	9	1789	47.19	47.18	47.17	47.17	47.16	47.15	47.14	47.14	47.13	47.12
MK	9	1799	47.12	47.11	47.10	47.10	47.09	47.08	47.07	47.07	47.06	47.05
MK	9	1809	47.05	47.04	47.03	47.03	47.02	47.01	47.01	47.00	46.99	46.99
MK	9	1819	46.98	46.98	46.97	46.96	46.96	46.95	46.94	46.94	46.93	46.93
MK	9	1829	46.92	46.91	46.91	46.90	46.90	46.89	46.88	46.88	46.87	46.87
MK	9	1839	46.86	46.85	46.85	46.84	46.84	46.83	46.83	46.82	46.81	46.81
MK	9	1849	46.80	46.80	46.79	46.79	46.78	46.78	46.77	46.76	46.76	46.75
MK	9	1859	46.75	46.74	46.74	46.73	46.73	46.72	46.72	46.71	46.71	46.70
MK	9	1869	46.70	46.69	46.69	46.68	46.68	46.67	46.67	46.66	46.66	46.65
MK	9	1879	46.65	46.64	46.64	46.63	46.63	46.62	46.62	46.61	46.61	46.60
MK	9	1889	46.60	46.60	46.59	46.59	46.58	46.58	46.57	46.57	46.56	46.56
MK	9	1899	46.55									
SR	11	1940	~~13.72~~	~~56.83~~	~~56.82~~	~~56.81~~	~~56.80~~	~~56.80~~	~~56.79~~	~~55.78~~119.37	119.9[illegible]	119.92	119.89
119.87	119.84	119.81	119.79									
SR	12	1948	~~56.71~~	~~56.64~~	~~56.62~~	~~56.61~~	~~56.44~~	~~56.37~~	~~56.31~~	~~56.24~~	~~56.18~~	~~56.1~~119.59	119.39
119.19	118.99	118.79	118.60	118.40	118.21	118.02	117.82					
SR	12	1958	~~56.05~~	~~55.98~~	~~55.92~~	~~55.85~~	~~55.79~~	~~55.73~~	~~55.66~~	~~55.60~~	~~55.54~~	~~55.47~~
~~SR~~	~~12~~	~~1968~~	~~55.41~~	~~55.35~~	~~55.29~~	~~55.23~~	~~55.17~~	~~55.11~~	~~55.05~~	~~54.99~~	~~54.93~~	~~54.87~~
~~SR~~	~~12~~	~~1978~~	~~54.81~~	~~54.75~~	~~54.69~~	~~54~~117.63	~~54.58~~	~~54.52~~	~~54.46~~	~~54.40~~	~~54.35~~	~~54.29~~
~~SR~~	~~12~~	~~1988~~	~~54.23~~	~~54.18~~	~~54.12~~	~~54.07~~	~~54.01~~	~~53.96~~	~~53.90~~	~~53.85~~	~~53.79~~	~~53.74~~
~~SR~~	~~12~~	~~1998~~	~~53.68~~	~~53.63~~	~~53.58~~	~~53.52~~	~~53.47~~	~~53.42~~	~~53.37~~	~~53.31~~	~~53.26~~	~~53.21~~
~~SR~~	~~12~~	~~2008~~	~~53.16~~	~~53.11~~	~~53.06~~	~~53.00~~	~~52.95~~					
~~SR~~	~~13~~	~~2013~~	~~52.80~~	~~52.64~~	~~52.49~~	~~52.33~~	~~52.18~~	~~52.04~~	~~51.89~~			
~~SR~~	~~14~~	~~2020~~	~~56.23~~	~~56.22~~	~~56.21~~	~~56.20~~	~~56.19~~	~~56.18~~	~~56.16~~	~~56.16~~	~~56.14~~	~~56.14~~
~~SR~~	~~14~~	~~2030~~	~~56.12~~	~~56.11~~	~~56.10~~	~~56.09~~	~~56.08~~	~~56.07~~	~~56~~117.44	117.25	117.06	~~56.04~~	~~56.03~~
~~56.02~~												
~~SR~~	~~14~~	~~2040~~	~~56.01~~	~~56.00~~	~~55.99~~	~~55.98~~	~~55.97~~	~~55.96~~	~~55.95~~	~~55.94~~	~~55.93~~	~~55.92~~
~~SR~~	~~14~~	~~2050~~	~~55.90~~	~~55.89~~	~~55~~116.88	~~55.87~~	~~55.86~~	~~55.85~~	~~55.84~~	~~55.83~~	~~55.82~~	~~55.81~~116.69	116.50
116.32	116.13	115.95										
~~SR~~	~~14~~	~~2060~~	~~55.80~~	~~55.79~~	~~55.78~~	~~55.77~~	~~55.76~~	~~55.75~~	~~55.74~~	~~55.73~~	~~55.71~~	~~55.70~~
~~SR~~	~~14~~	~~2070~~	~~55.69~~	~~55.68~~	~~55.67~~	~~55.66~~	~~55.65~~	~~55.64~~	~~55.63~~	~~55.62~~	~~55.61~~	~~55.60~~
~~SR~~	~~14~~	~~2080~~	~~55.59~~	~~55.58~~	~~55.57~~	~~55.56~~	~~55.55~~	~~55.54~~	~~55.53~~	~~55.52~~	~~55.51~~	~~55.50~~
~~SR~~	~~14~~	~~2090~~	~~55.49~~	~~55~~ SR	12 1968	115.77	115.59	115.41	115.23	115.05	114.87	114.69	114.52
114.34	114.17											
SR	12	1978	113.99	113.82	113.65	113.48	~~55.47~~	~~55.46~~	~~55.45~~	~~55~~113.31	113.14	112.97	112.80
112.63	112.47											
SR	12	1988	112.30	112.13	111.97	111.81	111.64	111.48	111.32	111.16	111.00	110.84
SR	12	1998	110.68	110.52	110.36	110.21	110.05	109.90	109.74	109.59	109.44	~~55.43~~	~~55.42~~	~~55.41~~
~~55~~109.28												

SR	13	2010	[illegible]	108.98	[illegible]	108.08	107.63							
SR	13	2015	108.07	107.61	107.15	106.71	106.27	105.83	105.40					
SR	14	~~2100~~	~~[illegible]~~	~~55.30~~	~~55.37~~	~~55.36~~	~~55.35~~2020	88.75	88.71	88.68	88.65	88.62	88.58	
88.55	88.52	88.49	88.45											
SR	14	2030	88.42	88.39	88.36	88.32	88.29	88.26	88.23	88.20	88.16	88.13		
SR	14	2040	88.10	88.07	88.04	88.00	87.97	87.94	87.91	87.88	87.85	87.82		
SR	14	2050	87.78	87.75	87.72	87.69	87.66	87.63	87.60	87.56	87.53	87.50		
SR	14	2060	87.47	87.44	87.41	87.38	87.35	87.32	[illegible]	87.25	87.22	87.19		
SR	14	2070	87.16	87.13	87.10	87.07	87.04	87.01	[illegible]	86.95	86.92	86.89		
SR	14	2080	86.86	86.83	86.80	86.77	86.74	86.71	[illegible]	86.65	86.62	86.59		
SR	14	2090	86.56	86.53	86.50	86.47	86.44	86.41	[illegible]	86.35	86.32	86.29		
SR	14	2100	86.26	86.23	86.20	86.17	86.14							
SR	15	2105	~~55.34~~	~~55.34~~	~~55.34~~	~~55.34~~	~~55.34~~	~~55.34~~	~~55.34~~	~~55.33~~	~~55.33~~	~~55.33~~86.14	86.13	
86.12	86.12	86.11	86.10	86.10	86.09	86.08	86.08							
SR	15	2115	~~55.32~~	~~55.32~~	~~55.32~~	~~55.31~~	~~55.31~~	~~55.31~~	~~55.31~~	~~55.31~~	~~55.30~~	~~55.30~~86.07	86.06	
86.06	86.05	86.04	86.04	86.03	86.02	86.01	86.01							
SR	15	2125	~~55.30~~	~~55.30~~	~~55.29~~	~~55.29~~	~~55.29~~	~~55.29~~	~~55.28~~	~~55.28~~	~~55.28~~	~~55.28~~86.00	85.99	
85.99	85.98	85.97	85.97	85.96	85.95	85.95	85.94							
SR	15	2135	~~55.28~~	~~55.27~~	~~55.27~~	~~55.27~~	~~55.27~~	~~55.26~~	~~55.26~~	~~55.26~~	~~55.26~~	~~55.26~~85.93	85.93	
85.92	85.91	85.91	85.90	85.89	85.89	85.88	85.87							
SR	15	2145	~~55.25~~	~~55.25~~	~~55.25~~	~~55.25~~	~~55.24~~	~~55.24~~	~~55.24~~	~~55.24~~	~~55.23~~	~~55.23~~85.87	85.86	
85.85	85.85	85.84	85.83	85.83	85.82	85.81	85.81							
SR	15	2155	~~55.23~~	~~55.23~~	~~55.23~~	~~55.22~~	~~55.22~~	~~55.22~~	~~55.22~~	~~55.21~~	~~55.21~~	~~55.21~~85.80	85.79	
85.79	85.78	85.77	85.77	85.76	85.75	85.75	85.74							
SR	15	2165	~~55.21~~	~~55.21~~	~~55.20~~85.73	85.73	85.72									

RR	7	1403	178.83	178.82	178.81	178.80	178.80	178.79	178.78	178.78	178.77	178.76	
RR	7	1413	178.76	178.75	178.74	178.73	178.73	178.72	178.71	178.71	178.70	178.69	
RR	7	1423	178.69	178.68	178.67	178.66	178.66	178.65	178.64	178.64	178.63	178.62	
RR	7	1433	178.62	178.61	178.60	178.59	178.59	178.58	178.57	178.57	178.56	178.55	
RR	7	1443	178.55	178.54	178.53	178.52	178.52	178.51	178.50	178.50	178.49	178.48	
RR	10	1900	176.17	176.16	176.16	176.16	176.16	176.15	176.15	176.15	176.14	176.14	
RR	10	1910	176.14	176.14	176.13	176.13	176.13	176.12	176.12	176.12	176.12	176.11	
RR	10	1920	176.11	176.11	176.10	176.10	176.10	176.10	176.09	176.09	176.09	176.09	
RR	10	1930	176.08	176.08	176.08	176.07	176.07	176.07	176.07	176.06	176.06	176.06	
RR	16	2168	160.2731	160.2731	160.2731	160.2731	160.2731	160.2731	160.2731	160.2731	160.2731	160.2731	
RR	16	2178	160.31	160.31	[illegible]	160.31	160.31	160.31	160.31	160.31	160.31	[illegible]	
RR	16	2188	160.30	160.30	[illegible]	160.30	160.30	160.30	160.30	160.30	160.30	[illegible]	
RR	16	2198	160.30	160.30	160.30	160.30	160.30	160.30	160.30	160.30	160.30	[illegible]	
RR	16	2208	160.30	160.29	[illegible]	160.29	160.29	160.29	160.29	160.29	160.29	160.29	
RR	16	2218	160.29	160.29	[illegible]	160.29	160.29	160.29	160.29	160.29	160.29	[illegible]	
RR	16	2228	160.29	160.29	[illegible]	160.28	160.28	160.28	160.28	160.28	160.28	160.28	
RR	16	2238	160.28	160.28	[illegible]	160.28	160.28	160.28	160.28	160.28	160.28	160.28	
RR	16	2248	160.28	160.28	[illegible]	160.28	160.28	160.28	160.27	160.27	160.27	[illegible]	
RR	16	2258	160.27	160.27	[illegible]	160.27	160.27	160.27	160.27	160.27	160.27	160.27	
RR	16	2268	160.27	160.27	[illegible]	160.27	160.27	160.27	160.27	160.27	160.26	160.26	
RR	16	2278	160.26	160.26	160.26	160.26	160.26	160.26	160.26				
~~RR~~	~~16~~	~~2188~~	160.26	160.26	160.26								
RR	16	2288	160.26	160.26	160.26	160.26	160.26	160.26	160.26				
~~RR~~	~~16~~	~~2198~~	160.26	160.26	160.26								
RR	16	2298	160.26	160.25	160.25	160.25	160.25	160.25	160.25				
~~RR~~	~~16~~	~~2208~~	160.25	160.25	160.25								
RR	16	2308	160.25	160.25	160.25	160.25	160.25	160.25	160.25				
~~RR~~	~~16~~	~~2218~~	160.25	160.25	160.25								
RR	16	2318	160.25	160.25	160.25	160.24	160.24	~~160.24~~	~~160.24~~				
~~RR~~	~~16~~	~~2228~~	~~160.24~~	~~160.24~~	[illegible]	~~160.24~~	~~160.24~~	~~160.24~~	~~160.24~~	~~160.24~~	~~160.24~~	[illegible]	
~~RR~~	~~16~~	~~2238~~	~~160.24~~	~~160.24~~	[illegible]	~~160.24~~	~~160.24~~	~~160.24~~	~~160.24~~	~~160.24~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2248~~	~~160.23~~	~~160.23~~	[illegible]	~~160.23~~	~~160.23~~	~~160.23~~	~~160.23~~	~~160.23~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2258~~	~~160.23~~	~~160.23~~	[illegible]	~~160.23~~	~~160.23~~	~~160.23~~	~~160.23~~	~~160.23~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2268~~	~~160.23~~	~~160.22~~	[illegible]	~~160.22~~	~~160.22~~	~~160.22~~	~~160.22~~	~~160.22~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2278~~	~~160.22~~	~~160.22~~	[illegible]	~~160.22~~	~~160.22~~	~~160.22~~	~~160.22~~	~~160.22~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2288~~	~~160.22~~	~~160.22~~	[illegible]	~~160.21~~	~~160.21~~	~~160.21~~	~~160.21~~	~~160.21~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2298~~	~~160.21~~	~~160.21~~	[illegible]	~~160.21~~	~~160.21~~	~~160.21~~	~~160.21~~	~~160.21~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2308~~	~~160.21~~	~~160.21~~	[illegible]	[illegible]	~~160.21~~	~~160.21~~	~~160.20~~	~~160.20~~	[illegible]	[illegible]	
~~RR~~	~~16~~	~~2318~~	~~160.20~~	~~160.20~~	[illegible]	~~160.20~~	~~160.20~~						
MK	8	1453	34.90	34.90	34.90	34.90	34.90	34.90	34.90	34.90	34.90	34.90	
MK	8	1463	34.90	34.90	34.90	34.90	34.90	34.90	34.90	34.90	34.90	34.91	
MK	8	1473	39.27	39.17	39.07	38.97	38.88	38.80	38.72	38.64	38.56	38.49	
MK	8	1483	38.42	38.35	38.29	38.22	38.16	38.11	38.05	38.00	37.94	37.89	
MK	8	1493	37.84	37.80	37.75	37.71	37.66	37.62	37.58	37.54	37.50	37.47	
MK	8	1503	37.43	37.40	37.36	37.33	37.30	37.27	37.23	37.20	37.18	37.15	
MK	8	1513	37.12	37.09	37.07	37.04	37.02	36.99	36.97	36.94	36.92	36.90	
MK	8	1523	36.88	36.86	36.83	36.81	36.79	36.77	36.75	36.74	36.72	36.70	
MK	8	1533	36.68	36.66	36.65	36.63	36.61	36.60	36.58	36.57	36.55	36.54	
MK	8	1543	36.52	36.51	36.49	36.48	36.46	36.45	36.44	36.43	36.41	36.40	
MK	8	1553	36.39	36.38	36.36	36.35	36.34	36.33	36.32	36.31	36.30	36.28	

MK	8	1563	36.27	36.26	36.25	36.24	36.23	36.22	36.21	36.20	36.20	36.19
MK	8	1573	36.18	36.17	36.16	36.15	36.14	36.13	36.12	36.12	36.11	36.10
MK	8	1583	36.09	36.08	36.08	36.07	36.06	36.05	36.05	36.04	36.03	36.03
MK	8	1593	36.02	36.01	36.00	36.00	35.99	35.98	35.98	35.97	35.97	35.96
MK	8	1603	35.95	35.95	35.94	35.94	35.93	35.92	35.92	35.91	35.91	35.90
MK	8	1613	35.90	35.89	35.88	35.88	35.87	35.87	35.86	35.86	35.85	35.85
MK	8	1623	35.84	35.84	35.83	35.83	35.82	35.82	35.81	35.81	35.81	35.80
MK	8	1633	35.80	35.79	35.79	35.78	35.78	35.77	35.77	35.77	35.76	35.76
MK	8	1643	35.75	35.75	35.75	35.74	35.74	35.73	35.73	35.73	35.72	35.72
MK	8	1653	35.72	35.71	35.71	35.70	35.70	35.70	35.69	35.69	35.69	35.68
MK	8	1663	35.68	35.68	35.67	35.67	35.67	35.66				
MK	9	1669	35.66	35.66	35.65	35.65	35.65	35.65	35.64	35.64	35.64	35.63
MK	9	1679	35.63	35.63	35.63	35.62	35.62	35.62	35.62	35.61	35.61	35.61
MK	9	1689	35.60	35.60	35.60	35.60	35.59	35.59	35.59	35.59	35.58	35.58

MK	9	1699	35.58	35.58	35.58	35.57	35.57	35.57	35.57	35.56	35.56	35.56		
MK	9	1709	35.56	35.55	35.55	35.55	35.55	35.55	35.54	35.54	35.54	35.54		
MK	9	1719	35.54	35.53	35.53	35.53	35.53	35.52	35.52	35.52	35.52	35.52		
MK	9	1729	35.51	35.51	35.51	35.51	35.51	35.51	35.50	35.50	35.50	35.50		
MK	9	1739	35.50	35.49	35.49	35.49	35.49	35.49	35.49	35.48	35.48	35.48		
MK	9	1749	35.48	35.48	35.47	35.47	35.47	35.47	35.47	35.47	35.46	35.46		
MK	9	1759	35.46	35.46	35.46	35.46	35.45	35.45	35.45	35.45	35.45	35.45		
MK	9	1769	35.45	35.44	35.44	35.44	35.44	35.44	35.44	35.43	35.43	35.43		
MK	9	1779	35.43	35.43	35.43	35.43	35.42	35.42	35.42	35.42	35.42	35.42		
MK	9	1789	35.42	35.41	35.41	35.41	35.41	35.41	35.41	35.41	35.41	35.40		
MK	9	1799	35.40	35.40	35.40	35.40	35.40	35.40	35.39	35.39	35.39	35.39		
MK	9	1809	35.39	35.39	35.39	35.39	35.38	35.38	35.38	35.38	35.38	35.38		
MK	9	1819	35.38	35.38	35.38	35.37	35.37	35.37	35.37	35.37	35.37	35.37		
MK	9	1829	35.37	35.37	35.36	35.36	35.36	35.36	35.36	35.36	35.36	35.36		
MK	9	1839	35.36	35.35	35.35	35.35	35.35	35.35	35.35	35.35	35.35	35.35		
MK	9	1849	35.34	35.34	35.34	35.34	35.34	35.34	35.34	35.34	35.34	35.34		
MK	9	1859	35.33	35.33	35.33	35.33	35.33	35.33	35.33	35.33	35.33	35.33		
MK	9	1869	35.33	35.32	35.32	35.32	35.32	35.32	35.32	35.32	35.32	35.32		
MK	9	1879	35.32	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31		
MK	9	1889	35.31	35.31	35.31	35.30	35.30	35.30	35.30	35.30	35.30	35.30		
MK	9	1899	35.30											
SR	11	1940	~~19.01~~	99.4698	99.[illegible]	99.[illegible]	99.3991	99.3789	99.3587	99.3385	99.[illegible]			
SR	12	1948	99.1666	99.0050	99.33	[illegible]	99.01	98.8485	98.6869	98.5253	98.[illegible]	98.[illegible]		
~~98.04~~	~~97.88~~	~~97.7221~~												
SR	12	1958	98.05	97.90	97.74	97.[illegible]	97.4413	97.2628	97.1012	96.9597	96.[illegible]	96.[illegible]		
~~96.50~~	~~96.35~~	~~96.2067~~												
SR	12	1968	96.65	~~95.50~~	~~96.02~~	[illegible]	96.22	96.08	95.93	95.78	95.64	95.4[illegible]	[illegible]	95.20
SR	12	1978	95.06	94.92	94.78	[illegible]	94.50	94.36	94.22	94.08	93.94	[illegible]		
SR	12	1988	93.67	93.53	93.40	93.26	93.12	92.99	92.86	92.73	92.60	92.4[illegible]		
SR	12	1998	92.34	92.21	92.08	[illegible]	91.82	91.69	91.56	91.44	91.31	91.[illegible]		
SR	12	2008	91.06	90.94	90.82	[illegible]	90.57							
SR	13	2013	90.19	89.81	89.44	[illegible]	88.71	88.35	87.99					
SR	14	2020	74.30	74.27	74.24	[illegible]	74.19	74.16	74.14	74.11	74.08	[illegible]		
SR	14	2030	74.03	74.00	73.98	[illegible]	73.92	73.90	73.87	73.85	73.82	[illegible]		
SR	14	2040	73.77	73.74	73.72	[illegible]	73.66	73.64	73.61	73.58	73.56	[illegible]		
SR	14	2050	73.51	73.48	73.45	[illegible]	73.40	73.38	73.35	73.33	73.30	[illegible]		
SR	14	2060	73.25	73.22	73.20	[illegible]	73.15	73.12	73.10	73.07	73.05	[illegible]		
SR	14	2070	73.00	72.97	72.95	[illegible]	72.90	72.87	72.85	72.82	72.80	72.7[illegible]		
SR	14	2080	72.75	~~95.61~~	~~95.46~~	[illegible]	~~95.17~~	~~95.02~~	~~94.88~~	~~94.74~~ 72.72	72.70	[illegible]	72.65	
72.62	72.60	72.57	72.55	72.52										
SR	~~12~~	~~1978~~	~~94.60~~	~~94.46~~	~~94.32~~	[illegible]	~~94.04~~	~~93.90~~	~~93.76~~	~~93.62~~	~~93.48~~	[illegible]		
~~SR~~	~~12~~	~~1988~~	~~93.22~~	~~93.08~~	~~92.95~~	[illegible]	~~92.68~~	~~92.55~~	~~92.42~~	~~92.28~~	~~92.15~~	[illegible]		
~~SR~~	~~12~~	~~1998~~	~~91.89~~	~~91.76~~	~~91.64~~	[illegible]	~~91.38~~	~~91.25~~	~~91.12~~	~~91.00~~	~~90.88~~	[illegible]		
~~SR~~	~~12~~	~~2008~~	~~90.63~~	~~90.51~~	~~90.39~~	[illegible]	~~90.~~14							
~~SR~~	~~13~~	~~2013~~	~~89.76~~	~~89.38~~	~~89.02~~	[illegible]	~~88.29~~	~~87.94~~	~~87.58~~					
~~SR~~	~~14~~	~~2020~~	~~73.99~~	~~73.97~~	~~73.94~~	[illegible]	~~73.89~~	~~73.86~~	~~73.83~~	~~73.81~~	~~73.78~~	[illegible]		
~~SR~~	~~14~~	~~2030~~	~~73.73~~	~~73.70~~	~~73.67~~	[illegible]	~~73.62~~	~~73.60~~	~~73.57~~	~~73.54~~	~~73.52~~	~~73.49~~		
~~SR~~	~~14~~	~~2040~~	~~73.46~~	~~73.44~~	~~73.41~~	[illegible]	~~73.36~~	~~73.34~~	~~73.31~~	~~73.28~~	~~73.26~~	[illegible]		
~~SR~~	~~14~~	~~2050~~	~~73.21~~	~~73.18~~	~~73.16~~	[illegible]	~~73.10~~	~~73.08~~	~~73.05~~	~~73.03~~	~~73.00~~	[illegible]		
~~SR~~	~~14~~	~~2060~~	~~72.95~~	~~72.93~~	~~72.90~~	[illegible]	~~72.85~~	~~72.83~~	~~72.80~~	~~72.77~~	~~72.75~~	[illegible]		

SR	14	2070	72.71	72.67	72.65	72.62	72.60	72.58	72.55	72.53 2090	72.50	72.46	
SR	14	2080 47	72.45	72.4442	72.40	72.38	72.35	72.33	72.30	72.28	72.25	72.23	
SR	14	2090	72.21	72.18	72.16	72.13	72.11	72.08	72.06	72.04	72.01	71.99	
SR	14	2100	71.96	71.94	71.92	71.89	71.87 72.25	72.23	72.21	72.18	72.16		
SR	15	2105	72.15	72.15	72.14	72.13	72.13	72.12	72.12	72.11	72.11	72.10	
SR	15	2115	72.10	72.09	72.08	72.08	72.07	72.07	72.06	72.06	72.05	72.05	
SR	15	2125	72.04	72.03	72.03	72.02	72.02	72.01	72.01	72.00	72.00	71.99	
SR	15	2135	71.98	71.98	71.97	71.97	71.96	71.96	71.95	71.95	71.94	71.94	
SR	15	2145	71.93	71.92	71.92	71.91	71.91	71.90	71.90	71.89	71.89	71.88	
SR	15	2155	71.87	71.87	71.86	71.86	71.85	71.85	71.84	71.84	71.83	71.83	71.82	71.82
71.8282													
SR	15	2115	71.81	71.80	71.80	71.79	71.78	71.78	71.77	71.77	71.76	71.76	
SR	15	2125	71.75	71.75	71.74	71.73	71.73	71.72	71.72	71.71	71.71	71.70	
SR	15	2135	71.70	71.69	71.68	71.68	71.67	71.67	71.66	71.66	71.65	71.65	
SR	15	2145	71.64	71.64	71.63	71.63	71.62	71.61	71.61	71.60	71.60	71.59	
SR	15	2155	71.59	71.58	71.58	71.57	71.57	71.56	71.55	71.55	71.54	71.54	
SR	15	2165	71.5452	71.5381	71.5281								

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RR	7	1403	718.97	718.95	718.92	718.90	718.88	718.85	718.83	718.81	718.78	718.76		
RR	7	1413	718.74	718.71	718.69	718.67	718.64	718.62	718.60	718.57	718.55	718.53		
RR	7	1423	718.50	718.48	718.46	718.43	718.41	718.39	718.36	718.34	718.32	718.29		
RR	7	1433	718.27	718.25	718.22	718.20	718.18	718.15	718.13	718.11	718.08	718.06		
RR	7	1443	718.04	718.02	717.99	717.97	717.95	717.92	717.90	717.88	717.85	717.83		
RR	10	1900	711.06	711.05	711.05	711.04	711.03	711.02	711.01	711.00	710.99	710.98		
RR	10	1910	710.97	710.96	710.95	710.94	710.93	710.92	710.91	710.90	710.90	710.89		
RR	10	1920	710.88	710.87	710.86	710.85	710.84	710.83	710.82	710.81	710.80	710.79		
RR	10	1930	710.78	710.77	710.76	710.75	710.74	710.74	710.73	710.72	710.71	710.70		
RR	16	2168	660.81	660.80	660.80	660.80	660.80	660.80	660.80	660.80	660.79	660.79		
RR	16	2178	660.81	660.81	660.81	660.81	660.81	660.81	660.80	660.80	660.80	660.80		
RR	16	2188	660.80	660.80	660.80	660.80	660.79	660.79	660.79	660.79	660.79	660.78		
RR	16	2198	660.78	660.78	660.78	660.78	660.78							
RR	16	2188	660.78	660.77	660.77	660.77	660.77							
RR	16	2208	660.77	660.77	660.77	660.76	660.76							
RR	16	2198	660.76	660.76	660.76	660.76	660.76	660.75						
RR	16	2218	660.75	660.75	660.75	660.75								
RR	16	2208	660.75	660.75	660.74	660.74	660.74	660.74						
RR	16	2228	660.74	660.74	660.74	660.73	660.73							
RR	16	2218	660.73	660.73	660.73	660.73	660.73							
RR	16	2238	660.72	660.72	660.72	660.72	660.72							
RR	16	2228	660.72	660.72	660.71	660.71	660.71	660.71						
RR	16	2248	660.71	660.71	660.71	660.70								
RR	16	2238	660.70	660.70	660.70	660.70	660.70	660.70						
RR	16	2258	660.69	660.69	660.69	660.69	660.69							
RR	16	2248	660.69	660.69	660.68	660.68	660.68							
RR	16	2268	660.68	660.68	660.68	660.68	660.67							
RR	16	2258	660.67	660.67	660.67	660.67	660.67							
RR	16	2278	660.67	660.66	660.66	660.66	660.66							
RR	16	2268	660.66	660.66	660.66	660.65	660.65	660.65						
RR	16	2288	660.65	660.65	660.65	660.65	660.64							
RR	16	2278	660.64	660.64	660.64	660.64	660.64							
RR	16	2298	660.64	660.63	660.63	660.63	660.63							
RR	16	2288	660.63	660.63	660.63	660.62	660.62	660.62						
RR	16	2308	660.62	660.62	660.62	660.62								
RR	16	2298	660.61	660.61	660.61	660.61	660.61	660.61						
RR	16	2318	660.61	660.60	660.60	660.60	660.60							
RR	16	2308	660.60	660.60	660.60	660.59	660.59	660.59	660.59	660.59	660.59	660.59		
RR	16	2318	660.58	660.58	660.58	660.58	660.58							
MK	8	1453	296.60	296.60	296.60	296.60	296.60	296.60	296.60	296.60	296.60	296.60		
MK	8	1463	296.60	296.60	296.60	296.60	296.60	296.60	296.60	296.60	296.60	296.71		
MK	8	1473	328.53	327.78	327.06	326.37	325.71	325.08	324.48	323.90	323.35	322.82		
MK	8	1483	322.31	321.81	321.34	320.89	320.45	320.02	319.61	319.22	318.84	318.47		
MK	8	1493	318.11	317.77	317.43	317.11	316.79	316.49	316.19	315.91	315.63	315.36		
MK	8	1503	315.09	314.84	314.59	314.35	314.11	313.88	313.66	313.44	313.23	313.02		
MK	8	1513	312.82	312.62	312.43	312.24	312.06	311.88	311.70	311.53	311.36	311.20		
MK	8	1523	311.04	310.88	310.73	310.58	310.44	310.29	310.15	310.01	309.88	309.75		
MK	8	1533	309.62	309.49	309.36	309.24	309.12	309.00	308.89	308.77	308.66	308.55		
MK	8	1543	308.45	308.34	308.24	308.13	308.03	307.94	307.84	307.74	307.65	307.56		
MK	8	1553	307.47	307.38	307.29	307.21	307.12	307.04	306.96	306.88	306.80	306.72		

MK	8	1563	306.64	306.57	306.49	306.42	306.34	306.27	306.20	306.13	306.06	306.00
MK	8	1573	305.93	305.86	305.80	305.74	305.67	305.61	305.55	305.49	305.43	305.37
MK	8	1583	305.31	305.26	305.20	305.14	305.09	305.03	304.98	304.93	304.88	304.82
MK	8	1593	304.77	304.72	304.67	304.62	304.58	304.53	304.48	304.43	304.39	304.34
MK	8	1603	304.30	304.25	304.21	304.16	304.12	304.08	304.04	303.99	303.95	303.91
MK	8	1613	303.87	303.83	303.79	303.75	303.71	303.68	303.64	303.60	303.56	303.53
MK	8	1623	303.49	303.46	303.42	303.38	303.35	303.32	303.28	303.25	303.21	303.18
MK	8	1633	303.15	303.12	303.08	303.05	303.02	302.99	302.96	302.93	302.90	302.87
MK	8	1643	302.84	302.81	302.78	302.75	302.72	302.69	302.67	302.64	302.61	302.58
MK	8	1653	302.56	302.53	302.50	302.48	302.45	302.42	302.40	302.37	302.35	302.32
MK	8	1663	302.30	302.27	302.25	302.23	302.20	302.18				
MK	9	1669	302.16	302.13	302.11	302.09	302.07	302.05	302.03	302.01	301.99	301.97
MK	9	1679	301.95	301.93	301.91	301.89	301.87	301.85	301.83	301.81	301.79	301.77
MK	9	1689	301.75	301.73	301.71	301.69	301.68	301.66	301.64	301.62	301.60	301.59
MK	9	1699	301.57	301.55	301.53	301.52	301.50	301.48	301.47	301.45	301.43	301.42
MK	9	1709	301.40	301.38	301.37	301.35	301.33	301.32	301.30	301.29	301.27	301.26
MK	9	1719	301.24	301.23	301.21	301.20	301.18	301.17	301.15	301.14	301.12	301.11
MK	9	1729	301.09	301.08	301.06	301.05	301.04	301.02	301.01	301.00	300.98	300.97
MK	9	1739	300.95	300.94	300.93	300.91	300.90	300.89	300.88	300.86	300.85	300.84
MK	9	1749	300.82	300.81	300.80	300.79	300.77	300.76	300.75	300.74	300.72	300.71
MK	9	1759	300.70	300.69	300.68	300.67	300.65	300.64	300.63	300.62	300.61	300.60
MK	9	1769	300.58	300.57	300.56	300.55	300.54	300.53	300.52	300.51	300.50	300.49
MK	9	1779	300.47	300.46	300.45	300.44	300.43	300.42	300.41	300.40	300.39	300.38
MK	9	1789	300.37	300.36	300.35	300.34	300.33	300.32	300.31	300.30	300.29	300.28
MK	9	1799	300.27	300.26	300.25	300.24	300.23	300.23	300.22	300.21	300.20	300.19
MK	9	1809	300.18	300.17	300.16	300.15	300.14	300.13	300.13	300.12	300.11	300.10
MK	9	1819	300.09	300.08	300.07	300.06	300.06	300.05	300.04	300.03	300.02	300.01
MK	9	1829	300.01	300.00	299.99	299.98	299.97	299.97	299.96	299.95	299.94	299.93
MK	9	1839	299.93	299.92	299.91	299.90	299.89	299.89	299.88	299.87	299.86	299.86
MK	9	1849	299.85	299.84	299.83	299.83	299.82	299.81	299.80	299.80	299.79	299.78
MK	9	1859	299.78	299.77	299.76	299.75	299.75	299.74	299.73	299.73	299.72	299.71
MK	9	1869	299.71	299.70	299.69	299.68	299.68	299.67	299.66	299.66	299.65	299.64
MK	9	1879	299.64	299.63	299.63	299.62	299.61	299.61	299.60	299.59	299.59	299.58
MK	9	1889	299.57	299.57	299.56	299.56	299.55	299.54	299.54	299.53	299.52	299.52
MK	9	1899	299.51									
SR	11	1940	[illegible]	[illegible]	499.91	499.81	499.72	499.[illegible]	499.[illegible]	499.44	499.35	499.26
SR	12	1948	498.[illegible]	[illegible].56	497.86	497.17	496.[illegible]	[illegible]	495.[illegible]	495.10	494.42	493.75
			493.07	492.[illegible]								
SR	12	1958	491.[illegible]	491.07	490.41	489.75	489.[illegible]	488.[illegible]	487.80	487.15	486.[illegible]	[illegible].51
			485.[illegible]									
SR	12	1968	485.[illegible]	484.[illegible]	483.97	483.34	482.[illegible]	482.[illegible]	481.10	480.48	[illegible]	[illegible]
			479.[illegible]									
SR	12	1978	479.[illegible]	478.[illegible]	477.[illegible]	477.23	476.[illegible]	476.[illegible]	475.[illegible]	474.[illegible]	474.28	473.[illegible]
SR	12	1988	473.[illegible]	472.[illegible]	471.97	471.[illegible]	470.[illegible]	[illegible]	469.70	469.[illegible]	468.[illegible]	468.02
SR	12	1998	467.[illegible]	466.92	466.[illegible]	465.[illegible]	[illegible]	464.[illegible]	464.[illegible]	463.[illegible]	463.12	462.[illegible]
SR	12	2008	462.[illegible]	461.[illegible]	461.[illegible]	460.[illegible]	[illegible]	[illegible]				
SR	13	2013	458.[illegible]	456.[illegible]	[illegible].74	[illegible]	453.60	452.06	450.54	449.04		

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 SR     14   2020      391.05   390.9490    390.8479    390.7467    390.6456    390.4845    390.3833    390.2622    390.14   390.0011
389.39    389.88
 SR     14   2030      389.92   389.81   389.6977    389.5965    389.4754    389.3643    389.2432    389.1320    389.0203    388.9096
388.87    388.76
 SR     14   2040      388.80   388.69   388.5465    388.4654    388.3642    388.2431    388.1320    388.0209    387.9198    387.8087
387.76    387.65
 SR     14   2050      387.69   387.58   387.4754    387.3643    387.2532    387.1421    387.0410    386.9399    386.8289    386.7178
386.67    386.56
 SR     14   2060      386.60   386.49   386.3845    386.2834    386.1723    386.0613    386.02    385.9591    385.8430    385.7420
385.6359    385.48
 SR     14   2070      385.52   385.4237    385.3327    385.2016    385.1005    384.9995    384.8984    384.7874    384.6963    384.5652
384.42
 SR     14   2080      384.46   384.3531    384.2521    384.1410    384.0400    383.9389    383.8379    383.7268    383.6058    383.5047
383.37
 SR     14   2090      383.41   383.3026    383.2016    383.1005    382.9995    382.8985    382.7974    382.6864    382.5854    382.4443
382.33
 SR     14   2100      382.37   382.2723    382.1712    382.0602    381.9692    381.82
 SR     15   2105      381.94   381.91   381.89   381.87   381.84   381.82   381.79    381.77    381.7574    381.72    381.70
381.67    381.65    381.63    381.60    381.58
 SR     15   2115      381.70   381.6856    381.6552    381.6251    381.6148    381.5846    381.5644    381.5341    381.5139    381.4937
381.34
 SR     15   2125      381.46   381.44   381.42   381.39   381.37   381.35   381.32    381.30    381.2827    381.25    381.23
381.20    381.18    381.15    381.13    381.11
 SR     15   2135      381.23   381.21   381.18   381.16   381.14   381.11   381.09   08    381.06    381.04    381.02
 SR     15   2145  01     380.99    380.97    380.9594    380.92    380.90    380.8887
 SR     15   2145      380.85    380.83    380.8130    380.78
 SR     15   2155      380.76    380.7473    380.71    380.69    380.6666    380.64
 SR     15   2155      380.62    380.6059    380.57    380.55    380.52    380.50    380.48    380.45    380.43    380.41
 SR     15   2165      380.5338    380.5036    380.4834
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.....EXECUTION COMPLETED