June 8, 2016

Lazy TH Estates Home Owner's Association
Attn: Kathi Cowdrey

Re: HOA Road Assessment

Kathi,

Thank you for the opportunity to be a part of the road assessment project for the Lazy TH Estates Home Owner's Association. In order to best preserve their investment in the road infrastructure, a proactive approach to maintenance is essential. Our purpose of this assessment has been to gather accurate and representative data to create a live database that illustrates current road conditions and help develop maintenance programs with estimated costs of the future repairs.

The quantity of data collected across the 9,050 feet of road is extensive and we hope that you find it compiled into an informative and easy to use format. The Google Earth platform has been helpful to spatially compile the collected data into an interactive medium that we believe will be beneficial to the HOA when organizing and defining future road management tasks.

As proposed, this assessment also contains an estimated maintenance schedule with recommendations for immediate, short term, and long term maintenance actions. This matrix of information also includes a cash flow forecasting model that distributes costs across the estimated infrastructure service life.

Again, thank you for this opportunity and should you have any questions or need any additional information, please do not hesitate to contact us.

Sincerely,

Chris Wasia, P.E.
Genesis Engineering, Inc.
www.g-e-i.net

Lazy TH Estates Road Assessment

Pavement Assessment and Rehabilitation Options

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I. Executive Summary

Genesis has completed the survey of the existing paved road infrastructure within Lazy TH Estates as directed by the Lazy TH Estates Home Owner's Association (HOA). The total infrastructure reviewed was over 9,000 feet of pavement. Maintaining this amount of infrastructure is challenging and often difficult to prioritize. To help with the challenge of where to begin, we developed an access "use" ranking based on the development's forecasted average daily trips combined with the empirical Pavement Condition Index data recently collected. This data was collected through a process of visually inspecting each observation station for a list of specific issues that pavement experiences as it ages. The "use" factor was determined from extrapolating the number of trips each road on every day based on the number of lots each road services. Looking at the data from this perspective allows the home owner's association to optimize their maintenance budget and to create a priority list of highly used existing infrastructure in need of maintenance. The roads, in descending order of importance, are Terrance Loop Ln., Sir Arthur Dr., Lucille Ln., Rodeo Ct., Legend Ct., and Hofer Ln.

Each road has been specifically programmed for maintenance activities depending on the current road conditions (such as types of failures present and type of asphalt previously used), and the importance of the traveled way. The maintenance and cash flow forecast model within this report is spreadsheet driven and maintains flexibility by allowing the user to make adjustments for fluctuating oil prices and labor costs as well as inflation. Assuming a current reserve of $100K, Genesis' forecast suggests the HOA should be collecting approximately $700 per Lot Owner annually to meet the ongoing and upcoming on future infrastructure maintenance costs including replacement of consumed road infrastructure. The routine annual expenditures to address the ongoing crack sealing, ditch cleaning, and culvert cleaning is estimated to be approximately $30 per Lot Owner. The difference in the funds collected is considered future reserve funds and will be needed to pay for more significant expenditures such as chip seal, remove & replace, and mill & overlay projects.

Genesis observed patterns in the type of pavement failures present in 2016. A few deeper base failures were noted, but the majority of the pavement issues are due to surface failures such as cracking and the breakdown or stripping of asphalt oil between the aggregate. The purpose of this report is to help the HOA document the current road conditions, identify the highly used and specific locations in need of ongoing maintenance and suggest adequate treatments and timing of such projects. Greater detail is outlined in the Road Matrix section of this report.

II. Introduction

Genesis thanks you for the opportunity to be of service to the Lazy TH Estates Home Owner's Association. It is our understanding that the HOA has pursued this overall road assessment to help prioritize repairs and maintenance of the road network within the boundaries of the Lazy TH Estates Sub-division. With almost 2 miles of road infrastructure to manage and maintain, we recognize that an evolving plan and database is necessary to stay ahead of infrastructure deterioration.

Photo II.1: *Lazy TH Estates Infrastructure Network, Bozeman, MT.*

The road infrastructure in Lazy TH Estates is well used every year. Rain, snow, groundwater flow, construction vehicles and snow plows all take a toll on the pavement surface. Repairing roads in Montana's climate can require frequent efforts, however the overall maintenance costs during the life of the infrastructure can be significantly reduced by proactive maintenance. The costs of minor pavement repair and preservation are much less than the costs of total road rehabilitation. It is imperative that the management team consistently identify the best time to make the most cost effective repairs through **pavement preservation** rather than incurring greater expenses as the result of **reactive maintenance**.

We also understand that it can be difficult to prioritize road maintenance, however, one of our objectives is to create a simple way to organize this data in a practical and easy to use manner. The Pavement Condition Index (PCI) is a main factor used in developing this prioritization. In addition, a road

that services 25 lots should have a greater priority over a road that only services 2 lots, even if they may exhibit similar pavement conditions. Hence, pavement condition along with the number of average daily trips (ADT) was used to identify when and where repairs should likely be made.

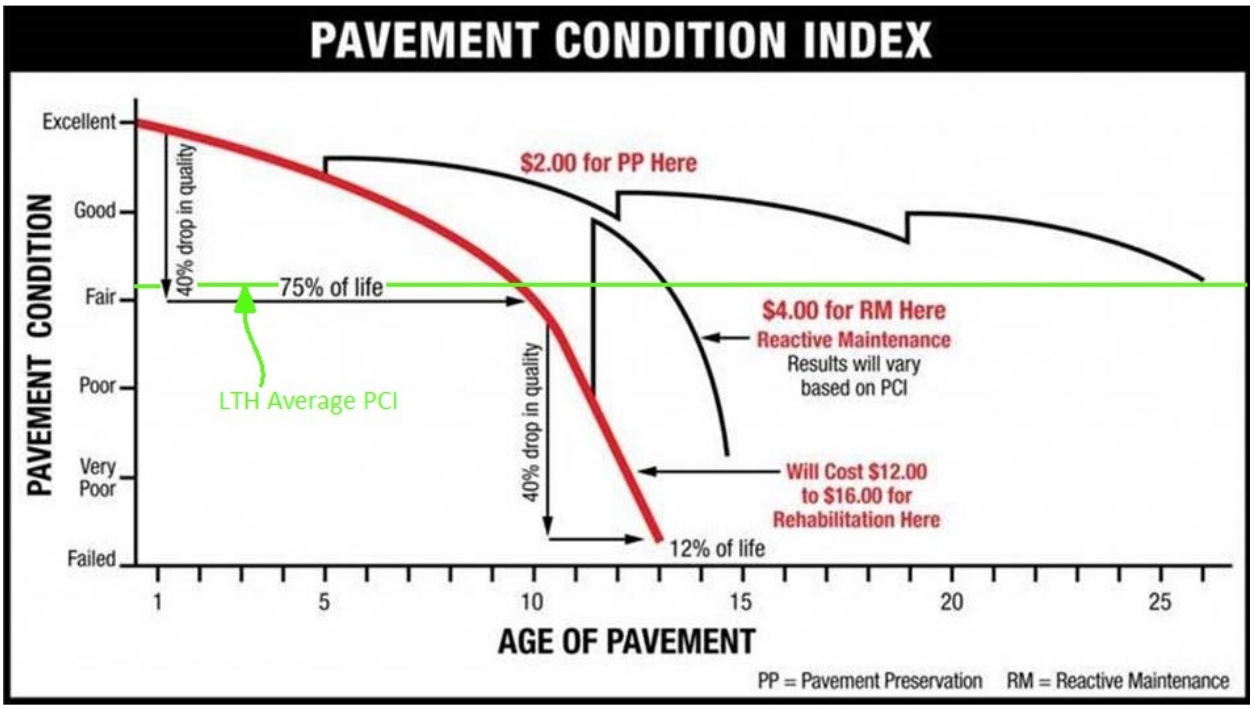


Figure II.2: *PCI Chart where the green line is Lazy TH Estates average PCI.*

Please bear in mind this assessment is limited to the top two feet of the road section. Any issues or remedies associated with deeper sub-grade failures will need additional consultation (geotechnical) to verify estimated modes of failure and help develop more accurate deep repair costs for the forecasting models. It is important to note that Genesis did not observe any deep failure characteristics at this time. We have accounted for general inflation but maintenance budgets will need to be routinely updated as labor and oil prices can fluctuate with time. Since design and construction administration costs shall be expended at the time of each maintenance project execution, estimates of those costs are also included in the cash flow forecasting model.

III. Background Terminology

Settlement Areas

When the full road section is unstable due to poor compaction of base materials or wet weaker subgrade soils, pavement can displace and settle. Shoulder sags can make the road dangerous to travel on due to instability. When filled with water, settlement areas are often referred to as "bird baths", holding water that further accelerates the weakening of the road structure.

Photo IIII.1: *Terrance Loop Rd Settlement Station 6+00 – "Bird Bath"*

Photo IVII.2: *Rutting on Sir Arthur Dr. Station 10+00*

Rutting

Rutting is a longitudinal depression in the road surface that creates channels in wheel paths. Traffic induced compaction due to a weak base or subgrade can cause rutting as well as deformation of the pavement matrix. Significant rain and rut depth can present an unsafe condition because automobiles may experience hydroplaning, losing all traction. The water held in the rut channels also weakens pavement surfaces causing aggregate erosion, additional cracking, frost heaving, and accelerated base weakening.

Transverse Cracking

Movement of the roadway surface and base can form transverse cracks that occur perpendicular to the centerline. Transverse cracking generally begins widely spaced apart, but additional cracking can occur with further aging, traffic loading, and temperature changes. Once water enters the cracks, they may branch out to form new cracks and more problems will arise. The drivability of a road with unsealed transverse cracks doesn't become dangerous as much as irritating and less pleasant.

Photo III.3 *Transverse cracking Lucille Ln Station 6+00*

Longitudinal Cracking

Cracks that run in the direction of traffic are longitudinal cracks. If inadequate lift/seam bonding was done during construction, centerline cracks or lane cracks occur. Longitudinal cracking in the wheel paths indicate fatigue failure from heavy vehicle loads. Once water enters the crack, it becomes wider and deeper and in time branches out to form more lateral cracks. These multiple cracks weaken the roadway section and can lead to other issues such as base contamination, alligator cracking, and potholes.

Photo III.4: *Lucille Ln Longitudinal Cracking Station 10+00*

Photo III.5: *Rodeo Ct. Edge Cracking Station 4+00*

Shoulder Cracking

Shoulder cracks are caused by insufficient base support at the edge or poor drainage away from the road and will eventually become wider and deeper, working their way into the traveled way. When the cracks are exposed, they allow water to enter the road section which weakens and breaks the pavement completely away from the road, forming drop-offs. Shoulder drop-offs discreetly narrow the width of the road which can result in tire damage and make driving unsafe.

Aggregate Asphalt Erosion

Raveling, or scouring, is the loss of asphalt material from the surface. If asphalt pavement isn't compacted well (especially in cold weather construction) or if the asphalt mix is poor in strength and quality, a "washed off" look will appear where the aggregate is exposed. Once the road surface begins to ravel, typical vehicles can further break it up making it behave more like a gravel road than a paved one. This damaging process accelerates with the presence of rain or snow because water can be easily held in the surface causing oxidation and freeze thaw wedging leading to further deterioration. Studded snow tires and chains also accelerate the deterioration.

Photo III.6: *Hydro scouring Terrance Loop Rd at Station 12+00*

Reasonable & Suggested Surface Repair Processes

Remove and Replace

When characteristics suggesting base failure are observed, usually through severe rutting and classic alligator cracking, removal of the affected pavement and base gravels from 6" to 12" is often considered. In order to facilitate a speedy repair, often full depth asphalt in multiple lifts is used to replace the gravels as well. This type of repair would occur prior to a chip sealing or mil and overlay scenario in order to achieve a competent base.

Chip Seal

Once all of the remove and replace areas are identified and completed, a 3/8" chip seal is often applied to seal the top surface of the asphalt from damaging water and provide an additional wearing surface. This is a vital process and tool that can be used to keep water out while replacing the wear surface that is often removed by studded snow tires, chains, and snow plowing.

Mill and Overlay (M+O)

Where the road gravel base appears to be adequate, but additional pavement strength and sealing is needed, milling the existing surface and an overlay is often utilized. Based on field conditions, roughly one inch of asphalt surface is milled away leaving a virtually crack and oxidation free surface ready to receive anywhere from 2"-4" of new asphalt surfacing. This method removes existing asphalt surface issues and provides an increase in pavement strength in a relatively short construction time.

IV. Methods

The 2016 road assessment started with the collection data for every stretch of paved road in Lazy TH Estates totaling 1.7 miles of road. Data collection began on May 23rd, 2016 and ended on May 24th, 2016. The data was collected on 200 foot intervals, resulting in a total of 52 collection areas. Genesis recorded information on all connecting driveways and road culverts independent of the 200 foot intervals. The raw details can be seen in the data collection in the Appendix, however a more user friendly way to use this information is through the G.I.S. Model that can be found HERE.

Photo IV.1: *Sir Arthur Dr. at Station 14+00 Observation*

Our data collection included the following infrastructure items:

- Shoulder conditions
- Road Way conditions
- Drainage conditions
- Signs

Genesis quantitatively documented road characteristics such as width, length of longitudinal cracking and length of traverse cracking. We also noted on site any qualitative observations. In addition to written data, over 500 photos were collected documenting the current conditions and are linked to our written data entries within the G.I.S. Model.

Photo IV.2: *Terrance Loop Rd. Observation at Station 14+00.*

V. Findings

The Lazy TH Estates Sub-division roads have an average Pavement Condition Index (PCI) of 3.18 on a scale from 0 to 5 with 5 being the best pavement condition and 0 being the worst. This puts the overall condition of the road infrastructure in the good to fair category.

Photo V.1: *Lazy TH Estates PCI Results. More severe areas are shown in red.*

There are four roads that fall below the PCI average with two roads having a better than the average PCI. Statistically speaking, there are three roads that fall below one-half of a standard deviation of the average PCI. They are as follows:

1. Terrance Loop Rd. (C)
2. Lucille Ln. (D)
3. Rodeo Ct. (F)

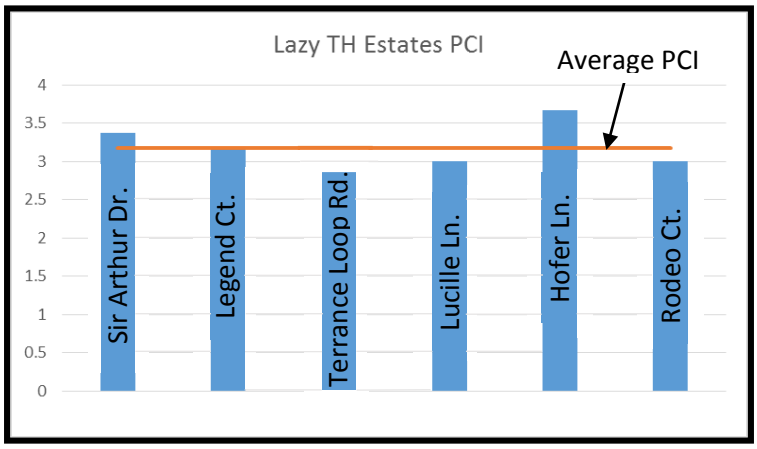


Figure V.2: *PCI Bar Graph with Average PCI*

Conditions, Culverts, and Ditches

Genesis compiled all of the findings into the G.I.S. model overlaid onto aerial photos. The information when viewed together readily shows the problem areas and possible patterns. We have summarized some of the collected data within the following figures. The 11x17" plan sheets can be found in the Appendix.

Rutting

Although rutting was not a major issue, it was observed that many locations exhibited at least some minor rutting of 0.125" or less. Of the 52 stations observed, 24 locations, shown in yellow, exhibited rutting from 0.25" to 0.5" and another 10 locations, shown in red, had rutting greater than 0.5".

Photo V.3: *Lazy TH Rutting Map. Yellow indicates 0.25" – 0.5" of rutting. Red shows areas greater than 0.5" of rutting.*

Longitudinal and Transverse Cracking

Approximately 7,500 LF of existing roadway cracking was observed on the sub-division roads, however most of this cracking had been previously treated with sealant and has re-cracked. Micro cracking is an inherent problem with crack seal. It can be caused from over-heating of the material, prolonged heating of the product, or aged crack seal can crack from UV exposure. It usually is not an issue to the full depth of the product, normally the cracking remains on the surface. The numerous freeze thaw cycles present here in Montana is exceptionally hard on crack seal.

Photo V.4: *Crack sealant appears to be failing in tension on driveway interface and traverse crack across Sir Arthur Dr. at Station 13+00.*

Culverts

Culverts that are crushed, completely buried, or 100% full of sediment can also cause runoff to travel in undesirable locations. Both road and driveway culverts are important parts of the network intended to convey drainage away from the roadway. Approximately 30 culverts are recommended to be uncovered, cleaned and/or repaired in the near future. Routine inspection and maintenance of all culverts should be conducted every spring to identify any problematic areas. Additionally, there are a few places that are missing culverts where one would typically be located. Below are some culverts we have identified as needing some attention as well as an area missing a culvert. The asterix signifies a priority concern.

Photo V.5: *Driveway culvert full of sediment Lucille Ln. at Station 11+00***.**

Photo V.6: *No culvert at the intersection of Rodeo Ct. and Sir Arthur Dr. at Station 20+00.*

Culvert Findings

Sir Arthur Dr.

1. *Station 0+00 Road Culvert 18" CMP culvert crushed on both sides. Photo
2. Station 2+00 Left Driveway 12" CMP culvert almost half full. Photo
3. *Station 4+00 Left Driveway 12" CMP culvert outlet blocked with landscaping. Photo
4. Station 8+00 Left Driveway 12" CMP full of sediment. No photo
5. Station 10+00 Intersection missing culvert. Photo
6. Station 13+00 Left Driveway 12" CMP culvert outlet covered with cloth. No photo
7. Station 20+00 Intersection missing culvert. Photo
8. Station 24+00 Right Driveway 12" HDPE culvert almost half full. Photo

Terrance Loop Rd.

1. Station 6+00 Road Culvert 18" CMP culvert slight crushing crushed on right side. No photo
2. Station 10+00 Left Driveway 12" CMP culvert half full. Photo
3. Station 10+00 Right Driveway 12" CMP culvert half full. Photo
4. *Station 18+00 Left Driveway 12" HDPE culvert almost full. Photo
5. *Station 28+00 Left Driveway missing culvert. Photo
6. *Station 30+00 Left Driveway 12" CMP culvert crushed & full. Photo
7. *Station 30+00 Right Driveway 12" HDPE blocked with landscaping. Photo
8. *Station 32+00 Road 12" CMP culvert crushed on right side & half full. Photo
9. Station 34+00 Right Driveway 12" CMP buried. No photo

Lucille Ln.

1. *Station 2+00 Right Driveway Culvert 12" CMP crushed and filled. Photo
2. Station 3+00 Left Driveway 12" HDPE culvert full. Photo
3. Station 6+00 Road 18" CMP Culvert partially full. Photo
4. *Station 9+00 Left Driveway missing culvert. Photo
5. *Station 10+00 Left Driveway missing culvert. Photo
6. Station 11+00 Right Driveway 12" CMP culvert half full. Photo

Rodeo Ct.

1. *Station 4+00 Driveway Culvert 12" CMP buried. Photo
2. *Station 4+00 Driveway Culvert 12" HDPE full. Photo

Road Side Ditches

The majority of the roadside ditches are in good condition and are functioning properly. However, there are a few areas that we observed could use some maintenance. The cul-de-sacs at the ends of Legend Ct and Rodeo Ct. essentially have no ditch. These areas are unable to direct water away from the road and into culverts efficiently. There are also three (3) construction access ramps and a landscaping bridge running across the road side ditch that prevent efficient water flow or conveyance. See *Figure V.7* for clean ditch clarification.

Photo V.7: *Typical clean ditch Sir Arthur Dr. at Station 18+00.*

Sir Arthur Dr.

1. Station 12+00 Right Side Construction Access to be removed or culvert added. Photo
2. Station 26+00 Left Side Construction Access to be removed or culvert added. Photo
3. Station 26+00 Right Side Landscaping Bridge Noted. Photo

Legend Ct.

1. Station 4+00 No ditches. Photo

Terrance Loop Rd.

1. Station 37+50 Right Side Construction Access to be removed or culvert added. Photo

Rodeo Ct.

1. Station 4+00 No ditches. Photo

Photo V.8: *Map showing ditch maintenance spots.*

Road Summaries

The observed specific road summaries and suggested maintenance and/or repairs are contained within this section. Included is the combined Rank for each road in terms of PCI and ADT in descending order of importance. Please feel free to open the Google Earth G.I.S. model found HERE to use as a visual guide while reading this section.

Drainage Patterns

The existing drainage system is such that Lucille Lane and the east-west portion of Terrance Loop Road drain into Sir Arthur Dr. and from there, drain towards Patterson Rd. The dividing point for Lucille is at the intersection of Terrance Loop and then drains towards Sir Arthur. Likewise, Terrance Loop has its high point at the intersection with Hofer Ln. and the east-west route drains towards Sir Arthur and the north-south section drains towards Patterson Rd. This drainage routes need to maintained and kept clear of sediment, obstructive landscaping and debris. The pavement observations are as follows:

Sir Arthur Dr. (A) **PCI = 3.36** **Rank = 5**

This road is one of the best roads among the six in Lazy TH Estates with its condition falling into the fair to good category. However, some rutting without alligator cracking was observed. The entire length of road averages approximately 0.25 inches of rutting depth in both lanes. Most of the visible cracks recorded on Sir Arthur have been previously treated with crack sealant and have started to crack again. Roughly 2,300 linear feet of sealed and unsealed cracks were recorded. Also the wearing surface has become highly oxidized from 20 years of use will likely lead to more cracking in the near future. The asphalt is also experiencing scouring or raveling in many places which increases surface area as well as the rate of oxidation. From our observations we would suggest removing and replacing any base failure areas (rutting teamed with alligator cracking) followed with a chip seal treatment in the near future. Depending on how the chip seal performs, we would then anticipate 5 to 7 years later a 1-inch mill of the existing surface pavement followed with a 2-inch overlay with new hotmix asphalt. Due to plow and studded snow tire abrasion we have observed, we would also propose a chip seal treatment 7-10 years after the overlay to seal and protect the surface.

Photo V.9: *Significant rutting on Sir Arthur Dr. at Station 10+00.*

Photo V.10: *Typical hydro-scouring on Sir Arthur Dr. Station 18+00.*

<u>Legend Ct. (B)</u> **PCI = 3.17** **Rank = 4**

Legend Ct. is a 400-foot cul-de-sac street off of Sir Arthur Dr. providing access to five lots. The end of the cul-de-sac shows some settlement and cracking. The only concern with this section of road is the settlement areas at the end of the cul-de-sac as well as the absence of ditches around the cul-de-sac. Based on our observations, we propose the same approach to a long term solution as previously mentioned above.

Photo V.11: *Settlement at Station 4+00 forming a "Bird Bath."*

Photo V.12: *No drainage at the cul-de-sac of Legend Ct. at Station 4+00.*

<u>Terrance Loop Rd. (C)</u> **PCI = 2.88** **Rank = 1**

Terrance Loop (3,575 feet) is in the worst condition among the six roads in Lazy TH Estates with the condition falling into the poor to fair category. Rutting appears to be one of the leading problems on this section of the sub-division, with 70% of the observation stations having noticeable rutting depth of at least 0.25", the stations without an observation had 0.125" of rutting. Most of the cracks recorded on Terrance Loop have been previously treated with crack sealant and have cracked again. Roughly 1,700 linear feet of sealed and more recent unsealed cracks were recorded. The wearing surface has become highly oxidized from age and will likely cause more cracking in the future which may lead to additional problems. The surface is also experiencing scouring or raveling in some places which increases the rate of oxidation. From our observations we would suggest removing and replacing any base failure areas (rutting teamed with

Photo V.13: *Terrance Loop rutting/settlement at Station 6+00.*

alligator cracking) followed with a chip seal treatment in the near future. Depending on how the chip seal performs, we would then anticipate 5 to 7 years later a 1-inch mill of the existing surface pavement followed with a 2-inch overlay with new hotmix asphalt. Due to plow and studded snow tire abrasion we have observed, we would also propose a chip seal treatment 7-10 years after the overlay to seal and protect the surface.

Photo V.14: *Terrance Loop cracking and hydro-scour at Station 16+00.*

<u>Lucille Ln. (D)</u> PCI = 3.00 Rank = 2

Lucille Ln. (1,300 feet) condition falls into the fair to good category and is ranked the second road in the need of maintenance in the sub-division, taking PCI and ADT into account. Again we observed rutting as a concern, more particularly, with the right lane, traveling East bound, having twice as much rutting as the left lane. A majority of the observation points (63%) displayed rutting depths of 0.25 inches or greater. Most of the cracks recorded on Lucille that have been previously treated with crack sealant are beginning to re-crack. Roughly 1,300 linear feet of sealed and recent or unsealed cracks were recorded. Lucille Lane displays many of the common pavement issues that have been observed throughout the Lazy TH development. Based on our observations, we propose the same approach to a long term solution as previously mentioned above.

Photo V.15: *Lucille Ln. sealed cracks that are starting to crack again at Station 12+00.*

Hofer Ln. (E) **PCI = 3.67** **Rank = 6**

Hofer Ln. is a 400-foot street off of Terrance Loop Ln. providing access to only two lots with in the subdivision. It also provides connection to existing tracts to the south of Lazy TH. This road appears to be in the best condition of any within the sub-division likely due to minimal traffic. However, oxidation and hydro-scouring along the entire section are the prevailing issues with this road. From our observations we would suggest the same long term solution as the rest of the roads.

Photo V.16: *Typical Oxidation of Hofer Ln. at Station 2+00.*

Rodeo Ct. (F) **PCI = 3.00** **Rank = 3**

Rodeo Ct. is a 400-foot cul-de-sac street off of Sir Arthur Dr. providing access to four lots. The end of the cul-de-sac shows some edge settlement and cracking due to improper drainage. The main concern with this section is the settlement in the bulb as well as the lack of ditches around the cul-de-sac draining water away from the edge of the road. From our observations we would suggest completing some ditch forming and the same long term solution as the rest of the roads.

Photo V.17: *Settlement and cracking in the cul-de-sac on Rodeo Ct. at Station 4+00.*

Photo V.18: *Lack of drainage ditches at the cul-de-sac on Rodeo Ct. Station 4+00.*

Summary

The overall condition of the roads falls into the fair category with Terrance Loop Road and Lucille Lane needing the most attention at this time. The common issues Genesis observed throughout the sub-division were scouring/raveling, rutting, and cracking of the asphalt pavement. The scouring may be, in part, to do with the shape of the selected aggregate for the pavement. The aggregate present on the roads is typically round and smooth as opposed to a more ideal aggregate which has fractured faces and is much more angular in shape to enhance the interlock and bonding between the materials. Genesis also noted that almost every driveway-road interface was cracked and in need of sealing so as to keep water out of the road cross section. Many lawn sprinkler irrigation systems were observed to be adding water to the pavement from not being properly aimed. Additionally, some of the driveway culverts would benefit from routine maintenance such as sediment and debris removal as well un-crushing and reshaping the ends. From our observations we would suggest removing and replacing any base failure areas (rutting teamed with alligator cracking) followed with a chip seal treatment in the near future. Depending on how the chip seal performs, we would then anticipate 5 to 7 years later a 1-inch mill of the existing surface pavement followed with a 2-inch overlay of hotmix asphalt. Due to plow and studded snow tire abrasion we have observed, we would also propose a chip seal treatment 7-10 years after the overlay to seal and protect the surface. A summary of all data collected is in the appendix.

Photo V.19: *Water from sprinklers ponding in rut along Terrance Loop.*

Road Matrix - Estimated Costs & Time Line

Based on our observation, data collection, and study, Genesis has developed a maintenance program or menu consisting of initial or catch-up maintenance items, estimated annual maintenance tasks, and long term maintenance items. A table of these tasks and associated costs can be seen in Figure V.20 below. This information is used throughout the rest of the forecasting models.

Lazy TH Estates 2016 Road Matrix

ID	Road Name	Timeframe	Work																			Total EST. Cost
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)							
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost					
A	Sir Arthur Dr.	Annual	10	$ 4.00	$ 40.00	304	$ 1.50	$ 456.39		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 496.39
		1	116	$ 4.00	$ 465.00	922	$ 1.50	$ 1,383.00		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 1,848.00
		2	-	-	-	-	-	-	2470	$ 6.00	$ 14,820.00		$ 0.33	$ -		$ 2.00	$ -					$ 14,820.00
		3	-	-	-	-	-	-		$ 6.00	$ -	67,349	$ 0.33	$ 22,225.28		$ 2.00	$ -					$ 22,225.28
		4	-	-	-	-	-	-		$ 6.00	$ -		$ 0.33	$ -	67,349	$ 2.00	$ 134,698.67					$ 134,698.67
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)							
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost					
B	Legend Ct.	Annual	10	$ 4.00	$ 40.00	83	$ 1.50	$ 124.99		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 164.99
		1	40	$ 4.00	$ 160.00	250	$ 1.50	$ 375.00		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 535.00
		2	-	-	-	-	-	-	195	$ 6.00	$ 1,170.00		$ 0.33	$ -		$ 2.00	$ -					$ 1,170.00
		3	-	-	-	-	-	-		$ 6.00	$ -	9,660	$ 0.33	$ 3,187.80		$ 2.00	$ -					$ 3,187.80
		4	-	-	-	-	-	-		$ 6.00	$ -		$ 0.33	$ -	9,660	$ 2.00	$ 19,320.00					$ 19,320.00
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)							
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost					
C	Terrance Loop Rd.	Annual	10	$ 4.00	$ 40.00	405	$ 1.50	$ 607.14		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 647.14
		1	100	$ 4.00	$ 400.00	1214	$ 1.50	$ 1,821.60		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 2,221.60
		2	-	-	-	-	-	-	1729	$ 6.00	$ 10,374.00		$ 0.33	$ -		$ 2.00	$ -					$ 10,374.00
		3	-	-	-	-	-	-		$ 6.00	$ -	90,244	$ 0.33	$ 29,780.44		$ 2.00	$ -					$ 29,780.44
		4	-	-	-	-	-	-		$ 6.00	$ -		$ 0.33	$ -	90,244	$ 2.00	$ 180,487.50					$ 180,487.50
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)							
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost					
D	Lucille Ln.	Annual	10	$ 4.00	$ 40.00	176	$ 1.50	$ 263.57		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 303.57
		1	53	$ 4.00	$ 210.00	527	$ 1.50	$ 790.80		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 1,000.80
		2	-	-	-	-	-	-	3250	$ 6.00	$ 19,500.00		$ 0.33	$ -		$ 2.00	$ -					$ 19,500.00
		3	-	-	-	-	-	-		$ 6.00	$ -	31,460	$ 0.33	$ 10,381.80		$ 2.00	$ -					$ 10,381.80
		4	-	-	-	-	-	-		$ 6.00	$ -		$ 0.33	$ -	31,460	$ 2.00	$ 62,920.00					$ 62,920.00
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)							
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost					
E	Hofer Ln.	Annual	0	$ 4.00	$ -	72	$ 1.50	$ 107.59		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 107.59
		1	0	$ 4.00	$ -	215	$ 1.50	$ 322.80		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 322.80
		2	-	-	-	-	-	-	195	$ 6.00	$ 1,170.00		$ 0.33	$ -		$ 2.00	$ -					$ 1,170.00
		3	-	-	-	-	-	-		$ 6.00	$ -	9,720	$ 0.33	$ 3,207.60		$ 2.00	$ -					$ 3,207.60
		4	-	-	-	-	-	-		$ 6.00	$ -		$ 0.33	$ -	9,720	$ 2.00	$ 19,440.00					$ 19,440.00
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)							
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost					
F	Rodeo Ct.	Annual	10	$ 4.00	$ 40.00	115	$ 1.50	$ 171.78		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 211.78
		1	40	$ 4.00	$ 160.00	344	$ 1.50	$ 515.40		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -					$ 675.40
		2	-	-	-	-	-	-	195	$ 6.00	$ 1,170.00		$ 0.33	$ -		$ 2.00	$ -					$ 1,170.00
		3	-	-	-	-	-	-		$ 6.00	$ -	9,700	$ 0.33	$ 3,201.00		$ 2.00	$ -					$ 3,201.00
		4	-	-	-	-	-	-		$ 6.00	$ -		$ 0.33	$ -	9,700	$ 2.00	$ 19,400.00					$ 19,400.00

Figure V.20: *Forecasted maintenance items and associated costs.*

The next step is to define what takes place and when. The maintenance matrix model (spread sheet) allows the user to change timing of the prescribed maintenance activities by placing the "X" in the desired year in which the task will take place. This simple approach takes into consideration the flexibility often necessary for a changing schedule and provides real-time cost analysis so effective decisions can be made.

Prescribed Work	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
Work	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Annual Maintenance		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Initial Catchup	X																											
Remove & Replace		X					X							X														X
Chip Seal		X												X														
Mill & Overlay							X																					X

Figure V.21: *User defined forecasted time line for prescribed maintenance items.*

The last part of the maintenance matrix model illustrates the HOA cash-flow with respect to time. Based on the budget data and time line from above, the cash-flow model takes into consideration inflation and the time value of money to better identify the forecasted budget liabilities and estimate the dues needed to meet those liabilities.

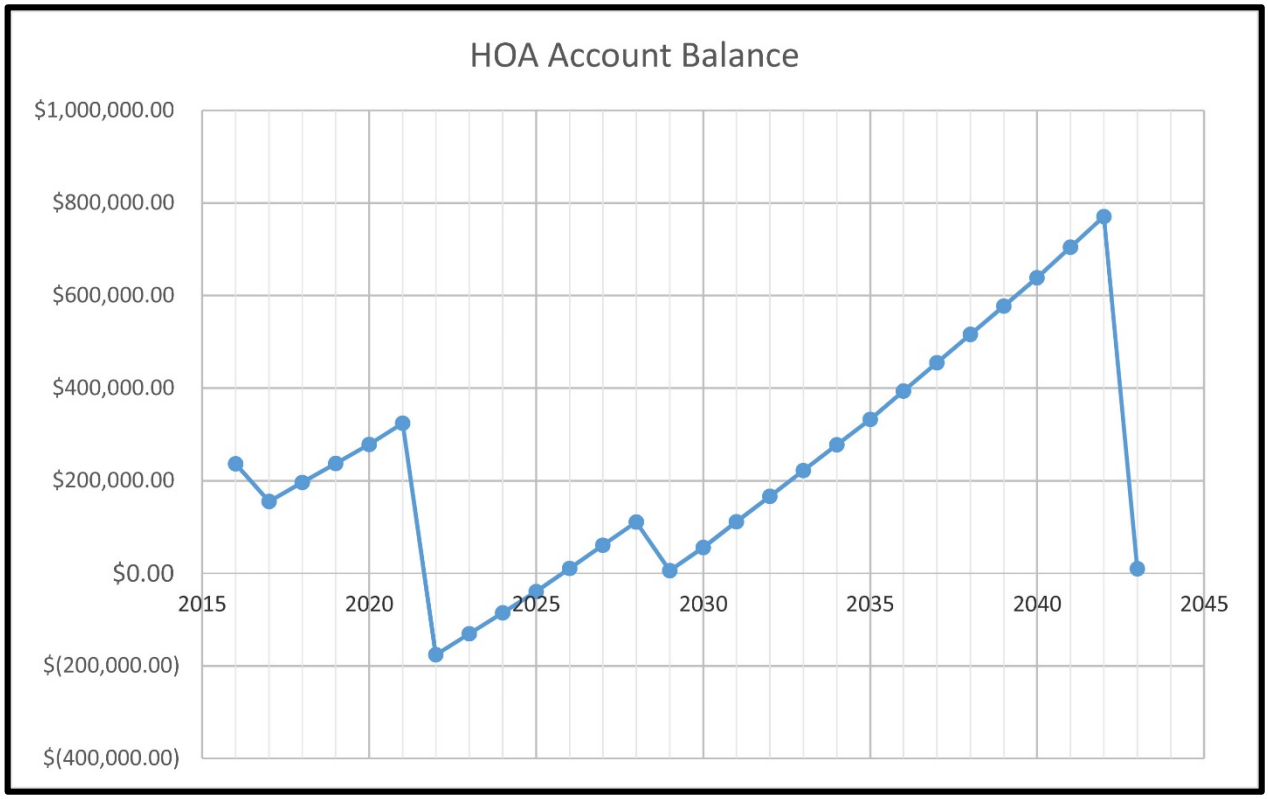


Figure V.22: *HOA cash flow balance for road future maintenance costs. 2" Overlays are shown in 2021 and 2042.*

The significance of this illustration is to identify the future expenditures and budgets needed to complete the forecasted maintenance. It shows how the timing of proposed maintenance tasks can be adjusted from year to year to better level out the planned expenditures. It also shows that a reserve fund is necessary to stay cash-flow positive with the HOA Account and that additional funding may be necessary where cash-flow is negative.

The results of the preliminary analysis by Genesis suggest that from the 68 Lazy TH Estates lots, approximately $660 per lot per year will need to be collected and attributed to the road infrastructure maintenance fund to accomplish the future maintenance tasks as outlined in Figure V.21. A working copy of the Road Matrix and estimated costs can be found HERE and in the appendix. Further modifications and adjustments can be implemented to fine tune the cash-flow model to obtain the desired budget amounts or scope of work for a given year.

G.I.S. Model Description

One of the objectives of this road assessment is to assimilate all of the photos and data collected into a user friendly format that is easy to use and retrieve when needed at a later date. The G.I.S. system used in this assessment is Google Earth. You will need to have Google Earth loaded on your computer to view the model. The three main components of the G.I.S. model are Geo-Referencing, Data/Photo Indexing and Data Retrieval. Model can be found HERE.

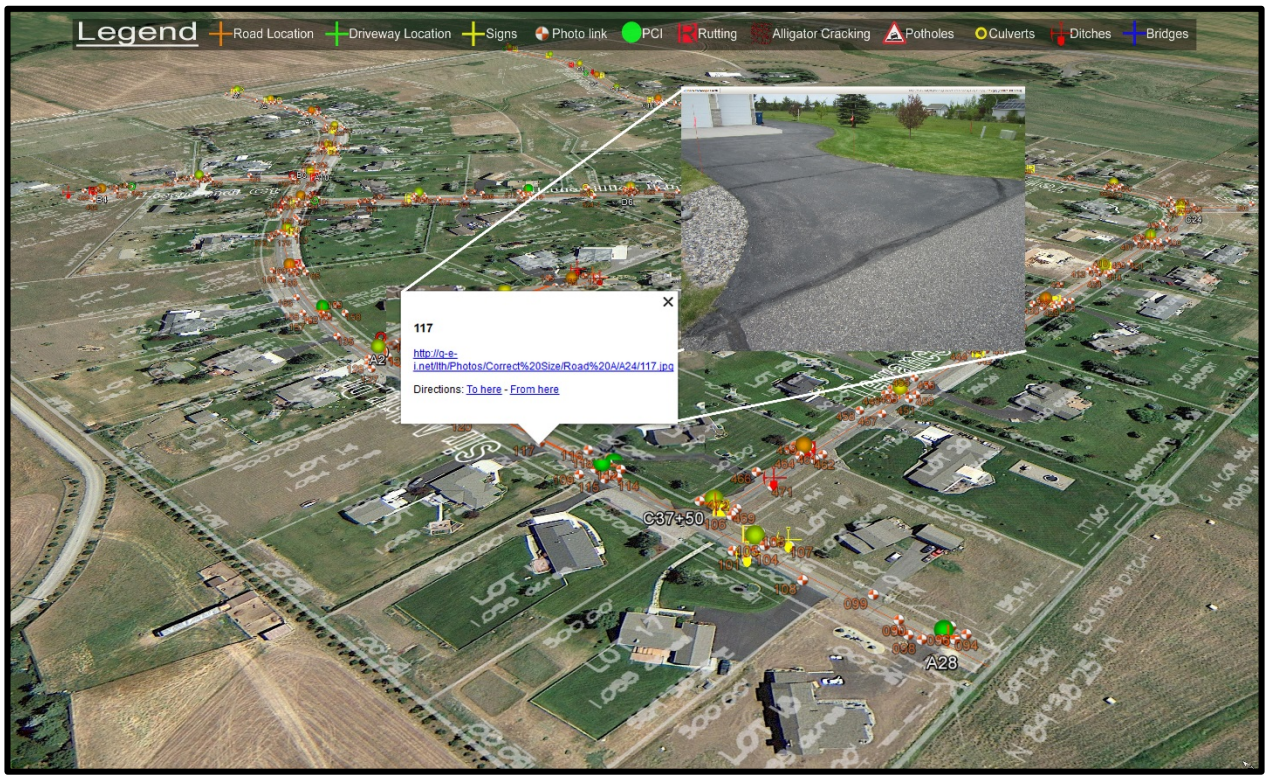


Photo V.23: *Lazy TH G.I.S. Model.*

Geo-Reference

The purpose of the Geo-Referencing system is to systematically organize and tie the data collected to the ground. There are location markers placed at 200 foot increments along every surveyed road. We assigned an alpha-numeric label to each location which describes the road name and station of each data point. Each road was labeled with an arbitrary letter A-F. Sir Arthur Dr. was labeled A, Legend Ct. B, Terrance Loop Ln. C, Lucille Ln. D, Hofer Ln. E, and Rodeo Ct. F. A number was then assigned to each station. For example, the point of beginning on Sir Arthur Dr. is A0 and the next station on Sir Arthur Dr. is 200 feet further along the road and labeled A2. If photos were referencing "A6" it would indicate the location is 600 feet from the origin of Sir Arthur Dr.

Data/Photo Indexing

Genesis also collected detailed notes along with photos providing a more thorough description. Genesis compiled over 500 photos that are organized and accessed through the G.I.S. model. For example, to

view pictures of the cul-de-sac shoulder at B4, one can easily navigate to that location in the Google Earth model and then find the links for all the photos collected at that location. The photos are labeled with the file number ranging from 090 to 552 and are marked with a Genesis logo icon. Just click the icon and hit the link in the dialogue balloon and it will take you to an online directory of all the photos at that specific location.

Data Retrieval

All of the field data collected is also recorded in hardcopy on Field Data Collection sheets and can be found in the Appendix with over 50 sheets of data. This data has also been programmed into the G.I.S. model as "observation layers".

The G.I.S. data is as follows:

- Pavement Condition Index (PCI)
- Rutting
- Ditches
- Culverts
- Miscellaneous Items
  - Alligator Cracking
  - Settlement

Each observation layer can be turned on or off allowing the user to combine and overlay certain data or look at each layer separately. This can be a powerful tool in finding correlations between certain pavement failures.

Most of the observational data layers are also color coded. Data collected that varies in quality or severity has been assigned a color code. For example, any rutting that is less than or equal to 0.5" deep is colored yellow, while rutting greater than 0.5" deep is colored red. Generally speaking, the colors range from green to red (green = best, red = worst). We hope this G.I.S. tool helps organize the data that is needed to manage the road infrastructure in Lazy TH Estates.

VI. Conclusion

After reviewing all of the collected data we believe the road conditions Lazy TH Estates are in fair to good condition. The road infrastructure is aging and in need of some routine maintenance and time is of the essence.

To help with the challenge of where to begin, we developed an access "use" ranking based on the development's forecasted average daily trips combined with the empirical Pavement Condition Index data collected in May of 2016. This allows the HOA to maximize their maintenance budget and operate from a priority list of highly used existing infrastructure in need of maintenance.

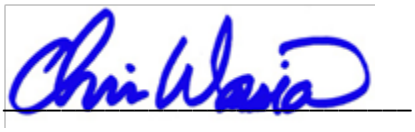
Each road has been specifically programmed for maintenance activities depending on the current road conditions (such as types of failures present and type of asphalt previously used), and the importance of the traveled way. The maintenance and cash flow forecast model within this report is spreadsheet driven and maintains flexibility by allowing the user to make adjustments for fluctuating oil prices and labor costs, including inflation. The current forecast suggests the HOA needs to be collecting approximately $660 per lot owner annually to meet the ongoing and upcoming maintenance costs including the replacement of consumed road infrastructure. The routine annual expenditures to address the crack sealing, ditch cleaning, and culvert cleaning is estimated to be approximately $30 per lot owner. The difference in the funds collected is considered reserve funds and will be needed in the future to pay for larger expenditures such as chip seal, mill & overlay projects.

Genesis observed patterns in the type of pavement failures present in 2016. Some deeper base failures were noted, but the majority of the low pavement condition indexes are due to surface failures such as cracking and the breakdown or stripping of asphalt oil between the aggregate.

We believe this report will help the HOA record the current road infrastructure conditions, prioritize maintenance efforts to yield the greatest benefit for the dollar spent, identify the reasonable maintenance treatments available, and provides a simple cash flow analysis to help identify the costs and planning that is necessary to succeed.

We thank you for the opportunity to be of service and should you have any questions, please contact me anytime.

Sincerely,



Chris Wasia, P.E.
Genesis Engineering, Inc.
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VII. Appendix

Exhibits – 11 x 17 - Link: Here

Summary of Collected Road Data

Cost Forecast Modeling Link: Here

GIS Model - Link: Here

Data Sheets (hard copy only)

GENESIS ENGINEERING, INC

Sheet 1

Lazy TH Estates

GENESIS ENGINEERING, INC

Sheet 2

Lazy TH Estates

GENESIS ENGINEERING, INC

Sheet 3

Lazy TH Estates

GENESIS ENGINEERING, INC

Sheet 4

Lazy TH Estates

Name	Description	Station of Road (ft)	Traverse Cracking (ft)	Longitudual Cracking (ft)	Edge Raveling (ft)	Road Width (ft)	Weed Infestation (ft^2)	LHS Rutting (in)	RHS Rutting (in)	DW Connection Condition (0 -5, 5 is best)	DW Culvert Condition (0 -5, 5 is best)	Intersection Connection Condition (0 - 5, 5 is best)	PCI (0 - 5, 5 is best)	Culvert/Ditch Notes (only noted if something needs fixing)
Sir Arthur Dr	A0	0.0	30.0	60.0	0.0	24.7	0.0	0.125	0.500	-	-	3.0	3.5	Crushing on both ends main road culvert
Sir Arthur Dr	A2	200.0	130.0	30.0	1.0	24.2	0.0	0.125	0.500	3.0	3.0	-	3.0	Some sediment in driveway culverts
Sir Arthur Dr	A4	400.0	100.0	55.0	30.0	24.6	0.0	0.250	0.125	3.0	3.0	-	2.5	Some sediment in driveway culverts, one fully blocked
Sir Arthur Dr	A6	600.0	75.0	50.0	15.0	24.3	0.0	0.125	0.500	4.0	5.0	-	3.0	
Sir Arthur Dr	A8	800.0	70.0	50.0	0.0	24.2	0.0	0.250	0.750	2.0	2.0	-	3.0	Driveway culvert completely full of sediment
Sir Arthur Dr	A10	1000.0	125.0	80.0	0.0	24.1	2.0	0.750	0.000	-	-	3.0	3.0	No culvert at intersection
Sir Arthur Dr	A12	1200.0	103.0	108.0	0.0	24.1	1.0	0.500	0.500	3.0	3.0	2.5	2.5	Construction access ramp blocking ditch, driveway culvert covered w/ cloth
Sir Arthur Dr	A14	1400.0	100.0	90.0	0.0	24.3	1.0	0.500	0.000	3.0	4.0	-	3.5	
Sir Arthur Dr	A16	1600.0	125.0	60.0	0.0	24.0	0.0	0.750	0.000	-	-	-	2.5	
Sir Arthur Dr	A18	1800.0	75.0	10.0	0.0	24.0	1.0	0.250	0.125	3.0	5.0	-	4.0	
Sir Arthur Dr	A20	2000.0	144.0	80.0	0.0	24.4	0.0	0.250	0.125	3.0	4.0	3.5	3.5	No culvert at intersection
Sir Arthur Dr	A22	2200.0	125.0	0.0	0.0	24.1	2.0	0.250	0.250	-	-	-	4.5	
Sir Arthur Dr	A24	2400.0	105.0	29.0	0.0	23.1	2.0	0.000	0.125	3.0	4.0	-	4.0	Some sediment in driveway culvert
Sir Arthur Dr	A26	2600.0	127.0	0.0	5.0	23.1	1.5	0.125	0.500	4.5	4.5	-	4.0	Bridge path in ditch, construction access blocking oppsite ditch
Sir Arthur Dr	A28	2800.0	100.0	69.0	0.0	23.6	0.5	0.000	0.000	3.0	4.0	-	4.0	
TOTAL	TOTAL	2800.0	1534.0	771.0	51.0	-	11.0	-	-	-	-	-	-	
AVERAGE	AVERAGE	-		-	-	24.1	-	0.283	0.267	3.1	3.8	3.0	3.367	
Legend Ct	B0	0.0	125.0	80.0	0.0	24.1	2.0	0.750	0.000	-	-	3.0	3.0	
Legend Ct	B2	200.0	80.0	40.0	-	24.2	1.0	0.125	0.125	3.0	4.0	-	4.0	
Legend Ct	B4	400.0	-	300.0	20.0	-	0.0	0.500	0.500	3.0	-	-	2.5	
TOTAL	TOTAL	400.0	205.0	420.0	20.0	-	3.0	-	-	-	-	-	-	
AVERAGE	AVERAGE	-	-	-	-	24.2	-	0.458	0.208	3.0	4.0	3.0	3.17	
Terrance Loop Rd	C0	0.0	105.0	60.0	0.0	24.4	1.0	0.250	0.000	-	-	3.0	3.5	
Terrance Loop Rd	C2	200.0	30.0	20.0	23.0	24.0	1.0	0.250	0.250	-	-	-	3.5	
Terrance Loop Rd	C4	400.0	96.0	20.0	10.0	24.1	1.0	0.125	0.750	-	-	-	3.0	
Terrance Loop Rd	C6	600.0	80.0	20.0	0.0	24.1	2.0	0.250	0.125	-	-	-	2.5	Up to 1.75" settlement above culvert, slight crushing on one end
Terrance Loop Rd	C8	800.0	80.0	25.0	20.0	24.3	1.0	0.000	0.125	3.0	4.0	-	4.0	
Terrance Loop Rd	C10	1000.0	125.0	50.0	0.0	24.1	3.0	0.500	0.500	3.0	3.0	-	2.5	Driveway culvert half full of sediment
Terrance Loop Rd	C12	1200.0	80.0	26.0	0.0	24.0	1.0	0.250	1.000	3.0	4.0	-	2.5	
Terrance Loop Rd	C14	1400.0	75.0	60.0	0.0	23.9	0.0	0.250	0.750	3.0	4.0	-	3.0	
Terrance Loop Rd	C16	1600.0	100.0	170.0	0.0	23.9	0.0	0.250	0.750	3.0	3.0	2.0	1.5	No culvert at intersection, some driveway culverts need cleaning
Terrance Loop Rd	C18	1800.0	80.0	55.0	0.0	24.1	1.0	0.000	1.000	3.0	2.0	-	2.0	Driveway culvert half full of sediment
Terrance Loop Rd	C20	2000.0	92.0	120.0	0.0	24.1	1.0	0.250	0.500	2.5	4.0	-	2.5	
Terrance Loop Rd	C22	2200.0	65.0	75.0	0.0	24.0	1.0	0.000	0.125	-	-	-	3.0	
Terrance Loop Rd	C24	2400.0	150.0	150.0	0.0	24.2	0.0	0.125	0.250	-	-	3.0	3.0	No culvert at intersection
Terrance Loop Rd	C26	2600.0	94.0	40.0	0.0	24.3	1.0	0.000	0.125	3.0	4.0	-	3.5	
Terrance Loop Rd	C28	2800.0	81.0	60.0	0.0	24.1	0.0	0.250	0.250	3.0	4.0	-	3.0	One driveway missing a culvert
Terrance Loop Rd	C30	3000.0	96.0	130.0	0.0	24.0	2.0	0.250	0.250	3.0	2.0	-	2.5	Both driveway culverts blocked
Terrance Loop Rd	C32	3200.0	75.0	75.0	0.0	24.0	1.5	0.250	0.125	-	-	-	3.0	Main road culvert crushed on right side
Terrance Loop Rd	C34	3400.0	100.0	100.0	0.0	23.9	1.0	0.125	0.125	3.0	3.0	-	3.0	Right driveway culvert is buried on one end
Terrance Loop Rd	C36	3600.0	75.0	56.0	0.0	23.9	0.0	0.750	0.750	3.0	4.0	-	2.5	
Terrance Loop Rd	C37+50	3750.0	35.0	10.0	0.0	23.9	1.0	0.250	0.000	-	-	4.0	3.5	Construction access blocking ditch
TOTAL	TOTAL	3750.0	1714.0	1322.0	53.0	-	19.5	-	-	-	-	-	-	
AVERAGE	AVERAGE	-	-	-	-	24.1	-	0.219	0.388	3.0	3.4	3.0	2.9	
Lucille Ln	D0	0.0	103.0	108.0	0.0	24.1	1.0	0.500	0.500	3.0	3.0	2.5	2.5	Construction access ramp blocking ditch, driveway culvert covered w/ cloth
Lucille Ln	D2	200.0	55.0	8.0	0.0	24.5	1.5	0.125	0.250	3.0	3.0	-	4.0	Driveway culvert crushed on right side and full of sediment
Lucille Ln	D4	400.0	80.0	5.0	0.0	24.1	1.5	0.000	0.125	-	-	-	4.0	
Lucille Ln	D6	600.0	80.0	85.0	0.0	24.3	0.0	0.125	0.000	4.0	4.0	-	3.0	Main road culvert is comepletely full
Lucille Ln	D8	800.0	80.0	26.0	0.0	24.5	0.0	0.000	0.250	-	-	-	3.5	
Lucille Ln	D10	1000.0	125.0	165.0	0.0	24.1	1.0	0.000	0.250	3.0	1.0	-	2.5	Two driveways missing culverts
Lucille Ln	D12	1200.0	60.0	68.0	2.0	24.1	1.0	0.125	0.125	3.0	2.0	-	3.0	Driveway culvert full
Lucille Ln	D13	1300.0	100.0	170.0	0.0	23.9	0.0	0.250	0.750	3.0	3.0	2.0	1.5	No culvert at intersection, some driveway culverts need cleaning
TOTAL	TOTAL	1300.0	683.0	635.0	2.0	-	6.0	-	-	-	-	-	-	
AVERAGE	AVERAGE	-	-	1318.0	-	24.2	-	0.141	0.281	3.2	2.7	2.3	3.0	
Hofer Ln	E0	0.0	150.0	150.0	0.0	24.2	0.0	0.125	0.250	-	-	3.0	3.0	No culvert at intersection
Hofer Ln	E2	200.0	80.0	85.0	0.0	24.6	1.0	0.000	0.125	3.5	4.0	-	3.5	
Hofer Ln	E4	400.0	50.0	23.0	0.0	24.1	1.0	0.000	0.000	-	-	-	4.5	
TOTAL	TOTAL	400.0	280.0	258.0	0.0	-	2.0	-	-	-	-	-	-	
AVERAGE	AVERAGE	-	-	-	-	24.3	-	0.042	0.125	3.5	4.0	3.0	3.67	
Rodeo Ct	F0	0.0	144.0	80.0	0.0	24.4	0.0	0.250	0.125	3.0	4.0	3.5	3.5	No culvert at intersection
Rodeo Ct	F2	200.0	100.0	35.0	-	24.1	2.0	0.125	0.125	3.0	4.0	-	3.0	
Rodeo Ct	F4	400.0	-	500.0	30.0	-	1.0	0.000	1.000	3.0	1.0	-	2.5	No culvert in culdisack, Ditches non-existant, driveway culverts completely full
TOTAL	TOTAL	400.0	244.0	615.0	30.0	-	3.0	-	-	-	-	-	-	
AVERAGE	AVERAGE	-	-	-	-	24.3	-	0.125	0.417	3.0	3.0	3.5	3.00	

Lazy TH Estates Totals											
Lenth of Road (ft)	Traverse Cracking (ft)	Longitudual Cracking (ft)	Edge Raveling (ft)	Road Width (ft)	Weed Infestation (ft^2)	LHS Rutting (in)	RHS Rutting (in)	DW Connection Condition (0 -5, 5 is best)	DW Culvert Condition (0 -5, 5 is best)	Intersection Connection Condition (0 - 5, 5 is best)	PCI (0 - 5, 5 is best)
9050.0	4038.0	3433.0	156.0	24.2	41.5	0.211	0.281	3.1	3.5	3.0	3.18

Lazy TH Estates 2016 Road Matrix

ID	Road Name	Timeframe	Work																
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)			Management	Total EST.
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Costs	Costs
A	Sir Arthur Dr.	Annual	10	$ 4.00	$ 40.00	304	$ 1.50	$ 456.39		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 39.71	$ 536.10
		1	116	$ 4.00	$ 465.00	922	$ 1.50	$ 1,383.00		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 147.84	$ 1,995.84
		2	-	-		-	-		2470	$ 6.00	$ 14,820.00		$ 0.33	$ -		$ 2.00	$ -	$ 1,185.60	$ 16,005.60
		3	-	-		-	-			$ 6.00	$ -	67,349	$ 0.33	$ 22,225.28		$ 2.00	$ -	$ 1,778.02	$ 24,003.30
		4	-	-		-	-			$ 6.00	$ -		$ 0.33	$ -	67,349	$ 2.00	$ 134,698.67	$ 10,775.89	$ 145,474.56
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)			Management	Total EST.
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Costs	Costs
B	Legend Ct.	Annual	10	$ 4.00	$ 40.00	83	$ 1.50	$ 124.99		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 13.20	$ 178.19
		1	40	$ 4.00	$ 160.00	250	$ 1.50	$ 375.00		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 42.80	$ 577.80
		2	-	-		-	-		195	$ 6.00	$ 1,170.00		$ 0.33	$ -		$ 2.00	$ -	$ 93.60	$ 1,263.60
		3	-	-		-	-			$ 6.00	$ -	9,660	$ 0.33	$ 3,187.80		$ 2.00	$ -	$ 255.02	$ 3,442.82
		4	-	-		-	-			$ 6.00	$ -		$ 0.33	$ -	9,660	$ 2.00	$ 19,320.00	$ 1,545.60	$ 20,865.60
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)			Management	Total EST.
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Costs	Costs
C	Terrance Loop Rd.	Annual	10	$ 4.00	$ 40.00	405	$ 1.50	$ 607.14		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 51.77	$ 698.91
		1	100	$ 4.00	$ 400.00	1214	$ 1.50	$ 1,821.60		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 177.73	$ 2,399.33
		2	-	-		-	-		1729	$ 6.00	$ 10,374.00		$ 0.33	$ -		$ 2.00	$ -	$ 829.92	$ 11,203.92
		3	-	-		-	-			$ 6.00	$ -	90,244	$ 0.33	$ 29,780.44		$ 2.00	$ -	$ 2,382.44	$ 32,162.87
		4	-	-		-	-			$ 6.00	$ -		$ 0.33	$ -	90,244	$ 2.00	$ 180,487.50	$ 14,439.00	$ 194,926.50
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)			Management	Total EST.
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Costs	Costs
D	Lucille Ln.	Annual	10	$ 4.00	$ 40.00	176	$ 1.50	$ 263.57		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 24.29	$ 327.86
		1	53	$ 4.00	$ 210.00	527	$ 1.50	$ 790.80		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 80.06	$ 1,080.86
		2	-	-		-	-		3250	$ 6.00	$ 19,500.00		$ 0.33	$ -		$ 2.00	$ -	$ 1,560.00	$ 21,060.00
		3	-	-		-	-			$ 6.00	$ -	31,460	$ 0.33	$ 10,381.80		$ 2.00	$ -	$ 830.54	$ 11,212.34
		4	-	-		-	-			$ 6.00	$ -		$ 0.33	$ -	31,460	$ 2.00	$ 62,920.00	$ 5,033.60	$ 67,953.60
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)			Management	Total EST.
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Costs	Costs
E	Hofer Ln.	Annual	0	$ 4.00	$ -	72	$ 1.50	$ 107.59		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 8.61	$ 116.20
		1	0	$ 4.00	$ -	215	$ 1.50	$ 322.80		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 25.82	$ 348.62
		2	-	-		-	-		195	$ 6.00	$ 1,170.00		$ 0.33	$ -		$ 2.00	$ -	$ 93.60	$ 1,263.60
		3	-	-		-	-			$ 6.00	$ -	9,720	$ 0.33	$ 3,207.60		$ 2.00	$ -	$ 256.61	$ 3,464.21
		4	-	-		-	-			$ 6.00	$ -		$ 0.33	$ -	9,720	$ 2.00	$ 19,440.00	$ 1,555.20	$ 20,995.20
			Ditch/Culvert Cleaning			Crack Sealing			REMOVE AND REPLACE (SF)			CHIP SEAL (SF)			1" MILL & 2" OVERLAY (SF)			Management	Total EST.
			Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Amount	Cost/Unit	Total Cost	Costs	Costs
F	Rodeo Ct.	Annual	10	$ 4.00	$ 40.00	115	$ 1.50	$ 171.78		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 16.94	$ 228.73
		1	40	$ 4.00	$ 160.00	344	$ 1.50	$ 515.40		$ 6.00	$ -		$ 0.33	$ -		$ 2.00	$ -	$ 54.03	$ 729.43
		2	-	-		-	-		195	$ 6.00	$ 1,170.00		$ 0.33	$ -		$ 2.00	$ -	$ 93.60	$ 1,263.60
		3	-	-		-	-			$ 6.00	$ -	9,700	$ 0.33	$ 3,201.00		$ 2.00	$ -	$ 256.08	$ 3,457.08
		4	-	-		-	-			$ 6.00	$ -		$ 0.33	$ -	9,700	$ 2.00	$ 19,400.00	$ 1,552.00	$ 20,952.00

Road Matrix and Timeline

Place a capital "X" in the cell for ala cart improvements. All light green cells are input cells.

	Prescribed Work	Year					
	Work	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
1	Annual Maintenance		**X**	**X**	**X**	**X**	**X**
2	Initial Catchup	**X**					
3	Remove & Replace		**X**				
4	Chip Seal		**X**				
5	Mill & Overlay						

	Inflation Rate =	2.0%					
1	Cost - Annual	$ -	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98
2	Cost - Catch up	$ 7,131.89	$ -	$ -	$ -	$ -	$ -
3		$ -	$ 52,060.32	$ -	$ -	$ -	$ -
4		$ -	$ 77,742.63	$ -	$ -	$ -	$ -
5		$ -	$ -	$ -	$ -	$ -	$ -
	Total Cost	$ 7,131.89	$ 131,888.93	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98
	Total Cost (AFI)	$ 7,131.89	$ 134,526.71	$ 2,170.25	$ 2,213.66	$ 2,257.93	$ 2,303.09

HOA Initial Savings Balance	$ 100,000.00					
EST DUES Collected per Lot (AFI)	$ 700.00	$ 714.00	$ 728.28	$ 742.85	$ 757.70	$ 772.86
EST DUES Collected (AFI)	$ 47,600.00	$ 48,552.00	$ 49,523.04	$ 50,513.50	$ 51,523.77	$ 52,554.25
ACT DUES Collected per Lot (AFI)	$ 728.57	$ 728.57	$ 728.57	$ 728.57	$ 728.57	$ 804.40
ACT DUES Collected (AFI)	$ 49,542.46	$ 49,542.46	$ 49,542.46	$ 49,542.46	$ 49,542.46	$ 54,698.88
HOA Account Balance	$ 142,410.57	$ 57,426.33	$ 104,798.54	$ 152,127.34	$ 199,411.87	$ 251,807.66

2022	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
X							**X**	
							X	
X								

$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 52,060.32	$ -	$ -	$ -	$ -	$ -	$ -	$ 52,060.32	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 77,742.63	$ -
$ 471,167.46	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 525,313.76	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 131,888.93	$ 2,085.98
$ 591,588.61	$ 2,396.13	$ 2,444.06	$ 2,492.94	$ 2,542.80	$ 2,593.65	$ 2,645.53	$ 170,612.39	$ 2,752.41

$ 788.31	$ 804.08	$ 820.16	$ 836.56	$ 853.30	$ 870.36	$ 887.77	$ 905.52	$ 923.64
$ 53,605.33	$ 54,677.44	$ 55,770.99	$ 56,886.41	$ 58,024.13	$ 59,184.62	$ 60,368.31	$ 61,575.68	$ 62,807.19
$ 804.40	$ 804.40	$ 804.40	$ 804.40	$ 888.12	$ 888.12	$ 888.12	$ 888.12	$ 888.12
$ 54,698.88	$ 54,698.88	$ 54,698.88	$ 54,698.88	$ 60,391.99	$ 60,391.99	$ 60,391.99	$ 60,391.99	$ 60,391.99
$ (285,082.07)	$ (232,779.32)	$ (180,524.50)	$ (128,318.55)	$ (70,469.37)	$ (12,671.04)	$ 45,075.42	$ (65,144.99)	$ (7,505.41)

2031	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**
X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

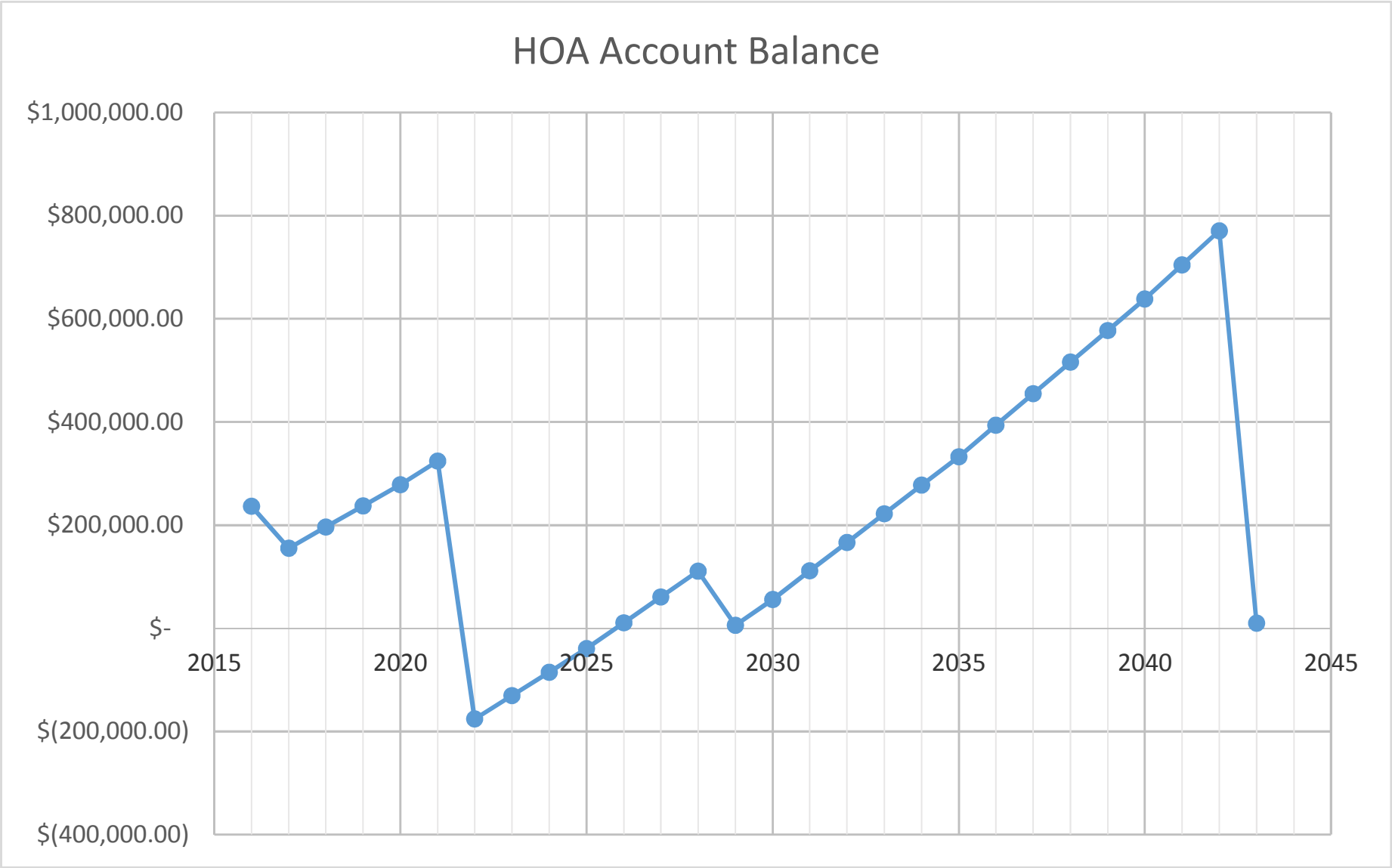
$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98
$ 2,807.45	$ 2,863.60	$ 2,920.87	$ 2,979.29	$ 3,038.88	$ 3,099.66	$ 3,161.65	$ 3,224.88	$ 3,289.38

$ 942.11	$ 960.95	$ 980.17	$ 999.77	$ 1,019.77	$ 1,040.16	$ 1,060.97	$ 1,082.19	$ 1,103.83
$ 64,063.33	$ 65,344.60	$ 66,651.49	$ 67,984.52	$ 69,344.21	$ 70,731.10	$ 72,145.72	$ 73,588.63	$ 75,060.40
$ 980.55	$ 980.55	$ 980.55	$ 980.55	$ 980.55	$ 1,082.61	$ 1,082.61	$ 1,082.61	$ 1,082.61
$ 66,677.63	$ 66,677.63	$ 66,677.63	$ 66,677.63	$ 66,677.63	$ 73,617.49	$ 73,617.49	$ 73,617.49	$ 73,617.49
$ 56,364.77	$ 120,178.80	$ 183,935.56	$ 247,633.90	$ 311,272.65	$ 381,790.49	$ 452,246.33	$ 522,638.94	$ 592,967.05

2040	**2041**	**2042**	**2043**
X	**X**	**X**	**X**
			X
			X

$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 2,085.98
$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ 52,060.32
$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ 471,167.46
$ 2,085.98	$ 2,085.98	$ 2,085.98	$ 525,313.76
$ 3,355.17	$ 3,422.27	$ 3,490.72	$ 896,650.95

$ 1,125.91	$ 1,148.42	$ 1,171.39	$ 1,194.82
$ 76,561.61	$ 78,092.85	$ 79,654.70	$ 81,247.80
$ 1,082.61	$ 1,171.55	$ 1,171.55	$ 1,171.55
$ 73,617.49	$ 79,665.11	$ 79,665.11	$ 79,665.11
$ 663,229.38	$ 739,472.22	$ 815,646.62	$ (1,339.21)


HOA Account Balance
$1,000,000.00
$800,000.00
$600,000.00
$400,000.00
$200,000.00
$-
$(200,000.00)
$(400,000.00)
2015
2020
2025
2030
2035
2040
2045