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Project: Pine River Ranches #2 Subdivision

Date: January 5, 2006

To: The Pine River Ranches Homeowners Association Board Members

Cc: Goff Files

From: Bruce Honisch, P.E. & P.L.S. and Garth Glasco, P.E.

Re: Road System and Bridge Structure Assessment

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Dear Members of the Board:

As per our scope of services we have visited your subdivision and performed a visual inspection of the existing street and bridge system. A site visit was performed on December 20, 2005. In attendance for the site visit was Judy Clarke, John Wickman and Mark Pommier, from your subdivision and Conor Feeney and Bruce Honisch from Goff Engineering & Surveying, Inc. Conor Feeney collected information on the bridge structure and Bruce Honisch toured the subdivision with the members to review the streets currently maintained by your group.

**General:**

Goff Engineering & Surveying, Inc. has been retained to prepare an assessment on your current bridge structure crossing the Pine River and to review your current road system comprised of Ludwig Drive and Pine River Ranch Circle. As per our scope of services the following is provided:

- Based upon our site visit provide an assessment of the street system as it currently exists and how it appears to have been maintained.
- Review your current road system and provide an assessment of whether the streets should be paved or remain as a gravel street system.
- Provide information related to both gravel and paved streets.
- Provide a bridge loading evaluation update for your structure crossing the Pine River.

### **Introduction:**

The Pine River Ranches #2 Subdivision is platted with approximately 77 lots and about 44 year-round residences. Vacant lots still exist within the subdivision, with new home construction observed during the site visit. Additionally, it appears that Duck Spring Trail is only partially constructed. Duck Spring Trail and Richard Drive located prior to the bridge were not reviewed as a part of this project. Access to the subdivision is from County Road 501, north of Bayfield. The entire street system was originally constructed with gravel surfacing; borrow ditches, cross culverts and one bridge structure crossing the Pine River along Ludwig Drive. Ludwig Drive loops with Pine River Ranch Circle to access the majority of the subdivision lots in a looped street configuration. The upper end of Ludwig Drive leading to the #1 Subdivision was not included. The road system in this portion appeared to be minimally constructed compared to the subject property.

The total length of roads maintained by the association consists of 0.55 miles of Ludwig Drive to the bridge and 1.9 miles of streets from the bridge along Ludwig Drive and Pine River Ranch Circle. As stated above, all the streets are gravel surfaced except for Ludwig Drive from County Road 501 to the bridge. This portion of Ludwig Drive was surfaced with pulverized asphalt from the Bayfield Buck Highway reconstruction project and a tack coat was added to the surface for a seal coat.

### **Initial Street System Site Assessment:**

From our site visit it is apparent that the entire street system has performed and been maintained very well since inception. The road surface has been well maintained and it appears routine maintenance has been provided as needed. Speed limit signs and informational signs are minimal and the bridge is posted for a 64,000 pound weight restriction. Drainage swales and ditches are generally good with a few exceptions that will be addressed below. The width of the streets is approximately 20 to 22 feet wide, with minimal to nil shoulders. The bridge is for single lane traffic only, with reasonable sight distance at the approaches and appropriate waiting areas if oncoming vehicles are present. Normal wear and tear such as some washboarding and raveling of the gravel at curves and intersections to the subbase layer were noted. Street grades are favorable with the only steeper grades being along Ludwig Drive at the northerly end of the subdivision and at the northerly intersection of Ludwig Drive and Pine River Ranch Circle.

The entrance drive surfaced with the reclaimed asphalt generally is wearing well and it is our understanding that potholes when opened are promptly repaired to limit moisture intrusion into the road structure. Some areas did appear to show alligator cracks, indicative of a weaker base or excessive moisture causing street flexing more than normal.



In areas of curves, it is apparent that the base course gravel has migrated to the shoulders with mostly the subbase gravels being present. This is normal and routine gravel addition placed with proper moisture content is necessary to replenish the lost gravel. On longer straight runs, washboarding was noted and at the time of the site visit, was not very severe. We were informed that the association has some equipment to assist in raking and reshaping the gravels to provide more routine maintenance. This appears to be very viable and allows the association to provide their own maintenance without waiting for another excavation and grading contractor to travel to the property.

Ditches were generally good, with no ditches noted along the bend after the bridge on Ludwig Drive. This area was in need of additional gravel. The cross culvert along Ludwig Drive across from Lots 5 & 6 was damaged. The end was upturned and drainage flows cannot enter the culvert unless the ditch was full. The end should be removed and replaced. Drainage was poor along Lot 59. A small dam was placed in the right-of-way with rocks to maintain a pond level on Lot 59. It is suggested this dam be moved to the right-of-way line to maintain the same pond level on Lot 59 while lowering the standing water along Pine River Ranch Circle to protect the street system. Also, it is suggested to install another cross culvert in the location of Lots 58 and 8 to assist in carrying the upstream water across and under the street in two locations. This section of road is very flat and the ditches have minimal grade. Ditch cleaning/burning in this area is suggested to help maintain the ditch flows. Other areas did not have a true defined ditch section, but with the porous ground, this did not appear to be an issue along Pine River Ranch Circle. A ditch along the uphill side of Ludwig Drive is present and appears to be able to carry the routine drainage flows.

During our site visit, gravel depths were not determined as a part of this review. If necessary, core samples could be obtained. Gravel windrowed along the shoulder edges can be reclaimed unless too contaminated with dirt or weeds to be effective in the road section. Natural loss of gravel is normal for these types of streets.

The Bear Creek culvert along Ludwig Drive did have recent abutment work performed. There is no shoulder in this area and the road is narrow. This area should maintain some reflector posts for night time driving as a cautionary measure. In low visibility, this is one area that could be a problem. The headwall work appears to work, but more work may be needed in the near future.

The bridge structure is reviewed below.

#### **When to Pave a Gravel Road:**

For this discussion, a paved road can be one similar to Ludwig Drive, but is generally meant to mean a street system paved with a hot bituminous pavement (hbp or asphalt). Desired and effective thickness is generally a minimum of a three-inch compacted mat over a properly prepared granular gravel base and subbase. Other types of pavement systems utilizing reclaimed pulverized asphalt are viable, based upon availability of the product.

Most rural areas utilize gravel roads for low volume roads. The decision of whether to pave is definitely a matter of trade-offs. Paving helps to seal the surface and keep rain and snow melt water from infiltrating the base course gravels. Road dust is eliminated, the street is smoother and travel will travel faster along a paved street.



However, in spite of this, well-maintained gravel roads are still very effective. Gravel roads do have lower initial construction costs and sometimes lower maintenance costs. Maintenance requires less equipment and lower operator skill levels. Potholes or depressions can be more easily fixed. Lower driving speeds typically occur. Gravel streets are more forgiving of external forces, such as large trucks, delivery vehicles, construction equipment hauled into job sites which could easily damage or greatly reduce the life of a paved street. This damage would require sealing and or some reconstruction. This type of damage on a gravel road would be much easier to repair.

Overall, there is nothing wrong with a well maintained gravel street system.

Should the road be paved?

- Your association appears to have a reliable maintenance program in place. The association needs to assess its overall needs.
- When traffic demands the street to be paved. Under the current La Plata County Land Use Development Code (LUDC), a subdivision of this density based upon 77 lots would create in excess of 600 ADT's (Average Daily Trips) per day. The LUDC requires streets to be paved when the ADT's exceed 400. Other reference manuals generally fall in the range of 400 to 500 ADT's as a threshold for when paving is suggested or required. Due to the rural nature of your subdivision and seasonal use, your current ADT's is probably under 400. Please remember, passenger cars cause little road damage, while construction truck traffic is the most damaging to the road.
- Paving of the streets will tempt drivers to travel faster. This is sure for the residents as well as delivery vehicles and trucks. The subdivision does have curves which require slower travel speeds. If the streets are paved, drivers may approach some area too quickly, even if cautionary and informational signs are added. Enforcement for driving too quickly is impossible in your area with limited sheriff personnel. Also, some road widening should be considered before paving to provide a consistent street section. Additional cost for this work needs to be accounted for.
- Street paving is ultimately an economic one. Based course materials, crowning and drainage all need to be improved prior to paving. The base structure needs to be sound to provide for the useful design life of the pavement.
- The future maintenance cost of a paved road verses gravel road should be considered.
  - For both paved and gravel roads shoulders need to be maintained, ditches pulled and kept clean, culverts need to be cleaned and signage needs to be maintained.
  - Paved roads require patching, resealing (chip, slurry, and crack seal) and possibly some striping.
  - Gravel roads require regravelling, grading and stabilization of soils or dust control.
  - The later two items above reflect the differences for street maintenance.



- Maintenance on personal vehicles increases when driven on many gravel roads due to greater rolling resistance, less traction, increased fuel consumption. The road roughness contributes to more tire wear and excessive dust if encountered contributes to extra engine wear. This extra cost should be considered in the overall desires of when to pave a road.

#### **Maintaining the Existing Paved Ludwig Drive:**

Ludwig Drive needs maintenance to ensure your initial investment in the pulverized asphalt is effective. It is our understanding that you have obtained a budget cost from Four Corners Materials (Mike Stengel) to chip seal the 0.55 miles of paved road from CR 501 to the bridge. From our conversations, a budget of approximately \$14,000 was presented. Mike Stengel did inform us that asphalt materials have increased along with all other oil based products. Prior to the chip seal placement, some areas should have additional work to provide a better crown to ensure water and snowmelt runoff will quickly travel off the street. A chip seal overlay will seal the surface as well as to provide an additional wearing course. The material is generally a 3/8 inch gravel chip spread over the asphalt binder and rolled with a pneumatic roller to embed the chips into the asphaltic binder. This overlay will last for a number of years, although, some weaker areas may still require pothole maintenance.

Maintenance of the recent asphalt installation is important and we concur that sealing the surface of the pavement is necessary to ensure useful life expectations.

#### **Cost of Materials:**

Material costs obtained from Four Corners Materials have increased over the past year. The following estimating costs were provided to us. Your current contractor, Bruce Neil, should be consulted to determine if his costs are less.

- Pavement material (hbp asphalt) installed is approximately \$80.00/ton. Last year the cost was closer to \$60.00/ton.
- For a 3 inch asphalt mat, coverage is approximately 5.7 to 6.0 sq.yds. of surface area per ton of material. Your street system comprised of 1.9 miles of roads, 22 feet wide would require approximately 4300 tons of material.
- Aggregate base course gravel was quoted at \$22 to \$23 per ton of material.
- Costs for labor and equipment have not been included except for general placement of material. From your past maintenance work, you should have a reasonable numbers for gravel maintenance, snow plowing, etc. Additional work should be budgeted for culvert repairs and a new culvert installation as presented above.
- Labor costs for pulling ditches and shaping/grading the gravel roads are generally the unit cost per hour for a maintainer/grader and backhoe time necessary for the type of work to be performed.



### Bridge Inspection:

As referenced above the site inspection was performed on December 20<sup>th</sup>, 2005. The bridge inspection consisted of a visual observation of the overall condition of the bridge and verifying the structural load rating for the bridge.

The bridge consists of an abutment on each bank, a central support located in the river, and two spans of 30 feet, and 44 feet. The primary structural members that carry the load are two steel "I" beams for each span. The 30-foot span has two beams that are 20-13/16 inches deep with an 8-3/16 inch wide flange. The 44-foot span has two beams that are 24-1/2 inches deep with a 9-inch flange. These "I" beams are braced every 6 feet with 3 1/2 inch steel angles. The deck of the bridge is constructed with 4x12 wood planks that cantilever over the "I" beams by 32 inches. The wood planks are also supported in the middle of their overhang by a 6 inch steel channel with a 2-inch flange. The channel is supported every 6 feet by two pieces of 3-1/2 inch steel angles that are welded to the "I" beams.

The "I" beams are space approximately 6 feet apart so that when a vehicle drives across the bridge the wheels are directly on top of the beams. The wood planks are compressed under the tire, and transfer the load directly to the supporting "I" beams.

The visual inspection of the structure revealed minor wear in the steel. There are small amounts of rust on the members; however this does not affect the structural integrity. The planks seem to be in good shape, there is no evidence of rotting. Although the bridge super structure is in good condition, the railing on the bridge does not meet the American Association of State Highway and Transportation Officials (AASHTO) minimum requirements. The railing height and the connection of the railing to the bridge are not structurally adequate to keep vehicles from driving off the bridge.

The structural analysis performed with the information gathered at the inspection shows that the 64,000 lbs load rating is a safe operational load, as long as all vehicles that use the bridge comply with the rules defined on the road sign on the east side of the bridge. The sign states, "Restricted bridge ahead G.V.W. 64,000 pounds max. Center of tire prints of any and all axles shall not exceed 72 inches. Tires must be centered on "I" beams of bridge super structure."

It is recommended that the wood planks be inspected on a regular basis. If there is any evidence of rotting or wear, the planks should be replaced. The rust on the bridge was minimal, however to protect from further rusting, the steel showing areas of rust should be clean, primed and painted.

### Summary:

In summary, the subdivision street and bridge infrastructure has performed adequately and still performs very well. The association has maintained their infrastructure and at this time some routine maintenance needs to be performed as well as to correct an upturned culvert and possibly install an addition street cross culvert to allow upstream flows a second flow path to carry the flows under the street system with less restriction.

The decision of whether or not to pave the remaining gravel streets should be weighed on the items referenced above. Since the subdivision is not fully built out or occupied on a year round basis, the daily trips generated are at a level where it could be determined to remain 'as is' or where it would be best to pave the system and move in a new direction. Please be aware of how much future construction traffic is still proposed in the development of the remaining vacant lots. The wear and tear caused by the construction traffic far greatly exceeds the normal passenger car trips. This item is probably the most important one to consider in paving of the remaining streets.

Goff Engineering & Surveying, Inc. has been pleased to assist you in your project. If you require any additional information, or if you have any further questions, please do not hesitate to contact us. We are available to meet with you in any schedules meetings.

Very Truly Yours,



Bruce A. Honisch, P.E. & P.L.S.

Goff Engineering & Surveying Inc.



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Garth Glasco, P.E.

Goff Engineering & Survey, Inc.

