#### **DRAFT CONCLUSIONS**

## LONG TERM FLOOD SOLUTIONS - RED RIVER BASIN COMMISSION

## August 15, 2011

- 1. Conclusion #1: Flood Reality: The Red River Basin geography determines that there will always be larger floods along the mainstem and its tributaries. In addition, flooding will continue to occur at various locations in the summer depending on rain events. The problem cannot be solved by moving back in time to a pre-settlement condition. The largest flood documented in the basin was in the spring of 1826, before any development occurred. One strategy throughout the basin cannot solve the flooding problem. Multiple approaches are necessary. Flood risk has been and continues to be reduced in the basin, yet more remains to be accomplished to protect the economic base and minimize potential catastrophic flood losses in the future. Enough basin wide structural and non-structural flood initiatives must be implemented so that residents can endure a large spring flood, experience minimal or no damage, and revert to normalcy as quickly as possible.
- 2. Conclusion #2: Basin-wide Flood Risk Reduction Plan: Addressing the flooding problem in the Red River Basin is complicated. There is no single "Silver Bullet" solution as some suggest. Strategies throughout the basin must be considered to address the problem. To achieve the goal of enduring floods with minimal or no damages, and revert to normalcy, the flood risk reduction plan must include a variety of strategies and components, including, flood plain non-structural strategies and flow reduction strategies such as floodwater storage projects, other structural strategies, and land use activities. No singular strategy has the ability to achieve adequate flood risk reduction for the basin.
- 3. Conclusion #3: Level of Protection Goals: Currently, there exist no level of protection goals for the basin that are strategically and systematically applied for a comprehensive basin strategy. The existing level of protection target is based on the most recent flood experience, political will generated by the most recent flood, and funding availability. This approach has been called into question by the recent increase in frequency and magnitude of flooding as well as the current expenditures on flood fighting, recovery, and ongoing projects. A comprehensive and strategic level of protection goals is needed for the entire basin.
- 4. **Conclusion #4: Economic Impacts of Flooding:** The economy of the basin is diverse and strong. Higher education, health care, manufacturing, farming, agribusiness, and technology industries are among those generating a vibrant economy that has been less adversely impacted by the recent downturn in the economy. The Red River basin economy in Minnesota and North Dakota produces annually \$??. Existing flood risk reduction projects, build over the years throughout the basin, for 100-year flood risk protection generate over \$5 billion in benefits. With much worth protecting, flood

mitigation efforts in the basin yield a benefit of \$4 to \$7 for every \$1 invested in mitigation according to national and state (FEMA??) figures. However, the remaining potential damages for a losing flood fight are over \$3 billion for a 100-year flood, over \$6 billion for a 200-year flood, and over \$11 billion for a 500-year. The largest share of the remaining potential damages is in the Fargo/Moorhead metropolitan area.

- 5. Conclusion #5: Floodplain Management: Flooding is an act of nature; while flood losses are largely acts of man. Since most of the population lives adjacent to the Red River mainstem and its tributaries, this is especially applicable in this basin. The immediate river corridor is geographically the lowest elevation in the basin where water deposits and then moves north into Canada. No comprehensive approach to floodplain management in the basin exists that accounts for the variations in local, state and federal rules, regulations, and approaches. Since structural measures have limitations in reducing flood risk, non-structural floodplain management is a major component of reducing flood damage risks in the basin.
- 6. Conclusion #6: Local Protection: There are cities, communities, rural residences and farmsteads in the basin that still are at significant levels of risk of flood damages. Most of the communities in the basin do not have flood risk reduction projection for a 100-year flood event with three feet of freeboard, the level for FEMA certification. These communities continue to rely on emergency flood fighting measures. Grand Forks-East Grand Forks, Halstad, West Fargo, Wahpeton-Breckenridge and Oslo are the only communities currently with protection greater than a 100-year flood. Some rural residences, farmsteads, and communities are protected by ring levees or other measures at varying levels, but are often surrounded by floodwater with limited or no access posing significant public safety concerns.
- 7. Conclusion #7: Flood Storage Projects: No comprehensive basin wide strategy exists with goals to provide both local and mainstem benefits for flood damage reduction. Modeling analysis of existing flood storage projects shows that retention storage sites can reduce flows and stages on the Red River main stem as well as provide local benefits on the tributaries. However, these impacts are often dependant on timing and the location of the retention site and not all sites are equally beneficial towards both local tributary and basin mainstem needs. (For example: White Rock Dam flood storage has demonstrated a major reduction on peak flood flows on the Red River main stem for the 1997 flood, but had no mainstem impact on other recent floods downstream. Several sub-basin areas with substantial flood storage have shown little contribution to peak flood flows. These sub-basins include the upper Otter Tail River, the Thief River, and the Tongue River.) In some cases localized flooding damages requires retention that only provides local benefits.
- 8. **Conclusion #8: Agriculture:** Agriculture is a significant component of the basin economy. Large acreages of prime agricultural land are subject to spring and summer riverine and

sheetwater flooding. This results in economic and environmental damage through loss of or damage to crops, erosion of topsoil, and water quality contamination. Drainage, retention, and land use are all important factors to protect this economic sector.

- 9. Conclusion #9: Effects of Drainage: Drainage is critical for a productive agricultural economy central to the Red River Basin and each state. Surface drainage began in the late 1800s and has been used since to maintain agriculture productivity. Drainage enables water to be moved off the land in the spring for timely planting and also in the summer to move water from a (24 hour 2 inch rain off growing crops). Drainage has been shown (timing Analysis Report: 1974) to have an impact on the early part of flood hydrographs. This has led to the categorization of early, middle, late water—where early water is best moved through the basin through drainage, middle water kept in the system by retention, and late water left unmanaged-except for local benefits. However, at this time there exists no comprehensive systematic approach to use the current drainage system in flood damage reduction. In addition, recent instillation of tile drainage is showing increases in yields by up to 15% and this practice will increase.
- 10. **Conclusion #10: Transportation:** The Red River basin covers approximately 45,000 square miles or 28 million acres that is mostly farmed. The basin has an extensive system of highways, roads and bridges in the three states and one province. This system provides for the movement of goods and people to enhance the economic output of the region. Significant disruptions and damages occur to the transportation network during major floods. Many roads are underwater for weeks or months making communities inaccessible. Stability of some roads is impacted by erosion and wash-outs making them unusable for public safety and economic needs. And finally, many of the smaller roads so critical to agriculture do not meet FEMA criteria for restoration reimbursement.
- 11. Conclusion #11: Potential Catastrophes: \_There are two locations in the basin where a major economic and/or environmental catastrophe is probable. The first location is the Fargo/Moorhead metropolitan area and the second is an overflow from Devils Lake, North Dakota. If the Fargo/Moorhead metropolitan area losses a 500 year flood fight they will account for up to 80% of \$11 plus billion in damages. Successful flood fighting in the past does not translate into successful flood fighting the future, especially in larger floods. Potential loss of life issues compound the economic devastation that could occur. Devils Lake on the other hand, in order to address the increasing levels of water will impact the Red River mainstem and tributaries at 600 cfs; 2,000-3,000 cfs; or at more than 14,000 cfs depending on what action is taken. Efforts must be taken to protect against the catastrophic 14,000 cfs natural outflows.
- 12. **Conclusion #12: Flood Forecasting:** New data sets, modeling improvements, real time information, and information sharing have resulted in significant improvements in flood forecasting since the 1997 flood. However, spring variables such as: when it rains, how fast it warms up, how these relate to each other, and other factors make forecasting an

art that improves with experience. Each flood is different and creates its own set of issues related to forecasting. Levels of protection for everyone at the LTFS Report recommended levels will provide the safety net that is needed and allow for variable weather and forecasting limitations.

13. Conclusion #13: Continuity in Flood Solutions Tracking and Implementation: Numerous studies and plans have been developed to address flooding issues in the Red River basin in recent years. The RRBC used and reflected the important preceding work of other stakeholders for this project. Moving forward using the LTFS Report as the guide for the 21<sup>st</sup> Century is an important component for the future. The US Federal government does not currently have the programs to effectively provide the necessary implementation support in achieving the basin wide LTFS long-term goals with the exception of a few large communities. Therefore a true local, state and federal partnership in comprehensive flood risk reduction strategies is currently piecemeal.



# LONG TERM FLOOD SOLUTIONS 2011 RED RIVER BASIN COMMISSION

**DRAFT RECOMMENDATIONS** August 15, 2011

These draft recommendations will develop with more specificity in the coming weeks. Please provide your input to us on suggested improvements. While written comments are preferred, please contact us in any way.

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Based on the studies and analysis of the flooding problems in the Red River basin and potential solutions conducted during the LTFS and on the conclusions reached, the RRBC makes the following recommendations:

## 1. Conclusion #1: Flood Reality.

- 1.1. Minnesota and North Dakota should continue to authorize and fund through the appropriate agencies both structural and non-structural flood risk reduction in the Red River Basin. (Should we put a timeline i.e. xx # years here?)
- 1.2. Minnesota and North Dakota should continue to authorize and fund through the appropriate agencies efforts aimed to help the basin reduce risks from flooding to residents and property so that recovery after a spring flood is quick with minimal inconvenience and damage and summer flooding is reduced to minimal damages.
- 1.3. Minnesota and North Dakota should invest state funds to cost share with local and federal governments where appropriate on flood (Do we list \$ amounts?) damage reduction projects, both structurally and non-structurally.
- 1.4. Appropriate mechanism need to be developed for federal, state and local funds to generate the \$1.5 billion that is needed for projects to achieve a basin wide 20 percent flow reduction on the mainstem Red River to the international boundary.

#### 2. Conclusion #2: Basin-wide Flood Risk Reduction Plan.

2.1. The Minnesota, North Dakota, and South Dakota Governors and the Manitoba Premier should meet at least once every two to four years to receive an update on progress towards the LTFS recommendations on flood reductions strategies, water quality and water supply coordinated by RRBC.

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- 2.2. Manitoba should continue funding RRBC's efforts in developing the supporting data for the 20 percent flow reduction strategy in Manitoba to match the corresponding Minnesota and North Dakota effort and to expand sub-watershed modeling similar or comparable to the current USACE HMS modeling effort in the US Red River basin subwatersheds in the next 2-4 years.
- 2.3. Manitoba should continue and accelerate the gathering of Light Detection and Ranging (LIDAR) data through the International Institute for Sustainable Development to match the US LIDAR in the next three to five years.
- 2.4. South Dakota should determine the feasibility of establishing local watershed districts in the basin (Roberts and Marshall Counties) through the International Legislator's Forum in the next one to two years.
- 2.5. State agencies that govern water resources should be streamlined instead of the current model that involves many entities. A reasonable reorganization of state water programs and functions should be considered, primarily on the Minnesota side of the basin through the Environmental Quality Board or the Legislative Auditor in the next biennium. (Check with MN legislators to see if this remains a valid need).
- 2.6. A thorough review and inventory of flood mitigation and water resource entities within the basin should be coordinated by RRBC in the next two years to identify roles, suggest streamlining possibilities, and report to the states and province.
- 2.7. The International Legislators Forum should continue to fund the Consensus Council to bring together and facilitate dialogue between Manitoba, Minnesota, North Dakota, and South Dakota legislators on flood risk reduction strategies with the assistance of RRBC.

## 3. Conclusion #3: Level of Protection Goals.

- 3.1. Minnesota and North Dakota should fund and administer flood mitigation policy so that floods in excess of the 100 year are the benchmark for managing the risk of flooding, regulating development in the floodplain, and for developing flood risk reduction projects around developed areas.
- 3.2. The Minnesota and North Dakota legislatures should adopt the LTFS Report "levels of protection" goals to guide for future basin flood risk reduction strategies.
  - 3.2.1. Large metro: add information
  - 3.2.2. Smaller Communities: add information.
  - 3.2.3. Rural residents and farmsteads: add information.

#### 4. Conclusion #4: Economic Impacts of Flooding.

- 4.1. Minnesota and North Dakota should invest funds appropriately (over time -how much time and how much funds) to maintain the basin economy and protect against catastrophic damages from future large floods.
- 4.2. The economic and environmental integrity of the basin should be maintained by (7: 1 BULLET) the long term financial investment of federal, state and local dollars to implement flood solutions for both metro and rural areas.
- 4.3. Where the state funds should come from??? Do we need a recommendation or two on this?

## 5. Conclusion #5: Floodplain Management.

- 5.1. Local governments in the basin should discontinue new development in areas of high risk of flooding immediately adjacent to the Red River and tributaries.
- 5.2. Every community and county in the basin should work toward joining or improving their rating through the FEMA Community Rating System so that their residents will pay lower flood insurance premiums.
- 5.3. Buildings located in at-risk areas where structural measures cannot accomplish the recommended flood protection levels should be bought out and removed.
- 5.4. (Get township regulations document from Tom Fischer) Recommendation for townships based on this model.
- 5.5. Minnesota and North Dakota should continue pursuit of additional floodplain management non-structural measures equal to the current work on structural and retention and flow reduction strategies through the RRBC.
- 5.6. We recognize that structural measures have limitations in reducing flood risk. Often non-structural floodplain management is the best option and always should be a significant part of any long term plan for flood risk reduction. Therefore, we recommend that an initiative be undertaken on flood loss reduction with the following goals and objectives:
  - 5.6.1. An evaluation of the appropriate standards and regulations for development, including farming practices, throughout the Red River Watershed. This should include an evaluation whether the current 100-year regulatory minimum standard is adequate and if appropriate, a recommendation for future standards to reduce flood losses.
  - 5.6.2. An evaluation of the adequacy of flood insurance rate maps (FIRMs) in the Red River Basin. This should include a review of future conditions flooding, and whether new areas need to be mapped and whether the newly acquired LiDAR elevation data should be used as the basis for the mapping.

- 5.6.3. An evaluation of compliance with the flood insurance program including recommendations for improving compliance. [Are we talking about mandatory flood insurance purchase or community federal and state compliance with existing regulations; or both? I hope you would want both]
- 5.6.4. Developing a method for tracking, documenting, and examining the consequences of variances issued by communities.
- 5.6.5. Identification of impediments to joining FEMA's Community Rating System (CRS) for communities in the basin and evaluation of potential tools and resources to assist in their participation. An evaluation of funding requirements and funding sources for implementing the recommendations developed in this initiative.

#### 6. Conclusion #6: Local Protection.

- 6.1. By the year 2015, Minnesota and North Dakota should complete funding ring dikes or elevation of buildings for rural residents and farmsteads in flood prone areas until completed so that all are protected to three feet above the 100-year level or three feet above the largest flood in their area, whichever is greatest.
- 6.2. What is the target for MD for rural residents and farmsteads??
- 6.3. What are the numbers we need for each state related to small communities??? (based on conclusion 3 above).
- 6.4. What are the large city numbers we need for each state?
- 6.5. What are the specific ag related numbers do we need for each state?
- 6.6. What other specific targets do we need?
- 6.7. By 2015, Minnesota and North Dakota public resources should be provided so that all communities in flood-prone areas have increased the level of protection to the largest flood of record for that area, plus three feet of protection above that level as a buffer (freeboard).
- 6.8. Minnesota and North Dakota should continue to invest in retention to increase all levels of protection for all in the basin and to assist in achieving the "level of protection" goals in the LTFS Report.
- 6.9. Increasing the level of protection for the Fargo-Moorhead area and the Grand Forks-East Grand Forks area should be increased to a minimum of a 500-year flood by strategies that are economically viable, provide the least amount of impacts, and that provide the least risk from a catastrophic flood in the future.

## 7. Conclusion #7: Flood Storage Projects:

7.1. Initially, the basin mainstem flow reduction goal should be established for a 20 percent reduction in peak flows for a 100-year flood along the Red River main stem.

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- 7.2. Local needs should prompt the retention strategies for the basin so that effects will have the desired impact on the mainstem flows, thereby increasing the level of protection and reducing the risk of flooding for all residents.
- 7.3. Basin wide retention must be used in concert with the above mentioned strategies, and funded to provide local flood damage reduction benefits, but also to reduce peak flows by at least 20 percent on the mainstem Red River.
- 7.4. Due to the variability of flood events, flow reduction through flood retention alone will not achieve the LTFS levels of protection goals nor eliminate major flooding from the Basin, but will result in improved levels of protection throughout the Basin.
- 7.5. The newly formed Red River Retention Authority should coordinate and prioritize retention projects to meet the flow reduction goals in Minnesota and North Dakota in conjunction with the Minnesota Red River Watershed Management Board and its member watershed districts and the North Dakota Joint Red River Water Resource Districts and its member water resource districts.
  - 7.5.1. Funds must be expended based on a locally developed priority system.
  - 7.5.2. NRCS Sub-committee work under RRRA. Do we need a recommendation on each sub-committee and its report?
  - 7.5.3. The permitting process\_for water retention projects should be streamlined at both the federal and state levels.
- 7.6. The Project Planning and Permit Evaluation demonstration project will enable water managers to access and display critical information in a useful online system to streamline planning, site selection, and permitting of flood damage reduction projects. Minnesota and North Dakota should provide \$400,000 to expand this effort to the entire Basin and integrate this work into the Red River Basin Decision Information Network being developed through the International Water Institute as part of the US Corps of Engineers Basin Watershed Feasibility Study.
- 7.7. If federal funding is available for cost share, Minnesota and North Dakota should fund over the <u>next 25 years</u>, \$25 million every biennium for the 1.5 million acre feet of storage necessary. (Are these the right numbers and timeline, should they be here or up under conclusion 1)?
- 7.8. If federal funding is not available for cost share, Minnesota and North Dakota should fund over the <u>next 25 years</u>, \$25 million every biennium for the 1.5 million acre feet of storage necessary.
- 7.9. Minnesota and North Dakota should cost share funding for either local or local- federal joint funded projects.
  - 7.9.1. Retention projects should be continued to be funded with state and local dollars regardless of the availability of new federal funds.

- 7.10. Land use practices that slow the water or hold it on the land longer must be exercised through existing programs, based on benefits, demonstrated with modeling, to the local area and the Red River mainstem.
- 7.11. Minnesota should provide state funding through bonding of \$20M a biennium for the Red River Basin through the Board of Water and Soil Resources for the Reinvest In Minnesota (RIM) to match or supplement federal USDA conservation funding such as the Wetland Reserve Program, Conservation Reserve Program, and Environmental Quality Assurance Programs to achieve long term flood retention and other benefits.
- 7.12. A pilot project for \$??? to analyze the flow reduction impacts of micro-storage (Waffle Concept) and culvert sizing should be developed in coordination with the RRRA with funding from local, state and other sources.
- 7.13. All new retention projects in Minnesota and North Dakota should include gates to provide multi-purpose benefits for improved flood flow control, to assist in improving water quality, and to provide potential water supply during extended droughts.
- 7.14. Minnesota and North Dakota should each fund \$500,000 to RRBC to develop a basin approach on water quality, especially as it relates to impacts on Lake Winnipeg.
- 7.15. Minnesota and North Dakota should each fund \$500,000 to RRBC to develop a basin approach on water supply that will prepare each state for joint action is consistent with the LTFS Report on flood solutions.

## 8. Conclusion #8: Agriculture:

- 8.1. Spring flood reduction strategies should be implemented to remove water from the land as quickly as possible without creating adverse impacts on others downstream.
- 8.2. Minnesota and North Dakota should be prepared to increase funding for flood projects contingent upon funding in the next U.S. Farm Bill for land use practices that will reduce flows and improve water quality through programs administered by the Natural Resource Conservation Service or their designee.
- 8.3. Minnesota DNR and North Dakota SWC should expedite permitting to match the pace of planned changes in the USACE permitting process.
- 8.4. Minnesota and North Dakota should invest funds in programs through BWSR and Game & Fish to match the potential federal funds through the NRCS.

#### 9. Conclusion #9: Effects of Drainage.

9.1. A pilot project with farm and commodity group input should be developed and funding provided to implement that would analyze the following impacts on flooding: tile drainage, surface drainage, early water ditch drainage, and culvert sizing.

- 9.2. The RRRA, the RRWMB, the NDJWRDB, MN DNR, and ND SWC should undertake an analysis of how to better utilize the current surface drainage network to maximize early water releases during the spring to lower the flood hydrographs by removing water on the upward rise with a goal of getting a minimum of 25% benefits of the 20% flow reduction strategies to the flood hydrograph.
- 9.3. The current drainage analysis by the RRRA through the Basin Technical and Scientific Advisory Committee under the staff direction of the International Water Institute should guide the development of the next phase of a drainage benefit and impact analysis with Minnesota and North Dakota participation, this should be coordinated with the current MN Department of Agriculture site in Clay County Minnesota.
- 9.4. An analysis of buffer strip compliance and enforcement should be completed for the basin to improve water quality and slow the flow of water into the drainage systems.

#### 10. Conclusion #10: Transportation:

10.1. Minnesota and North Dakota shall develop through the MN and ND Departments of Transportation a state and local funding strategy to assist in county and township road repairs that goes beyond the current programs that are funded under disaster declarations, as flood damage reduction strategies are implemented and the levels of protection for flooding increases.

## 11. Conclusion #11: Potential Catastrophes:

- 11.1. Continued high priority should be placed on resolving the flooding issues at Devils Lake and in the Fargo/Moorhead metropolitan area, as these two locations have the potential of affecting large parts of the Red River basin region.
- 11.2. The Fargo/Moorhead area Diversion Project at the 20,000 cfs ND option with storage should be pursued and funded by local, state and federal dollars as determined by the newly formed F-M Joint Powers Board.
- 11.3. Additional efforts by the F-M Technical Team and JPB members to offset and minimize upstream impacts to there are "No Adverse Impacts" should be pursued.
- 11.4. The recommendations developed by the Devil's Lake Executive Committee through the work of the Devil's Lake Collaborative Working Group should be funded and acted upon by appropriate local, state, federal and tribal governments.

## 12. Conclusion #12: Flood Forecasting:

12.1. A basin wide strategy for flood forecasting data and modeling needs to improve reliability and timeliness shall be coordinated by RRBC with the US NWS Integrated

- Warning Team, ND SWC, MN DNR, SD DENR, and MB WS input that produces a report of needs and costs.
- 12.2. A basin wide real time precipitation network for rain and snow melt equivalents shall be developed by RRBC with US NWS, ND SWC, MN DNR, SD DENR, and MB WS input that is built upon a volunteer network and is graduated to a real time automatic network over a 10 year period with funding from the above partners.
- 12.3. A volunteer network shall be developed by RRBC to gather frost depth information over the winter and spring and coordinated with the US NWS Integrated Warning Team, within the next two years.
- 12.4. RRBC shall develop a fund for ongoing use to bring a US NWS hydrologist into the basin to provide "on site decision support service" to the region during spring and summer flood events.
- 12.5. The Fargo-Moorhead diversion project shall provide funds annually through a contractor during the construction phase of the project and one year thereafter to work with the US NWS to continually update their forecast model with new project data as it impacts flood forecasting.
- 12.6. RRBC shall gather ND State Climatology (ND AWN), MN DNR Climate staff, MB Climate staff, NRCS, and others to discuss and develop a strategy for measuring, gathering and sharing soil moisture data to be used in flood forecasting.
- 12.7. A stream gages strategy for the basin should be developed by the USGS, the MN RRWMB, the ND RRJWRDB and their member water boards for the mainstem Red River and its tributaries that provide a basin network to provide ongoing and consistent data for model development to aid in flood reduction strategies.
- 12.8. Minnesota and North Dakota should participate in cost share funding through the DNR and the SWC and cooperating with other levels of government to gather additional data for forecasting as listed above.

## 13. Conclusion #13: Continuity in Flood Solutions Tracking and Implementation:

- 13.1. The states of Minnesota through the Board of Water and Soil Resources and North Dakota through the State Water Commission should fund RRBC at \$50,000 each to conduct an evaluation, once every 4 years for the next 20 years, of this and other recent flood solution plans to monitor progress towards implementation of actions to address the LTFS Report goals and recommendations and to update the LTFS Report.
- 13.2. Minnesota should coordinate through the Board of Water and Soil Resources the inclusion of all sub-watersheds on the Minnesota side as Watershed Districts (Ottertail) and membership in the RRWMB (Ottertail and Buffalo-Red Watershed District).

- 13.3. North Dakota should coordinate through the State Water Commission the inclusion of all Red River Counties in North Dakota in the ND JRRWRD.
- 13.4. North Dakota should establish an interim committee under the Legislative Water Resource Oversight Committee that consists of basin legislators, county commissions, water resource district managers, and the State Water Commission to analyze the pro's and con's of the formation of Water Resource Districts by hydrologic boundaries in the North Dakota Red River portion of basin, to better leverage local leadership and funds for projects and if warranted prepare legislation for the next ND legislative session.



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