
BRIGHTWATER ROADWAYS and DRAINAGE

JUNE 2013



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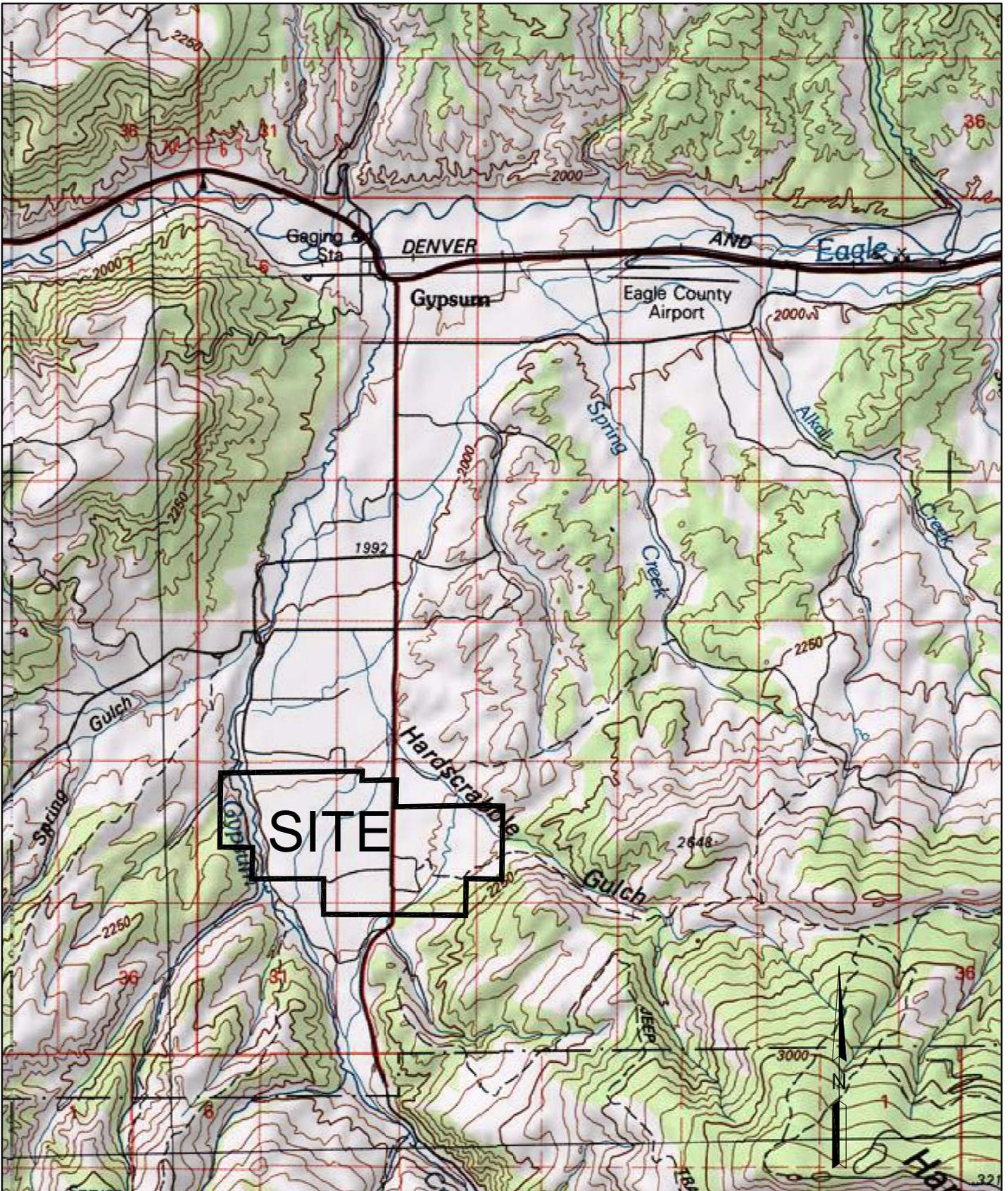
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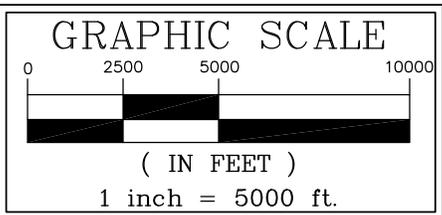


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**BRIGHTWATER
 VICINITY MAP**
 GYPSUM, COLORADO



INTRODUCTION

Brightwater Club Property Owners requested that AEI review the condition of the roads and culverts within Brightwater to better understand future maintenance and asphalt overlays of the roadways and the capitol costs associated with these items. AEI conducted several site visits to examine the roads and culverts, noted the condition of these facilities and documented the findings in this report. AEI has also provided an estimate of the costs associated with future asphalt overlays, an estimate of the approximate time frame for the overlays, an approximate cost to repair the settlement areas (per each) and the current cost, per lineal foot, for crack sealing. These costs are noted in Appendix 2.

ROAD PAVEMENT

In general, the road pavement within Brightwater appears to be in good condition. The exceptions are a large settlement in the outbound lane at the main entrance, numerous areas of water ponding on the asphalt and approximately 30 structures (manholes, inlets and valve boxes) that have some degree of pavement settlement around the structure(s).

The settlement at the entry is centered around a manhole.



Settlement at entry



Settlement around waterline valves in Lantern's Way

The entry settlement is a hazard and in need of repair. The asphalt in this area should be removed and a geotechnical engineer should observe the underlying soils to determine the cause and make repair recommendations. Recommendations might include removal of some of the underlying soils, possible installation of soil reinforcing Geogrid and replacement and compaction of gravel materials and replacement of the asphalt. It also appears the south curb & gutter and adjacent pavement, on both sides of the outbound gate, may have some settlement. A survey of this area may be warranted, to determine the appropriate extent of the roadway repairs in this area.

Areas of water ponding on the asphalt (bird baths) were marked with yellow paint by Tim Taagen following a rain storm.



‘Bird baths’ in pavement

There were approximately 29 depressed areas with ponding identified. Pictures of each of these are included at the end of this report. Many of these areas appear to be in the vicinity of manholes, gate valve boxes, and utility trenches. These may be the result of consolidation of backfill materials. When these become large enough to be problematic they should be repaired. Repairs may consist of removing the asphalt in the depressed areas, compaction of subgrade and patching the asphalt. If the underlying soils are poor then they may also require reinforcement and replacement with good gravel materials.

The pavement section appears to have performed well, in that signs of distressed pavement (alligating, rutting, raveling, bleeding, edge damage, oxidation) are not readily apparent. As stated in the “Preliminary Geotechnical Evaluation, Valagua Property Phase 1, Gypsum, Colorado”, ‘performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings.’ Given the large amount of vacant lots, the pavement has not been subject to significant amounts of construction traffic. When construction traffic increases, additional road maintenance maybe required.



Pavement in good condition

There are a few cracks in the asphalt. These do not appear to be widespread but they should be crack sealed to prevent water from going through the crack and weakening the underlying soils.



Longitudinal crack in asphalt



Asphalt crack

I talked with Jim Hancock of the Town of Gypsum. He indicated the Town had oversight of the construction and that pavement designs were submitted. The Town had contracted with an engineering firm located in Grand Junction, Colorado to provide construction oversight. Additionally, Ground Engineering provided materials testing.

Jim expressed concern regarding the settlement at the guard house and that the settling near the manhole maybe more widespread and that some drainage improvements may be required. Jim also mentioned a couple other areas that had required repair, including a road failure apparently caused by a culvert leaking and a waterline that wasn't deep enough and froze. He also mentioned there were some areas of ponding and settlement, as noted above.

ROAD CULVERTS AND STORM SEWER SYSTEM

In general, the culverts and storm sewer within Brightwater appear to be in good condition. With only a few exceptions, the storm drainage is constructed of concrete and none of the concrete pipe was observed to be broken or crushed. A few of the concrete end sections do have minor damage.

The storm sewer (inlets, manholes and connecting pipes) appeared to be relatively clean and free of sediment. It should be noted that most of the storm sewer piping was inaccessible, however, several of the Type D inlets at the intersection of Brightwater Club Rd & Latigo Trail were entered and the connecting pipes were observed to be clean. There are three Type D inlets at this intersection, with two grates on each inlet and two nuts affixing each grate. Most of these nuts were loose and in one case, missing. The inlet to the south of the intersection also had a substantial amount of dead vegetation (tumble weeds) covering the inlet grates.



Type D inlet.



Inlet in Bridal Path.

Each of the inlets and storm sewer manholes were looked into and appeared to be in good condition with minimal or no sediment observed. Each of the cross-culverts (drainage pipe crossing under a road with flared end sections) were also observed. Most of these pipes had some sediment, typically 1"-2", in the bottom of the pipe and end sections. Most of the pipes also had dead vegetation at each end section.



Culvert under Foxprowl.



Culvert under Foxprowl.

There are a few corrugated metal pipes (CMP's) installed at Brightwater. A total of six, 12" diameter CMP's are installed, two each at the cul-de-sac's on Cutbow, Herons Way and Bucktail. These pipes were installed to provide vehicular access north and south from the cul-de-sac across the roadside ditch. These pipes appeared free of damage and were also free of sediment. A seventh CMP is installed at the north end of Hare's Ear and appears in reasonable condition with only minor siltation.



CMP on the south side of Heron’s Way cul-de-sac. CMP on the south side of Heron’s Way cul-de-sac.

There are two high density polyethylene (HDPE) pipes that were observed onsite. One is under the start of the access to fishing cabin off the west end of Cutbow Lane. It appeared to be in good condition, with minor siltation and no end sections. The second HDPE pipe is a 36” diameter pipe, approximately 160’ long, running under Brightwater Club Drive between Bucktail and Herons Way. The end section at the inlet of this pipe has been partially collapsed by the surrounding rocks. The inlet end of the pipe has some siltation. There is a small belly in the pipe nearer to the outlet end, as well as a depression in the top of the pipe.



Inlet end section of 36” HDPE pipe.



Small belly in the 36” HDPE pipe.

The roadside ditches at Brightwater appeared to be in good condition, with no observed areas that didn’t drain.

MAINTENANCE AND REPAIRS

We recommend that the roads and drainage facilities be inspected on an annual basis. Roads with excessive settlement or distressed areas should be repaired and asphalt cracks should be sealed to prevent water intrusion into the underlying soils. Culverts and drainage ditches/swales should be cleared of sediment and materials that adversely affect their performance. The culvert in pictures 1-4 (photo index 1) has substantial sediment and should be considered for cleaning/flushing. Also, it is recommended the flared end section in picture 114 (photo index 3 & 5) be replaced. This culvert appears to be in a major drainage way and further collapse of the existing end section could cause additional issues.

As noted above, the pavement is generally in quite good condition. Repairs to the settled areas, both at structures and away from structures, could be considered. Beyond the road damage around the gatehouse, it appears that Hearthstone, Foxprowl, Lanterns Way and Bridal Path have the most damage per length of road and might be considered first for repairs. Also, given the low number of homes currently constructed, the streets that currently receive the most traffic may factor into the property owner's priority of which streets undergo repairs. Brightwater Drive, Bucktail, Heron's Way, Cutbow, Saddlehorn and Blue Stem have fewer areas of settlement per length of road than those noted above. One small area of settlement was observed on Lasso and no areas of settlement were observed on Wranglers, Doll Station, Tall Grass or Hare's Ear.

The standard design life for flexible (asphalt) pavement is 20 years, with an overlay typically occurring around 10-12 years after the initial construction. The pavement design (thickness of asphalt and base course) to reach the 20 year life is based on the underlying soils and the anticipated traffic loading (number of vehicle trips and weight of the vehicles). It is probably safe to assume the traffic levels at Brightwater, to this point, have been less than would have been anticipated by the pavement design and this may extend the useful life of the pavement accordingly.

Pavement performance may decrease over time and perhaps at an accelerated rate if/when construction traffic increases. When the condition of the asphalt begins to deteriorate, it will become necessary to overlay the roadways. According to the Town of Gypsum, all of the roads with the exception of Tallgrass and Doll Station were paved in 2007. Tallgrass and Doll Station were constructed in 2010. As noted above, the standard time frame for the first overlay is 10-12 years after construction, however, given the minimal traffic loading, overlays may not be required until a later date. Again, an annual review of the condition of the roads will help the property owners better understand when the need for an overlay is becoming more imminent. Providing an asphalt overlay is quite expensive and it is suggested that money be budgeted for this purpose. Cost estimates to overlay each road are included in Appendix 2 of this report. Please realize the cost of oil can be quite variable and that these estimates are based upon today's dollars. The actual costs may vary significantly.