September 19, 2013

In August two engineers from NDOT came out to review our roads. (It was Patrick Flanagan's idea.)

We all went out on the road trip together.

The two NDOT engineers (Gayle Maurer and Reid Kaiser) said we were doing a good job on our gravel roads, especially considering what we were able to spend. They were also complimentary on the condition of our equipment and the equipment yard.

Later, one of the NDOT engineers (Gayle Maurer) came back on her own and did a detailed review of Cartwright. It was her idea.

Her report is an eye-opener. Cartwright is in sad shape.

The report also contains good references to the care and feeding of gravel roads.

Jed Margolin
VCHPOA Roads Committee

What follows is the:

NEVADA DEPARTMENT OF TRANSPORTATION (NDOT)
MATERIALS DIVISION FIELD REVIEW REPORT

Prepared for: VCHPOA Roads Committee
Prepared by: NDOT Materials Division

August 2, 2013

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*NEVADA DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION FIELD REVIEW REPORT

INTRODUCTION

The Nevada Department of Transportation (NDOT) Materials Division was invited to tour selected roads in the Virginia City Highlands area located near Virginia City, Nevada off of State Route 341 (Geiger Grade Road) in Storey County. The invitation came from members of the Virginia City Highlands Property Owners' Association (VCHPOA) Roads Committee and several maintenance personnel from Storey County. The VCHPOA's purpose is to protect the property owners' interests in the Virginia City Highlands. The group is a non-profit corporation that is operated by volunteers.

Most of the roads in the Virginia City Highlands are on private property and these roads are maintained by the VCHPOA. Many of the roads are not paved and consist of gravel/native-surfaced material. The area is in a rural setting and use of four-wheel drive would be necessary during winter driving conditions.

SITE VISIT

An initial site visit was conducted on July 16, 2013. Individuals in attendance included:

Stephen A. Morrow, P.E., Roads Committee Chairman
Jed Margolin, Roads Committee Member
Patrick Flanagan, Treasurer for Board of Directors, VCHPOA
Jim Stewart, Storey County Maintenance
Rick Draper, Storey County Maintenance
Reid Kaiser, P.E., Chief of Materials Division, NDOT
Gayle Maurer, P.E., Senior Materials Engineer, NDOT

The group reviewed portions of several roads in the area including Silverado Road, Dortort Drive, Grizzley Road, Adobe Road, Enterprise Road, Empire Road, Agate Road, Clemens Road, Panhandle Road, Sazarac Road, Cartwright Road, and Lousetown Road. There was also a visit to the Maintenance Yard where discussion centered on equipment advancements the community has made in the last six years.

A second site visit was conducted by Gayle Maurer on July 22, 2013. The purpose of the second site visit was to document examples for Appendix A in this report. Appendix A documents several examples of issues that NDOT would normally be concerned about when inspecting its roads. These issues include undirected/uncontrolled roadside drainage, road edge drop-offs, lack of ditch maintenance, and vegetation that impedes vehicle sight-distance.

DISCUSSION

Much of the discussion during the initial site visit focused on the challenges that the Roads Committee has regarding maintenance on its gravel/native-surfaced roads. Challenges include dust abatement, displaced gravel, isolated areas of corrugations ("washboarding"), snowplowing, and an area of isolated rutting where travelers drive down the center of the road. These challenges are common on gravel and native-surfaced roads. There is a considerable amount of literature available that discusses these challenges as well as how to prevent, repair,

or abate these concerns on low-volume roads. The Roads Committee is aware of proper grading techniques such as trying to keep a crowned driving surface and maintaining established ditches that complement the terrain and drainage or runoff patterns. Keeping the corrugated pipes free-draining is also important and it was noticeable that many pipes next to the gravel roads were free of debris and should work properly when there is need. There were several new diversion ditches and this is one type of cost-effective erosion control technique that can help to keep the roadbed intact.

RECOMMENDATIONS

The following recommendations are not steadfast and only intended to promote some discussion among the VCHPOA Roads Committee members. The recommendations should not be interpreted as a complete or thorough engineering review or analysis because the information is cursory based on a very limited amount of data. Perhaps these ideas will help you to move forward as you decide how to spend future funding.

- Conduct an in-depth road condition survey to identify road and safety concerns. After all road and safety concerns are identified, the concerns should be prioritized with safety concerns receiving the highest priority for repair, maintenance, or improvement. Appendix A documents a few examples of issues that NDOT would look for when inspecting its roads. The examples are not inclusive of all the issues that the VCHPOA Roads Committee would encounter when surveying its road network. In general, any location that causes you to think “I definitely do not want to slip off the road right there!” is probably a location that could use some sort of repair, maintenance, or improvement.
- There are several consulting firms in Reno that specialize in pavement management. It may be practical to pay for some professional engineering advice regarding the road condition survey, prioritizing road and safety issues, and remedies for remediation.
- There are many locations where undirected/uncontrolled drainage due to lack of shoulder and ditch maintenance has caused erosion. Funding spent on erosion repair, maintenance, or improvement can be a good use of the available budget.
- Consider purchasing *Unsealed Roads Manual: Guidelines to Good Practice, Third Edition, 2009*. Australian Roads Research Board (ARRB Group Ltd.). Vermont South, Victoria, Australia. Edited by George Giummarra. Find the manual available for purchase at the following website: http://www.arrb.com.au/Information-services/Publications/Reports-Manuals/Pavements.aspx?preview=true.
- Consider saving a portion of the annual road maintenance budget for a few years in order to have on hand the amount of funding it would cost to construct a more permanent solution to locations of known road and safety concerns.
- There have been advances in road technology and products these last few years so do not get complacent about using the same dust control product year after year simply due to habit. Research this issue to determine that other products are available and may be more cost-effective in the long-term. There are application restrictions for each product including climate, weather, terrain, and soil type. Different types of products work best for different soil types and you may discover that you need to use two different types of products depending on the major soil type for each particular road. Always evaluate a test section before committing to a new product. Consider the life-cycle cost because sometimes a product costs more up-front but lasts much longer so you get “more bang for your buck.”
- Call/visit with the U.S. Forest Service and Bureau of Land Management as these agencies are responsible for many miles of low-volume roads. You may find some

assistance or referrals to good information. These agencies have produced a lot of credible research and manuals so make some effort to inquire about available information.

- Continue to improve drainage and control erosion by blading shoulders and ditches as funding becomes available. You may have to accomplish some of this work by hand or by other small equipment methods at locations that make blading impractical. Do not forget that the paved roads require corrugated pipe, shoulder, and ditch repair or maintenance as well. Make sure that water can flow freely through the corrugated pipes and drainage features. Corrugated pipes that have crushed ends can be improved by cutting off the bent material, rebending to the original shape, or replace a portion of the end section.
- Consider placing object markers and guide posts as effective aids to help keep drivers safe at critical areas on the roads. Advice about these traffic aids can be found in the Manual of Uniform Traffic Control Devices (MUTCD) on the World Wide Web.
- Steve Williams is a NDOT resource and may be able to offer a few tips on ditch maintenance. Steve can be contacted at 775.834.8300.

SOURCES FOR MORE INFORMATION (FREE ON THE WORLD WIDE WEB)

Below are links to reputable gravel and native-surfaced road references that can be perused for helpful information. Some sources are a little dated. However, many of the basic concepts remain the same and are a good starting point from which to investigate present day best practices. There are additional references within each source.

- Find a 16 page list of Keller's favorite selected references for low-volume roads that include topics such as environmental issues, hydrology for drainage, culverts, roadway materials, erosion control, and much more. Many of the following references are also included in Keller's list that can be downloaded from http://ucanr.org/sites/forestry/files/143394.doc.
- USDA Forest Service. Kestler. "*Stabilization Selection Guide for Aggregate-and Native-Surfaced Low Volume Roads."* Located at: http://www.fs.fed.us/eng/pubs/pdf/08771805.pdf.
- Wyoming report that is one of three volumes that outlines some basics of managing maintenance objectives for gravel and low-volume roads. Located at: http://wwweng.uwyo.edu/wyt2/Gravel%20Roads/OCT_2011_Gravel_Roads_Management_FINAL_REPORT_Oct2010%5B1%5D.pdf.
- Center for Dirt and Gravel Road Studies web site by PennState. Located at http://www.dirtandgravel.psu.edu/. There is good information on this web site in the resource section including technical bulletins, field guides, and etcetera. In particular, there is an *"Environmentally Sensitive Maintenance for Dirt and Gravel Roads"* report from the epa.gov web site located at: http://www.epa.gov/owow/NPS/sensitive/cover.pdf or http://water.epa.gov/polwaste/nps/sensitive.cfm.
- Cornell Local Roads Program. New York LTAP Center. "*Roadway and Roadside Drainage."* Located at: http://www.clrp.cornell.edu/workshops/manuals/drainage.pdf.
- U.S. Agency for International Development website. USDA Forest Service. Keller and Sherar*. "Low-Volume Roads Engineering Best Management Practices Field Guide."*

Located at: http://pdf.usaid.gov/pdf_docs/PNADB595.pdf.

- NCHRP Synthesis 430. Cost-Effective and Sustainable Road Slope Stabilization and Erosion Control. Located at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_430.pdf. Many good references after each chapter for control techniques.
- U. S. Environmental Protection Agency website. USDOT. FHWA. SD LTAP. Selim and Skorseth. "*Gravel Roads: Maintenance and Design Manual.*" Located at: http://water.epa.gov/polwaste/nps/gravelroads_index.cfm.
- ARRB webite for Austroads publications. Foley, Cropley, and Giummarra. "*Special Report 54 Road Dust Control Techniques.*" Located at: http://www.arrb.com.au/admin/file/content13/c6/SR54_RoadDustControl.pdf.

* This report is only intended to promote some discussion among the VCHPOA Roads Committee members and should not be interpreted as a complete or thorough engineering review or analysis. The recommendations and contents are a cursory review based on a very limited amount of data. The report is offered in the interest of information exchange only and no liability will be assumed by NDOT for its contents or use thereof.

APPENDIX A

Numerous occurrences of erosion were noticed on Cartwright Road. Undirected/uncontrolled roadside drainage due to lack of shoulder or ditch maintenance is causing erosion that affects the roadway by not only breaking the road off in pieces but causing drop-offs that are considered a safety issue by NDOT.

Road is breaking off in pieces.

Erosion actually extends under the road and more pieces will break off.

Red arrow points to a 12” ruler. Drop-off is 12” on the road edge and considered a safety issue by NDOT.

Red arrows point to school bus sign and 12” ruler from travel lane view.

Undirected/uncontrolled roadway drainage due to lack of shoulder or ditch maintenance is causing erosion that affects the roadway by not only breaking the road off in pieces but causing drop-offs on the road edge and holes near the edge of roadway.

Drainage runs along edge of road rather than in the ditch a few feet away.

Drainage along road edge eventually ends up flowing back into ditch.

Red arrow points to a 12” ruler.
Drop-off is almost 12” on the road edge and considered a safety issue by NDOT.

Hole is scoured out near edge of roadway.

Lack of ditch maintenance is exhibited by crushed corrugated pipe, debris filled pipes, no defined ditch shape, and ditches that are too deep/not side sloped properly within the context of the terrain.

Crushed and debris filled corrugated pipe opening.

Red arrow points to buried pipe opening.

No ditch definition and over growth.

Ditch is deep within context of the terrain. NDOT would consider this a safety issue.

Vegetation growing on the road edge can contribute to pavement failure. The vegetation on the VCHPOA roads is often a “thin veil” between the road edge and culverts, ditches, side slopes, headwalls, and gully-type or swale-type areas. This vegetation may help prevent further erosion and probably helps to delineate the edge of the road during night driving and winter storm events since there are no substantial shoulder areas in many places and few object markers or guide posts on the roads. However, vegetation that grows over the road should be trimmed back because this is a sight-distance safety issue when two vehicles meet on the road at those particular spots.

Examples where larger vehicles are forced to drive through vegetation when two vehicles meet on the road.