

Drainage Plan

Heritage Woods, Woodcroft

Durham, NC

Inspection Date:

October 30, 2012 & November 1, 2012
Revised June 22, 2013

Prepared For:

Heritage Woods Homeowners' Association

Prepared By:

Raymond Engineering, Inc.

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License # C-2650

919-942-7000



Report Number:

103012507

Inspector:

Bruce Raymond, P.E.

A handwritten signature in cursive script that reads "Bruce Raymond".

Professional Engineer's License Number: 30017



SCOPE

The scope of this drainage plan is to provide comprehensive specifications that will address the drainage concerns within the Heritage Woods townhome complex in the Woodcroft subdivision. The Heritage Woods subdivision is experiencing drainage issues (clogged pipes, standing water, erosion, etc.) in several locations throughout the townhome complex. The area behind 142 Long Shadow Place was inspected on February 8, 2012 to review erosion concerns. While reviewing this area of concern, the drainage between Long Shadow Place and Timber Ridge Drive was also reviewed. Heritage Woods was inspected on August 30, 2012 for drainage concerns. It was determined that during the August 30, 2012 inspection a larger more comprehensive review was necessary to address all the drainage concerns in the townhome complex, hence the development of this Drainage Plan. Appendix A contains the reports from both the February and August reviews and is referenced in this plan.

The drainage plan was developed by doing a site survey, using the City of Durham's GIS map with the storm water and elevation overlays. The site was inspected on October 30, 2012 and again on November 1, 2012. Details are noted on the attached GIS map. Even though the entire property was "walked" and every attempt to capture all issues was made; a few issues may arise after the plan is implemented. The area behind 107 -111 Shady Springs was not accessible and therefore, not inspected. As with any drainage plan of this magnitude; after the improvements are in place, the systems should be checked after a few heavy rainstorms and tweaked as necessary. Also once in place, the systems will need to be maintained. Many of the issues defined in this plan are due to lack of maintenance of the originally installed systems. The majority of the plan details are contained on the attached map. Following are general notes and pictures to aid in the implantation of the plan.

There are several added catch basins. All that were identified during the site visit are included on attached GIS map. As work is performed, any found basins should be identified on the GIS map or other suitable record keeping method such that all the catch basins can be cleaned regularly as noted below.

GENERAL NOTES

1. The to-be newly installed and existing drainage systems should be periodically checked and cleaned as necessary.
 - a. Open stream channels should have new vegetation removed.
 - i. Small trees/saplings should be clipped. Waiting until a tree needs to be “chain sawed” cost additional money to remove.
 - ii. Weed type vegetation may be removed OR sprayed to kill.
 - iii. Recommend open channels receive an annual inspection/cleaning.



Neglected open channel

- b. Culvert outlets should be cleaned by removing silt build-up and checking for/removing foreign debris. Rip/rap should be re-arranged as necessary.
 - i. Recommend that the culvert outlets be checked annually. This may be reduced once a history is developed that indicates less frequent cleaning is required.



Sample – culvert opening completely covered (culvert opening along Timber Ridge, see attached GIS map)

- c. Collected debris should be removed from catch basins.
 - i. The top grate should have collected debris (leaves, grass clippings, etc.) removed.
 - ii. The cover should be removed and any silt build up removed before it clogs outlet pipes.
 - iii. Recommend that catch basins' grates be checked twice a year. Covers should be removed and silt checked/removed every couple of years. This may be reduced once a history is developed that indicates less frequent cleaning is required.



Sample – catch basin
needing cleaning

- d. Gutters need to be cleaned a minimum of twice a year (more frequently if in heavily wooded area). This is critical if leaders (downspout piping) are used. Debris in gutters will clog leaders and the leaders will need to be replaced.
- e. Leader (piping connected to downspouts) outlets should be checked annually to assure their outlets flow freely and the pipes are not damaged. Landscape maintenance personnel should be made aware of the importance of protecting the leader outlets.



Sample – damaged
(crushed) leader

- f. Leader-to-downspout connections should be checked annually for proper joining. The outlet position should also be checked at the same inspection. Most leader outlets have been pinned (good practice) to assure they are properly discharging.



Sample – pinned leader outlet

- g. All landscape coverings that are installed through the years need to be added such that they do not obstruct drainage system components.
2. In some locations, it may be more desirable to use splash blocks in lieu of leaders to direct downspout discharge. Splash blocks will not clog; leaders will. For example, the downspout in front of 100 Wethersfield could be converted to a splash block. Care must be exercised to prevent an erosion issue when using a splash block. Leaders should be used where the downspout discharge needs to be directed; a splash block would not properly direct water. Short leaders are easier to replace if necessary.



Convert leader to splash block

3. Leader discharge should be checked to assure the discharge does not create an erosion issue. The use of light rip/rap in a small depression at a leader discharge can help break up the water flow and eliminate erosion.



Example: Add light rip/rap at leader discharge to eliminate erosion (in front of 104 Weathersfield)

4. Individual homeowners' yard landscaping must be performed in a manner that it does not obscure added/improved drainage.
5. While every attempt was made to locate all catch basins, not every catch basin may have been located. All catches basins (see map) should be checked for assurance that:
 - a. The outlets' pipes are to be free flowing and their outlet unobstructed.
 - b. The soil at the catch basin is graded such that the slope is towards the basin (see Note 3).
6. Added swales to be installed as follows:
 - a. Slope no greater than $\frac{1}{4}$ inch per foot, but must slope such that water flows as noted on attached map.
 - b. All disturbed soil to be seeded and matted. Appropriate seeding should be performed in the fall season. If the soil is disturbed at other times of the year, a temporary seed (rye) is to be used, and then the appropriate seed added in the fall. After one growing season, re-seed as necessary.
7. Where designated on the attached GIS map, areas are to be matted and seeded. As above noted, appropriate seeding should be performed in the fall season. If the soil is disturbed at other times of the year, a temporary seed (rye) is to be used, and then the appropriate seed added in the fall. After one growing season, re-seed as necessary. Care shall be exercised to assure the appropriate seed is applied (many areas will require shade tolerant seed). The soil may need to be checked to assure the soil and seed type match for the best results.

SPECIFIC NOTES

The following notes apply to specific sections of Heritage Woods, see attached GIS map.

- The soil grade above the small stone wall in front 112 to 120 Weathersfield Drive is sloped towards the wall. Generally, the soil should slope away from the wall; however, based on the surrounding grade this is the best solution. There are four catch basins below the wall to remove water. The area needs to be monitored to assure the water flows over the wall and into the catch basins. Re-seed as necessary.



Area to monitor

- The outlet channel below the culvert outlet between 122 and 124 Shady Spring Place needs to be lowered. The collected silt has raised the channel bed such that it is partially obstructing the culvert.



Lower channel bed

- The culvert behind 128 Shady Spring Place is under-eroded. Hydraulic cement should be added to the eroded area prevent damage to the culvert supporting soils. **This culvert may not be the responsibility of the Heritage Woods HOA.**



Water is running under culvert



11. There is erosion of the main stream channel behind Heritage Woods, see GIS Map (bottom of Old Maple). Rip/Rap should be installed to prevent further erosion. **This culvert may not be the responsibility of the Heritage Woods HOA.**



Stream bank erosion

12. The culvert discharge area of the lower Old Maple curb drain needs to be re-defined. Currently, the discharge is directed at a large tree. The channel needs to be cleaned (silt re-moved) and re-cut to go around the tree.



Re-direct away from tree

13. Re-grade, mat and re-seed behind 124-136 Shady Spring Place. The lawn in place is a good start; however, there is still erosion occurring and some of the exterior air conditioner units are not properly supported. Re-support of the units should be included.



Sample – erosion
Improperly supported unit



14. Re-grade, mat and seed erosion next to rip/rap channel at the foot of Shady Spring Place.



Re-grade,
matt and seed

15. Fill void in front of 134 Shady Spring Place. This is a trip hazard.



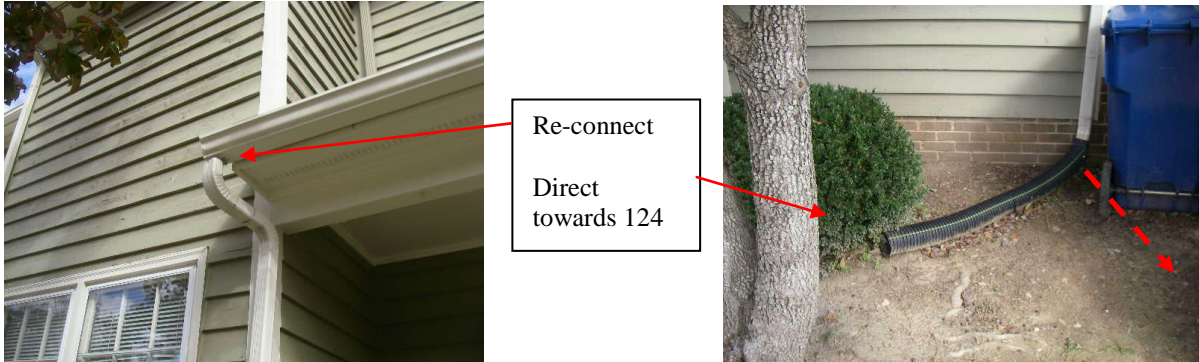
Fill void

16. The downspout in front of 109 Shady Spring Place is too high and needs to be lowered. A rain barrel was likely previously in place.

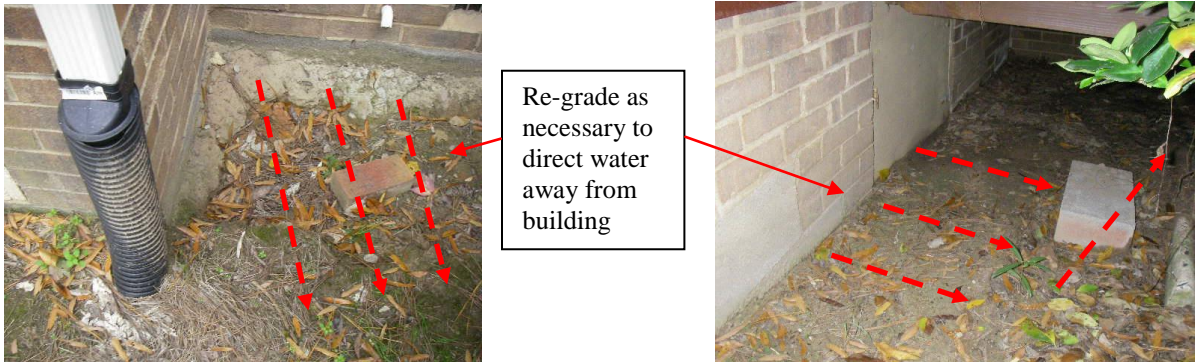


Downspout too
high

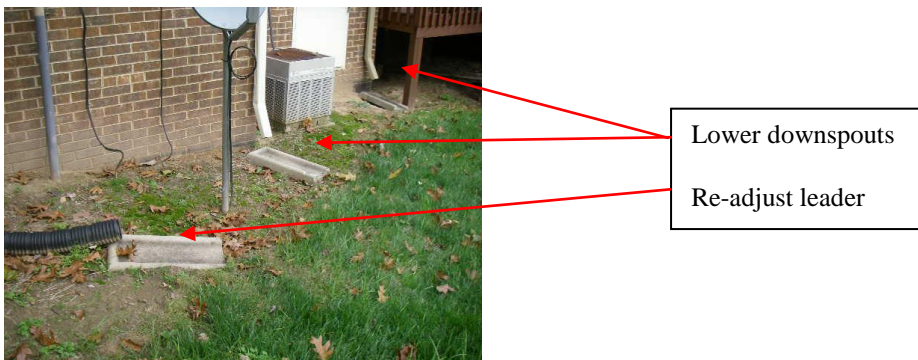
17. Re-connect the downspout to the gutter in front of 126 Shady Spring Place. The leader from the downspout should direct water towards 124.



18. Currently, the grade behind 102 Shady Spring Place is such that water is directed towards the crawl space entrance. This area needs to be re-graded to direct water away from the building. Mat and seed as necessary.



19. There was no access behind 107 -111 Shady Spring Place (wooden fences). This area was not inspected.
20. The rear leader of 100 Old Maple Lane should be re-directed and a swale is to be added in the side yard.
21. The downspouts and leader behind 101 -105 Shady Spring Place need to be adjusted. The downspouts are too high and the leader is uphill at the end. These need to be adjusted to convey water away from the building effectively.

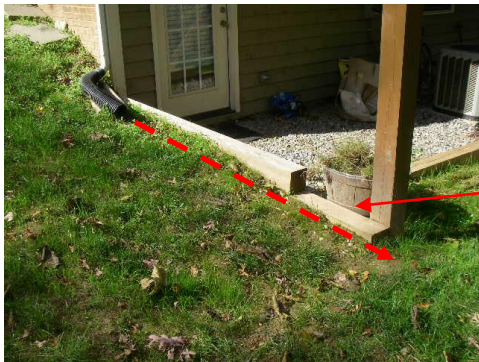


22. The leader behind 102 Old Maple Lane needs to be re-routed to direct water away from the building and the exterior air conditioner units.



Re-route leader

23. Extend the leader behind 106 Old Maple Lane such that water is directed beyond the small wood wall.



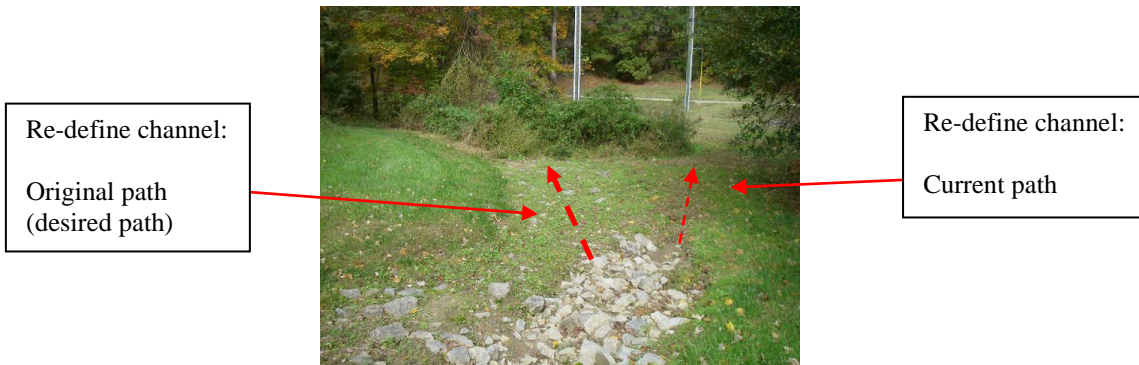
Extend leader

24. Re-grade in front of 110 and 112 Old Maple Lane.

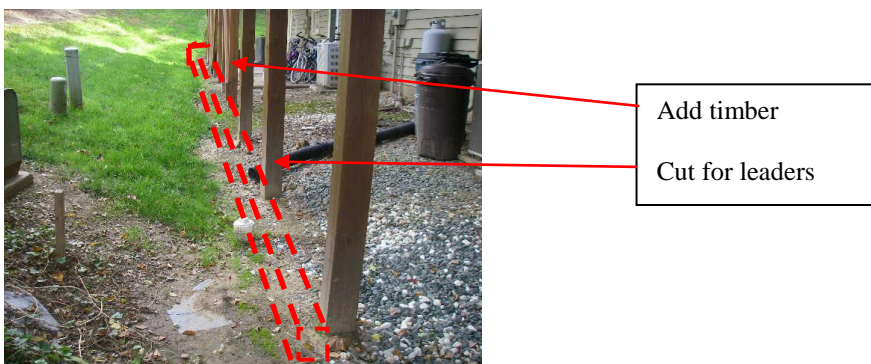


Re-grade as necessary to direct water away from building

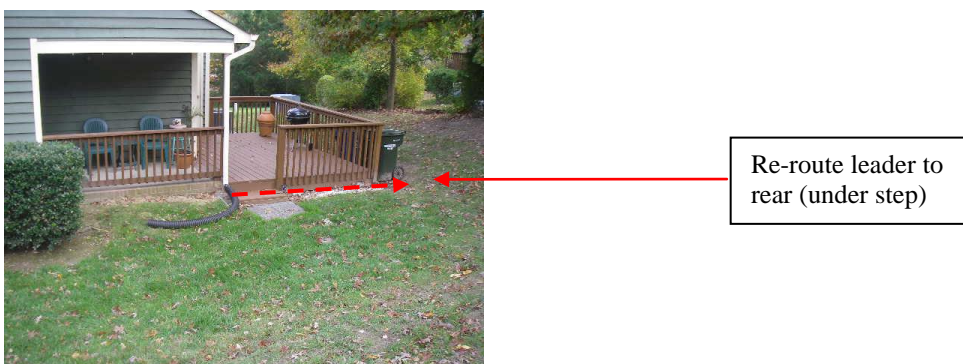
25. The channel behind 114-122 Old Maple Lane needs to be cleaned (silt removed) and the channel re-defined, see Appendix A.



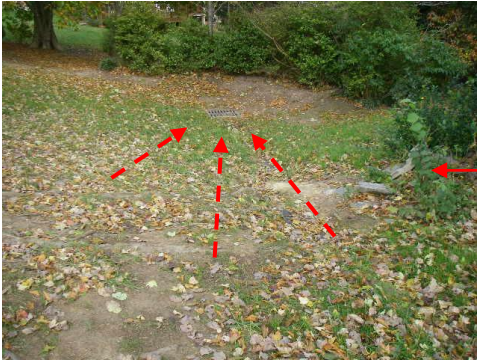
26. Add pressure treated timber (4 x 4) to form a swale behind 106 – 114 Long Shadow Place. Timber will need to be cut to allow the leaders to pass through.



27. Add pressure treated timber (4 x 4) to form a swale behind 106 – 114 Long Shadow Place. Timber will need to be cut to allow the leaders to pass through.



28. Re-grade around catch basin next to 114 Long Shadow so that all run-off is directed to the catch basin. Mat and seed after grading is complete.



Re-route leader to rear (under step)

29. The steep hill at the deck landing behind 134 Timber Ridge needs to be stabilized. Grass may work; however, a landscaper should be consulted to determine the best type of vegetation.



Steep hillside to stabilize

30. Gravel can be added to eroded area (swale) at the leader discharge in front of 126 Timber Ridge Drive.



Add gravel to stabilize

31. Vegetation should be installed in the bare area next to Applecross Court to control erosion and limit the slit in the storm water system. A qualified landscaper should be consulted to assure proper vegetation is installed and maintained.



Bare area
next to
Applecross
parking

32. The sidewalk in front of 105 Hollow Oak causes water to pond. The sidewalk should be removed and re-installed such that water will be directed to the front yard. Re-grading will be necessary.



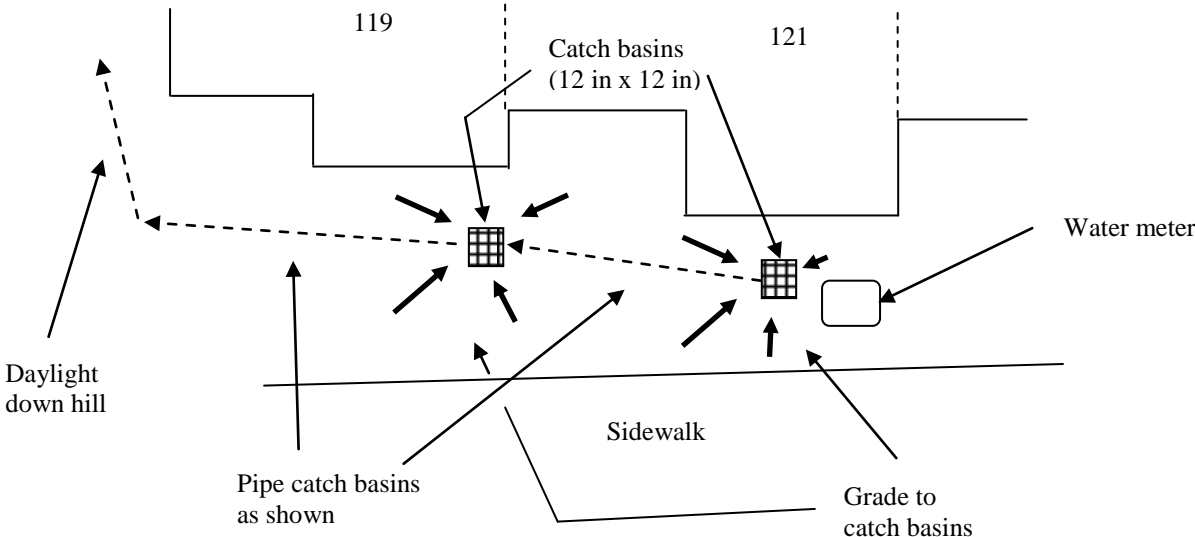
Re-slope
sidewalk to
direct water
to front yard



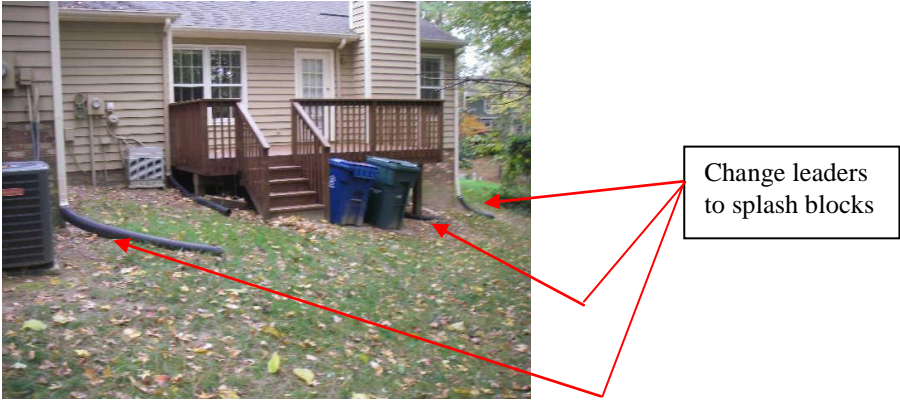
33. The low areas in front of 119 and 121 Hollow Oak should be addressed by adding catch basins as shown below.



Low areas



34. Three of the leaders behind 133-129 Hollow Oak can be changed to splash blocks as shown below.



35. The area below the retaining walls behind 111-115 Hollow Oak should be checked for drainage issues. (Does water pond at patios below?) Additional drainage may be necessary. The area was not accessible and therefore, the drainage in this area was not checked.



Check for
ponding water

Revision June 22, 2013

This report has been revised to include drainage concerns at the end units of buildings with basements particularly 106 Long Shadow and 118 Shady Springs. These and other units have had issues with water intrusion into the basement.

The two units noted were inspected on June 13, 2013. Some of the issue is with the gutters and downspouts. The gutters were over shooting and the leaders were not effectively conveying water away. The grading at both units could also be improved (slope away from building along the front). Correcting gutter overshoot (adding a diverter) making sure leader flow freely and re-grading will help but may not eliminate the leakage. A cost effective approach would be excavate down approximately three feet across the front and place pipe, silt cloth and gravel to the surface. The exposed wall should be damp proofed. This may not eliminate all the water but will have a significant impact on the quantity of water entering. In order to completely eliminate the water intrusion I would recommend a water proofing company that will provide a warranty. This will be very expensive per unit.

Appendix A

Raymond Engineering report dated August 31, 2012

Raymond Engineering report dated February 9, 2012

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August 31, 2012

Heritage Woods HOA
C/O CAS, Todd Petherbridge
5915 Farrington Road, Suite 104
Chapel Hill, NC 27517

Subject: Drainage Review

Reference: Raymond Engineering report dated February 9, 2012

Dear Todd,

A general drainage overview of the Heritage Woods townhome complex in the Woodcroft subdivision was performed on August 30, 2012. The purpose was to determine the overall condition, determine immediacy and to help prioritize expenditures for the HOA. There was concern that roadway issues may need to be addressed prior to

addressing drainage concerns. The review was a quick overview and while specific repairs are outline below a more in depth review would be recommended to assure that all drainage issues are addressed. There are curb drains, catch basins and underground piping that can be identified on the City of Durham's GIS map using the storm water map overlay. Using a GIS map with the storm water map and elevation overlays the HOA can gain additional knowledge about the drainage at Heritage Woods. This knowledge can then be used to develop a comprehensive drainage improvement plan.

Based on the quick overview performed, I recommend that the storm water drainage be addressed first. Some of the conditions observed will only worsen over time and be more costly to correct in the future. While there are areas where the roadways need attention, the general condition of the roadways should allow for a couple more years of usage prior to re-paving. Some of the storm water drainage improvements will affect the roadways and it is better to correct these before re-paving. An overcoat on some roadways can extend the life three to five years depending on usage and the weather. If the overcoat option is chosen, I would recommend a two coat sand mixture be applied.

Drainage Overview

The majority of the improvements and repairs that are necessary are due to lack of maintenance. Many of the culverts' outlets are occluded due to silt build up and collected debris. Also, many of the open channels have been allowed to become overgrown and need a serious cleaning. The cleaning of the open channel between Timber Ridge and Long Shadow was addressed in a previous report to the HOA, see above referenced Raymond Engineering report.

The erosion behind many of the townhomes needs to be addressed as it is affecting the decks and the exterior air conditioning units. I observed several deck steps that have added blocks under them to support the steps due to the soil removal from erosion. The air conditioning unit pads are being under eroded in many locations. Air conditioning units must remain level in order to operate properly. If the units become un-level, they may not be properly lubricated and this could greatly shorten their lives.

Some specific improvements that need to be incorporated into an overall drainage plan are:

- Clean out all culvert outlets.



Sample – clogged culvert outlet

- Clean all open channels – this includes removing small trees that have been allowed to grow, re-establishing the channel by re-grading as necessary and weed killing as needed.



Sample – overgrown open channel

- Apply erosion control methods behind many of the townhomes. This may involve re-grading and or reseeding with appropriate vegetation. I would recommend erosion control maps where re-seeding is performed



Sample – under eroded air conditioner pad

Sample – added support under deck steps



- Identify all catch basins – some appear to have been owner installed. In some cases, re-grading may allow for the removal of the basin. The catch basins should be checked for functionality, cleaned as needed and in some cases have the soil around them re-graded.



Sample – erosion next to catch basin (below mid point parking area off Long shadow)

Sample – lip at catch basin – will need re-grading



- A comprehensive overview of all the downspout leaders (plastic pipe attached to the downspouts). Each unit should be evaluated to assure the discharge from the pipes is properly directed in regards to the overall drainage of Heritage Woods. Some of the pipe outlets are crushed and or clogged. Burying of the pipes could be done if desired; however, assurance that pipes remain properly positioned needs to be part of the overall drainage plan to assure the discharge remains as desired. The use of the black corrugated pipe makes it imperative that the gutters be kept clean. Gutter debris will clog the pipes and if buried cannot be cleaned.



Sample – significant amount of water directed at neighbor's unit

Sample – crushed/clogged leader outlet



- Due to the roadway slope, the water at along Weathersfield between Timber Ridge and Long Shadow is directed to run over the hillside above the culvert outlet. Curbing could be added to direct the water to a rip/rap lined channel that could be added to direct the run-off into the open channel at the culvert outlet.



Water currently runs over hillside, will cause erosion

- The roadway grade is such that very little water is entering the catch basin in Weathersfield just above Old Maple (between Long Shadow and Old maple – closer to Old Maple). A curb drain or regrading of the roadway would reduce the volume of water on Old Maple.



Add curb drain or re-grade roadway

- The curbing and asphalt at the southwest corner of Apple Cross has settled. As a result, water is no longer directed into the curb drain. The water is jumping the curb and eroding the hillside below. The paving and curbing should be “cut out”, re-graded, and replaced.



Settled curb/paving

- The open channel below Old Maple and Shady Spring has silted such that the water is now making a new channel. The original channel needs to be cleaned, re-graded, and re-rip/rapped. It may be possible to save the original rip/rap and re-used it.



Original channel
Direction water now flows

- The open channel behind upper Weathersfield and behind Oak Hollow has become a dumping ground for grass clippings and leaves. This has disrupted the water flow in this area. The area needs to be cleaned and the channel re-established.



Re-generate original open channel

- Two raised patios behind the upper Weathersfield building (east side) have created a drainage swale that is causing erosion under the adjacent unit's air conditioner pad. The water should be re-directed to prevent erosion at the air conditioner pads.



Erosion at pad

Raised patio

- The speed bump in the middle of Long Shadow helps to direct water to the west. There is a curb drain just below the speed bump on the east side of the street. The speed bump should be re-positioned and angled such that it directs water to the curb drain. This will greatly reduce the amount of water that ends up at the lower curb drain at the bottom of Long Shadow.

The information contained in this report should be incorporated into a more comprehensive drainage plan. The plan should include a detailed map of where each issue is to be addressed. A decision/details of the roadway changes would need to be incorporated in the plan. The downspout leader configuration should be detailed. The areas of re-grading/re-seeding identified as well as identifying the appropriate groundcover to be seeded or planted. From the developed detailed plan, pricing could be obtained from contractors to help the HOA determine the expenditures and timing necessary to accomplish the plan. A landscape architect could provide the detailed plan. I could also provide the comprehensive plan. As noted at the site visit meeting, a budgetary price of \$3,500 was provided.

If further information is needed, please do not hesitate to contact me at raymondengineering@nc.rr.com

Sincerely,



Bruce Raymond, PE

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February 9, 2012

Ted Parenti, CAS
5915 Farrington Road, Suite 104
Chapel Hill, NC 27517

Subject: Heritage Woods, Drainage Issues

Reference: Raymond Engineering report dated June 14, 2010

Dear Ted,

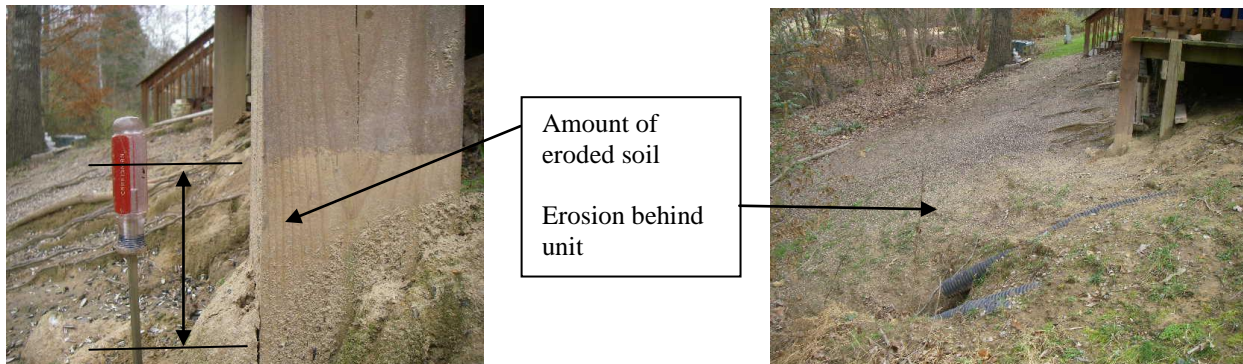
The soil erosion and foundation cracking at the townhome located at 142 Long Shadow Place in the Heritage Woods townhome complex in the Woodcroft subdivision in Durham, NC was inspected on February 8, 2012. The concern was that the erosion might lead to structural issues. The cracking was inspected to determine if there was any loss of structural integrity as a result of the cracking. After the inspection in this area of the townhome complex, the dry creek bed to the west of and behind the townhomes on Long Shadow Place was also inspected. This area of the

townhome complex had been previously inspected on June 11, 2010. The referenced Raymond Engineering report provided suggestions to improve the drainage and functionality of the dry creek bed. The re-inspection of February 8, 2012 was performed to check on improvements made and make recommendations for further/additional improvements. Each area inspected is addressed separately below.

Erosion

As noted above, there has been erosion around the side/rear of the townhome unit located at 142 Long Shadow Place. Based on the paint line on the upper deck post at the rear corner of this unit, gradual erosion has caused soil to wash away, thus nearly exposing the post footer. At this rate of erosion, the footer would be exposed in approximately one year. There was also significant erosion at the downspout leader discharge in the side yard next to the unit.

Based on the rate of erosion, this area needs to be stabilized. It is likely additional soil will be removed with each rain event. Additional soil should be added to return the soil height to the original position based on the painted line on the deck post. Once the soil grade has been re-established, the area needs to be stabilized. Planting/erosion control matting should be placed on top of the added soil and tacked in place to prevent additional erosion for the short term. Appropriate vegetation needs to be planted/seeded to provide a long-term stabilization of the area. A landscape architect could be consulted about the best vegetation to provide the stabilization needed and the aesthetic look desired.



Rip/rap (large stones) should be installed at the downspout leaders noted above to prevent additional erosion in this area.



Place rip/rap at
leader discharge

While reviewing the area, it was noted that the curb storm water catch basin on Long Shadow Place just above the area inspected is periodically incapable of accepting the volume of water generated during heavy rain events. The street “floods” as a result. The silt on the sidewalk next to the catch basin would indicate this to be true. Also, the owner of unit 142 stated that a sink hole had developed above the catch basin discharge pipe. Assuming the data provided is correct, this would indicate an obstruction of water flow through the discharge pipe. One possible condition that may be present is that the pipe connection may be mis-aligned (the sink hole mention leads to this possible conclusion). The interior of the discharge pipe should be inspected to assure the pipe is capable of discharging rain volumes appropriately.

Foundation Cracking

There is a vertical crack in the side foundation wall of the townhome at 142 Long Shadow. The exposed floor framing in the area of the crack was tight and did not indicate any significant movement from the “as built” condition. The dry wall on the walls in this area of the townhome did not indicate any significant movement. Based on these observations (the crack is relatively small, there was no apparent movement of the house framing and no significant corresponding cracking of interior walls in this area), the exterior foundation crack is most likely a settling/soil movement type crack common for this area of North Carolina. The Triangle area of North Carolina is known for its expansive clay soils (soils that expand significantly with moisture and contract significantly with lack of moisture). These soil conditions tend to create more foundation cracks than more stable soils. The crack should be monitored for movement. No structural repairs are required at this time. If the condition of the cracks changes, a re-evaluation will be necessary.



Crack in foundation

Dry Creek Bed

As noted above, the dry creek bed that is behind the townhomes on Long Shadow Place in the Heritage Woods townhome complex south of Durham, NC was inspected on June 11, 2010. The creek bed serves as a drainage conduit for run off in the area and for a couple storm culverts that deposit into this creek bed.

As noted in the June 2010 referenced Raymond Engineering report, the upper creek bed is in relatively good condition. The only additional work necessary in this area is cleaning out the discharge of the culverts. The outlets are clogged with silt and other debris. Of course, regular maintenance of this area will be required: keep the culverts clean and keep weeds and other debris from collecting in the dry creek bed. These items will alter the water flow such that it will no longer be in the established creek bed. This condition can cause erosion and silt build up downstream. Periodically check water flow to make sure it is in the creek bed and adjust as necessary if the water is not flowing into the creek bed.



Culverts needing cleaning



The middle and lower sections have improved since the 2010 inspection. Some of the larger trees have been removed and some collected debris has been removed. Additional work is required to assure the water flow follows the established rock (rip/rap) lined creek bed. The rock lining prevents erosion, which in turn minimizes the buildup of silt. All the saplings in the area should be removed and the grade altered such that the water flows in the established creek bed. Additional rip/rap will be required in some areas. Landscapers should continue to not blow leaves into the creek bed. These only cause small dams, which causes the water flow to jump the creek bed.



Saplings and limbs to be removed

Rip/rap (rock) in eroded depression



Saplings to be removed

If further information is needed, or you have questions, please do not hesitate to call me at 942-7000.

Sincerely,

Bruce Raymond, PE

License No. 30017

