CITY OF ROLLINGWOOD
CITY COUNCIL MEETING
AGENDA

Wednesday, November 16, 2022

Notice is hereby given that the City Council of the City of Rollingwood, Texas will hold a meeting, open to the public, in the Municipal Building at 403 Nixon Drive in Rollingwood, Texas on November 16, 2022 at 7:00 PM. Members of the public and the City Council may participate in the meeting virtually, as long as a quorum of the City Council and the presiding officer are physically present at the Municipal Building, in accordance with the Texas Open Meetings Act. The public may watch this meeting live and have the opportunity to comment via audio devices at the link below. The public may also participate in this meeting by dialing one of the toll-free numbers below and entering the meeting ID and Passcode.

Link: https://us02web.zoom.us/j/5307372193?pwd=QmNUbmZBQ1IwUlNjNmk5RnJrelRFUT09

Toll-Free Numbers: (833) 548-0276 or (833) 548-0282

Meeting ID: 530 737 2193

Password: 9fryms

The public will be permitted to offer public comments via their audio devices when logged in to the meeting or telephonically by calling in as provided by the agenda and as permitted by the presiding officer during the meeting. If a member of the public is having difficulties accessing the public meeting, they can contact the city at dadair@rollingwoodtx.gov. Written questions or comments may be submitted up to two hours before the meeting. A video recording of the meeting will be made and will be posted to the City's website and available to the public in accordance with the Texas Public Information Act upon written request.

CALL REGULAR CITY COUNCIL MEETING TO ORDER

1. Roll Call

SWEARING-IN CEREMONY OF NEWLY ELECTED OFFICIALS

2. Swearing-in ceremony of newly elected officials: Mayor Gavin Massingill, Council Member Sara Hutson and Council Member Kevin Glasheen

3. Recess meeting for brief reception, congratulations, and for officials to take their positions on the dais

4. Call City Council meeting back to order

5. Discussion and possible action on approval of a resolution honoring outgoing Council Member Roxanne McKee

6. Nomination and election of the Mayor Pro Tempore for a term of one year and to perform the duties of the Mayor in the Mayor's absence

PUBLIC COMMENTS

Citizens wishing to address the City Council for items not on the agenda will be received at this time. Please limit comments to 3 minutes. In accordance with the Open Meetings Act, the City Council is restricted from discussing or taking action on items not listed on the agenda.

Citizens who wish to address the Council with regard to matters on the agenda will be received at the time the item is considered.

PRESENTATIONS

7. Update on Bond Propositions A and B

8. Update on TXDoT proposed improvements for Bee Caves Road from Walsh Tarlton Lane to Montebello Road

CONSENT AGENDA

All Consent Agenda items listed are considered to be routine by the City Council and may be enacted by one (1) motion. There will be no separate discussion of Consent Agenda items unless a City Council Member has requested that the item be discussed, in which case the item will be removed from the Consent Agenda and considered in its normal sequence on the Regular Agenda.

9. Discussion and possible action on the minutes from the October 12, 2022 Joint Planning and Zoning Commission and City Council meeting

10. Discussion and possible action on the minutes from the October 19, 2022 City Council meeting

11. Discussion and possible action on a Resolution amending the fee schedule to reflect the park rental rates for adult fitness activities as approved at the October 19, 2022 City Council Meeting

12. Discussion and possible action on an Ordinance amending section 32-38 No parking signs of the City's Code of Ordinances to correct printing errors and reflect action previously taken by the City Council

REGULAR AGENDA

13. Discussion and possible action on an appeal of the City Engineer's denial of a request for alternative methods of design for drainage facilities for 208 Ashworth Drive

14. Status of the Pleasant/Nixon drainage project

15. Discussion and possible action on the process for appointing members of boards and commissions

16. Discussion and possible action on a recommendation from the Park Commission regarding the installation of artificial turf infield on Hatley Field 1 by Western Hills Little League

17. Discussion and possible action on a recommendation from the Park Commission regarding land clearing to the north of the swim facility

18. Discussion and possible action to protect trees and other vegetation on land zoned Park District (P).

19. Update and staff report on status of My Permit Now and stand-alone computer for resident access to building permit applications

20. Discussion regarding citizen written comment procedures for city public meetings and constituent correspondence

21. Update on the City Council message board implementation

22. Discussion and possible action to cast a ballot for the Western Travis County representative member of the Board of Directors of the Travis County Central Appraisal District

23. Discussion and possible action in regard to the process for hiring legal and planning services and scheduling dates for draft ordinance changes and public hearings in connection with implementation of the commercial zoning changes under the Comprehensive Plan

24. Discussion and possible action on setting dates for public hearings before the Planning and Zoning Commission and the City Council in connection with changes to the residential zoning ordinance

25. Briefing from the city attorney/outside counsel in connection with pending litigation and discussion and possible action in connection with such litigation

REPORTS

All reports are posted to inform the public. No discussion or action will take place on items not on the regular or consent agenda.

26. City Administrator's Report

27. Chief of Police Report

28. Municipal Court Report

29. City Financials for October 2022 - Fiscal Year 2022-2023

30. RCDC Financials for October 2022 - Fiscal Year 2022 - 2023

31. City Stats for October 2022

32. Contract Invoices through October 2022 - Crossroads Utility Services, Water and Wastewater Service, K. Friese + Associates - IIP & MS4, K. Fries + Associates, City Engineer

33. Crossroads Utility Services Report on Water and Wastewater for October 2022

34. City Engineer Report - K. Friese + Associates

35. Texas Central Appraisal District and Tax Assessor - Notices, Letters, Documents

36. Texas Gas Service - Notices, Letters, Documents

ADJOURNMENT OF MEETING

CERTIFICATION OF POSTING

I hereby certify that the above Notice of Meeting was posted on the bulletin board at the Rollingwood Municipal Building, in Rollingwood, Texas and to the City website at www.rollingwoodtx.gov at **5:00 p.m.** on **November 10, 2022.**

Desiree Adair

Desiree Adair, City Secretary

NOTICE -

The City of Rollingwood is committed to compliance with the Americans with Disabilities Act. Reasonable modifications and equal access to communications will be provided upon request. Please contact the City Secretary, at (512) 327-1838 for information. Hearing-impaired or speech-disabled persons equipped with telecommunication devices for the deaf may call (512) 272-9116 or may utilize the stateside Relay Texas Program at 1-800-735-2988.

The City Council will announce that it will go into executive session, if necessary, to deliberate any matter listed on this agenda for which an exception to open meetings requirements permits such closed deliberation, including but not limited to consultation with the city's attorney(s) pursuant to Texas Local Government Code section 551.071, as announced at the time of the closed session.

Consultation with legal counsel pursuant to section 551.071 of the Texas Local Government Code;
discussion of personnel matters pursuant to section 551.074 of the Texas Local Government Code;
real estate acquisition pursuant to section 551.072 of the Texas Local Government Code;
prospective gifts pursuant to section 551.073 of the Texas Local Government Code;
security personnel and device pursuant to section 551.076 of the Texas Local Government Code;
and/or economic development pursuant to section 551.087 of the Texas Local Government Code.
Action, if any, will be taken in open session.

Agenda Item __: Discussion and possible action on approval of a Resolution in honor of outgoing council member Roxanne McKee.

Submitted by: Council Member Brook Brown

Action Requested: Approval Overview and Background:

This agenda item provides for the adoption of a formal resolution in honor of Council member Roxanne McKee's service to the City of Rollingwood.

Supporting Documents:

• Resolution

RESOLUTION NO. 2022-11-16-05

A RESOLUTION HONORING ROXANNE MCKEE'S SERVICE TO THE CITY OF ROLLINGWOOD

WHEREAS, on behalf of the residents of the City of Rollingwood, Texas, in appreciation of Council member Roxanne McKee and her service to the residents of the City of Rollingwood, Texas, as a member of the City Council; and

WHEREAS, after prior years of service to the community through service on the City Council and as Mayor, she accepted appointment for an additional term of service as a member of the City Council, and has served the community with dignity, honor, and respect; and

WHEREAS, on behalf of the entire City Council, we want to express our sincere appreciation to Council member McKee for her commitment to the residents of Rollingwood through her service to the City as Mayor and for her service as a member of the City Council,

NOW, THEREFORE, the Mayor and Council of the City of Rollingwood, Texas, in recognition of the outstanding contributions of Roxanne McKee, do gladly thank Roxanne McKee for her dedicated service to our community and wish her the very best in her future endeavors.

IN WITNESS WHEREOF, I have hereunto set my hand and have caused the Seal of the City of Rollingwood Texas, to be affixed this resolution, on this the 16th day of November, 2022.

____
Gavin Massingill, Mayor

ATTEST:

____
Desiree Adair, City Secretary

CITY OF ROLLINGWOOD
JOINT PLANNING AND ZONING COMMISSION AND CITY COUNCIL MEETING
MINUTES

Wednesday, October 12, 2022

The Planning and Zoning Commission of the City of Rollingwood, Texas held a joint meeting with the Rollingwood City Council, open to the public, in the Municipal Building at 403 Nixon Drive in Rollingwood, Texas on October 12, 2022 at 5:00 PM. Members of the public, the Planning and Zoning Commission, and the City Council were able to participate in the meeting virtually, as long as a quorum of the Planning and Zoning Commission and the City Council and the respective presiding officers were physically present at the Municipal Building, in accordance with the Texas Open Meetings Act. A video recording of the meeting was made and will be posted to the City's website and available to the public in accordance with the Texas Public Information Act upon written request.

CALL JOINT ROLLINGWOOD PLANNING AND ZONING COMMISSION AND CITY COUNCIL MEETING TO ORDER

1. Roll Call

Mayor Gavin Massingill called the City Council meeting to order at 5:07 p.m.

Chair Amie Rodnick called the Planning & Zoning meeting to order at 5:07 p.m.

Present Members of City Council: Mayor Gavin Massingill, Mayor Pro Tem Sara Hutson, Council Member Phil McDuffee, Council Member Roxanne McKee, Council Member Alec Robinson, and Council Member Brook Brown.

Present Members of Planning and Zoning Commission: Chair Amie Rodnick, Michael Hall, Dave Bench, Brian Nash, and Tony Stein.

Also Present: City Administrator Ashley Wayman, City Attorney Charles Zech, City Secretary Desiree Adair, RCDC President Emily Doran, and Assistant to the City Administrator Makayla Rodriguez.

PUBLIC COMMENTS

There were no public comments.

REGULAR AGENDA

2. Discussion and possible action in regard to residential zoning ordinances defining the minimum required depth and width of yards

   Mayor Gavin Massingill called up agenda items 2, 3, and 4 simultaneously.

   Council Member Brook Brown discussed how City Council has received funding from RCDC in order to proceed on the commercial zoning changes from the Comprehensive Plan. She discussed bringing in development along the commercial corridor and issues discovered with our existing Code.

   The Planning and Zoning Commission asked why these issues were brought to the Planning and Zoning Commission at this time. Council Member Brook Brown explained the difference between the items, the timing for public hearings, and understanding the process of passing an ordinance.

   The Planning and Zoning Commission and City Council discussed current yard requirements, possible code changes, the Comprehensive Plan, and the process of moving forward resident concerns.

   The Planning and Zoning Commission discussed the idea of soliciting input from the community in regards to residential building concerns and requested examples. Council Member Brook Brown offered to put together a list of examples of the projections issue.

   The Planning and Zoning Commission and the City Council discussed spec homes, investment funds, and multiple owners of one property.

   Members of the Planning and Zoning Commission expressed concern with fixing issues one at a time that cause unintended consequences. They discussed development in Rollingwood with the mixture of newer and older homes, and providing time for the community to decide their options.

   The Planning and Zoning Commission discussed overhangs and the purpose that they provide from an energy efficiency standpoint. Dave Bench had previously emailed his concerns to City Council. They discussed how overhangs being restricted to the setback requirements have other considerations. City Council discussed trees as shade and water runoff from the roof onto neighboring properties. The Planning and Zoning Commission discussed the creation of non-conforming structures with making these changes. Council Member Brook Brown discussed defining overhangs, eaves, cornices, and projections.

   Members of the Planning and Zoning Commission discussed the purpose of the meeting and what is desired to be accomplished. Mayor Gavin Massingill defined which Rollingwood municipal codes are being discussed and reviewed. Chapter 107 is the Zoning Code, and section 107-3 includes the residential building height definition. Section 107-71 describes the maximum permissible height. Chapter 101 is the building and construction code which has definitions in section 101-2. Yard and setback line definitions are found in Chapter 107 of the Zoning Code in the definition section 107-3. Section 107-75 Yards generally and section 107-76 Minimum required depth and width of yards are also relevant to this discussion.

Abe Salinas, of K. Friese + Associates, discussed definitions, application, and recommendations. Their focus has been on building yard depths with respect to projections and maximum height regulations for residential buildings. They apply the code as written to reviews for approval or disapproval. Yard depths with projections need definitions, and limitations, such as 18-36 inches as other cities have done, and review for conformance with Code and the requirements for approval. K. Friese + Associates reviews the plans for general conformance with maximum height. He discussed the terrain and sloping lots with grading changes that occur during the building process. Mayor Gavin Massingill discussed an administrative requirement of an upfront promulgated form with clear indications of what the reference datum points are.

The Planning and Zoning Commission and City council discussed the measurement of the building height. Mayor Gavin Massingill discussed how to find the highest point and the lowest point. He explained the Code and how to determine the highest and lowest points without fluctuation. Council Member Brook Brown discussed a legal provision in our building code in section 107-71 that does not allow any part of a building to be greater than 35 feet, and the definition in 107-3 of residential building height. With the adoption of the International Building Code, the definitions were used, and in her opinion, caused a problem with enforcement. The Planning and Zoning Commission asked Mr. Salinas how this is currently applied. Mr. Salinas explained that they use the definition in section 107-3.

Mayor Gavin Massingill left the meeting at 6:36 p.m.

The Planning and Zoning Commission, City Council, and Mr. Salinas discussed projections and cantilevers and application of the code.

The Commission and Council Members discussed next steps in this process including costs and consultants. Council Member Brook Brown discussed how the Comprehensive Task Force acted with a survey, public hearings, workshops, and the development of a new plan.

Kendra Roloson, building on 304 Vale and living at 301 Wallis, discussed the need for community input. She would like her voice to be heard as well as other members of the community. She would like alternative times for meeting for community input, and she feels a code rewrite should be considered with the input of all citizens. She is a real estate attorney and discussed nonconforming use issues with piecemeal code changes and would like careful consideration by the community as a whole.

Emily Doran, 601 Ridgewood, discussed the complexity of building a house in Rollingwood. She would like a consideration of a welcoming committee for builders.

City Council and the Planning and Zoning Commission discussed the timing for a public hearing. City Administrator Ashley Wayman explained the noticing requirements for a public hearing at both the Planning and Zoning Commission and City Council meetings. City Staff will request availability tomorrow.

3. Discussion and possible action regarding building height and related provisions in the residential zoning code

   This item was called up simultaneously with item 2 and item 4.

4. Discussion and possible action to begin an assessment of the city's residential zoning ordinances

   This item was called up simultaneously with item 2 and item 3.

ADJOURNMENT OF MEETING

The Planning and Zoning Commission meeting was adjourned at 6:59 p.m.

The City Council meeting was adjourned at 7:01 p.m.

Minutes Adopted on the __________day of _______________, 2022 by the Planning and Zoning Commission.

____

Amie Rodnick, Chair

ATTEST:

____

Desiree Adair, City Secretary

Minutes Adopted on the ___________day of ________________, 2022 by City Council.

Gavin Massingill, Mayor

ATTEST:

Desiree Adair, City Secretary

CITY OF ROLLINGWOOD
CITY COUNCIL MEETING
MINUTES

Wednesday, October 19, 2022

The City Council of the City of Rollingwood, Texas held a meeting, open to the public, in the Municipal Building at 403 Nixon Drive in Rollingwood, Texas on October 19, 2022. Members of the public and the City Council were able to participate in the meeting virtually, as long as a quorum of the City Council and the presiding officer were physically present at the Municipal Building, in accordance with the Texas Open Meetings Act. A video recording of the meeting was made and will be posted to the City's website and available to the public in accordance with the Texas Public Information Act upon written request.

CALL REGULAR CITY COUNCIL MEETING TO ORDER

1. Roll Call

Mayor Gavin Massingill called the meeting to order at 7:02 p.m.

Present Members: Mayor Gavin Massingill, Mayor Pro Tem Sara Hutson, Council Member Alec Robinson, Council Member Phil McDuffee, and Council Member Roxanne McKee.

Also Present: City Administrator Ashley Wayman, City Attorney Charles Zech, Interim Chief of Police Kristal Munoz, Finance Director Abel Campos, City Secretary Desiree Adair, and Assistant to the City Administrator Makayla Rodriguez.

Present Virtually: Park Commission Chair Chad Smith

PROCLAMATIONS

2. Discussion and possible action on a Proclamation for Breast Cancer Awareness Month

Mayor Gavin Massingill proclaimed October 2022 Breast Cancer Awareness Month in the City of Rollingwood.

PUBLIC COMMENTS

The following individuals spoke during public comments:

- Shanthi Jayakumar, 3309 Park Hills Drive, thanked the Mayor, Council, and staff for their hard work. She acknowledged long term resident Lorraine Wheeler and her husband for their public service and donations to the City of Rollingwood. She also acknowledged Frankie Westbrook.

She brought attention to the addresses of Rollingwood being occasionally mistaken to be in West Lake Hills. She thanked the Police Department for its excellent planning and service during the ACL Festival. She asked if the City of Austin pays for Rollingwood's service during ACL.

PRESENTATIONS

3. Update regarding the November 8, 2022 Bond Election

   City Administrator Ashley Wayman discussed the completion of the statutory postings of election information around the City and on the election page on the City website.

   Mayor Gavin Massingill discussed the informational pages regarding the bond propositions and their addition to the website.

4. Presentation and discussion on the Quarterly Investment Report for the 4th Quarter

   Finance Director Abel Campos discussed the Quarterly Investment Report for the 4th quarter of Fiscal Year 2021 – 2022.

5. Presentation and discussion on the Budget Review for the 4th Quarter

   Finance Director Abel Campos discussed the Budget Review for the 4th quarter of Fiscal Year 2021 – 2022. He explained that the numbers presented are unaudited. The auditors will be here at the end of next month and the audit will be published depending on their schedule around February or March of 2023.

   Council Member Phil McDuffee asked about the drainage fund. Finance Director Abel Campos explained how the drainage fund is financed.

   Council Member Alec Robinson followed up about line items regarding the General Fund balance.

CONSENT AGENDA

All Consent Agenda items listed are considered to be routine by the City Council and may be enacted by one (1) motion. There will be no separate discussion of Consent Agenda items unless a City Council Member has requested that the item be discussed, in which case the item will be removed from the Consent Agenda and considered in its normal sequence on the Regular Agenda.

6. Discussion and possible action on the minutes from the August 17, 2022 City Council meeting

7. Discussion and possible action on the minutes from the September 21, 2022 City Council meeting

8. Discussion and possible action on the minutes from the September 27, 2022 Special City Council meeting

   Mayor Pro Tem Sara Hutson moved to approve Consent Agenda. Council Member Roxanne McKee seconded the motion. The motion carried with 4 in favor and 0 against.

REGULAR AGENDA

9. Discussion and possible action on a recommendation from the Park Commission regarding the installation of artificial turf infield on Hatley Field 1 by Western Hills Little League

   Mayor Gavin Massingill brought up item 10 at this time.

   Park Commission Chair Chad Smith discussed the improvement of Hatley Field with the implementation of artificial turf. He explained how it would make it a safer environment and the ability to play after rain. It takes stress off fields 3, 4, and 5 and would be able to control the drainage with this surface. This would make the field available for other activities like yoga. This would improve the maintenance of the Park for the City and Western Hills Little League.

   Melissa Morrow, 2502 Timberline Drive, Park Commission member, and executive director of the facility that Joseph field sits on, spoke about the ability to use the fields and the ease of maintenance with artificial turf. She discussed safety and improvement in numbers of injuries. She did describe the downside of the artificial turf being hot, but explained that is why it only covers the infield.

   City Council discussed the maintenance schedule, the warranty, the cost for removal and return to original condition. They also discussed the layout of the field with artificial turf and how bases are attached and movable. Mayor and City Council continued to discuss the advantages and disadvantages of artificial turf in regards to maintenance, City staff resources, heat, and injuries.

   Melissa Morrow discussed the construction and drainage of an artificial turf field.

   Council Member Roxanne McKee asked about the warranty, a proposed contract from KMI, and drainage issues.

   Jess Butler, 4822 Rollingwood Drive discussed issues that City Council needs to consider including recycled tire composition, the drainage of the field including construction with water pits, the beauty of a natural park, the odor of rubber at Joseph Field, and the temperature of the outfield, infield, and parking lot. He asked Council to respect the environment, water, insects, and wildlife. He supports the kids playing, but has concerns regarding health, and requests that the children be able to play on natural grass.

   John Hinton, 2 Jeffery Cove, discussed taking more time to study the comments made. His concern is with the water and the drainage. He requested the City Engineer review where the water would go with this project.

   Shanthi Jayakumar provided copies to City Council of a study of the drainage of Rollingwood Community Park. She had concerns from the study and for public time in the Park. She would like community input.

   Council Member Roxanne McKee and Melissa Morrow discussed water usage for cooling Joseph Field.

   Chad Smith discussed proper sliding instruction on turf, the warranty agreement, drainage, preference for turf, and the timing of installation before the spring season.

Mayor Pro Tem Sara Hutson discussed research done by Victoria Johnson and would like the opportunity to read through that information.

Mayor Pro Tem Sara Hutson moved to table this item until time certain next council meeting. Council Member Alec Robinson seconded the motion. The motion carried with 4 in favor and 0 against.

10. Discussion and possible action on a recommendation from the Park Commission regarding amendments to the park rental rates for adult fitness activities

Council Member Alec Robinson discussed the history of the passing of a new fee structure and the sustainability of that fee structure. There were 3 vendors previously and now there is 1 vendor remaining. After the Park Commission meeting, Council Member Alec Robinson looked at the price per hour. He stated that the rate has gone from $25 per hour to $3 per hour.

Mayor Gavin Massingill stated that from an administrative standpoint, staff is happy to implement the policy that Council decides.

Michael Wong, 8 Inwood Circle, asked about the Park Commission's recommendation. City Administrator Ashley Wayman explained that the current rate is $25 per hour. The new rate is a prorated rate based on size of the group and the hours per week.

Niccole Maurici, 4906 Timberline Drive and Park Commission member, explained the purpose of the fee structure as being consistent with renters within the local area. She explained the history of this item and the vendors that have left the park. She discussed the time per week, the number of participants, the residency of the participants, the costs to participants, and money made by the vendors. She would like consistency in application of fees to vendors. She discussed a comparative analysis of nearby spaces with other cities including facts and cost comparisons.

City Council asked for the comparative rates of other cities. Council Member Alec Robinson provided them for publication in the packet during the meeting.

Neissa Springmann, from Ignite, spoke regarding the spaces that they use in the Park. She discussed the timing of learning of the new rental rate policy. She explained the difficulty of the increase, the sustainability of the new fees, the expectation of the condition of the facilities, their services, and the health of body, mind, and spirit.

Council Member Phil McDuffee asked for clarification of which category Ignite aligns with in the new rental structure.

Melissa Morrow, 2502 Timberline Drive and Park Commission member, discussed keeping adult fitness activities happening in the park. There were unintended consequences of the passing of the new rental rate structure for adult fitness. She explained how the rate for an adult fitness class was calculated and the comparison with the City of Austin rates.

Neissa Springmann discussed partnering with the City of Rollingwood and supporting the Park.

City Council discussed the proposed rental rates and value of adult fitness classes in the Park.

Michael Wong requested action on this item.

Council Member Alec Robinson moved to approve the rates as they are written in this agenda item, but then bring this item back to Council meeting in January for possible further action after a 2-month run. Council Member Phil McDuffee seconded the motion.

Council Member Alec Robinson amended his motion to apply only to adult fitness activities. Council Member Phil McDuffee seconded the amended motion.

City council discussed the different groups and usage of the park. Niccole Maurici discussed sizes and usage of the park and pavilion for different groups. She asked City Council to consider consistency of rate application.

Mayor Gavin Massingill explained the ease of consistency for implementation of rates for staff.

City Council discussed the application of different rates for different groups and concerns regarding business planning purposes for vendors

The motion carried with 4 in favor and 0 against.

Mayor Gavin Massingill returned to item 9 at this time.

11. Discussion and possible action on a recommendation from the Park Commission to allow pavilion rental during weekdays when school is not in session

Council Member Alec Robinson discussed community feedback received.

Niccole Maurici, 4906 Timberline Drive and Park Commission member, discussed the history and the ability to rent the pavilion during time slots available. The Park Commission is asking to rent during weekdays when school is not in session.

Melissa Morrow, 2502 Timberline Drive and Park Commission member, discussed that this would not include more rentals but would just allow pavilion rental during school holidays.

Council Member Phil McDuffee discussed protections put in place for impact on residents neighboring the Park.

City Administrator Ashley Wayman explained the fees for renting the pavilion for residents and nonresidents.

Council Member Roxanne McKee moved to approve to allow pavilion rental during weekdays when school is not in session. Council Member Phil McDuffee seconded the motion.

Mayor Pro Tem Sara Hutson asked why the pavilion rental is limited to when school is not in session. Council Member Phil McDuffee agreed that this is a good point.

Nicole Maurici explained that pavilion rental is currently only available on Saturdays and Sundays. The Park Commission is asking for consideration on this recommendation from the Park Commission.

Council Member Roxanne McKee amended her motion to allow pavilion rental during the weekdays not to exceed 4 events per week. Council Member Phil McDuffee seconded the motion. The motion carried with 3 in favor and 1 against.

Council Member Alec Robinson clarified that the reason for his vote against was that this was not what the Park Commission passed. The Park Commission recommended rental only when school was out.

12. Discussion and possible action on an ordinance amending the date for assessing late fees to utility service charges

City Administrator Ashley Wayman explained the ordinance previously approved for assessing late fees and that our accounting system does not allow for this to work with our billing. Bills are currently due on the 23rd of the month and the new bill is generated the first week of the following month. Due to the short window of time, the change is to ask for 3 business days and then assessment of late fees.

Mayor Gavin Massingill discussed the addition of Veronica Hernandez as Utility Billing Manager and the accounts with late fees and flexibility extended.

City Administrator Ashley Wayman explained how messages will be presented with every effort before assessing these charges beginning in January.

Council Member Roxanne McKee moved to accept the ordinance as posed in the packet, Ordinance number 2022-10-19-12, that amends the City's Code of Ordinances Part 1 Chapter 22 Article 2 Section 22-30 - Payment. Council Member Alec Robinson seconded the motion.

Discussion ensued regarding the length of time for the assessment of late fees.

The motion carried with 4 in favor and 0 against.

13. Discussion and possible action to modify the current Designated Construction Holiday Calendar

Council Member Phil McDuffee discussed the previous adoption of the Holiday Calendar and the feedback from residents of construction performed on the most recent Federal holiday. He would like to consider adding President's Day and Texas Independence Day to the days on which construction will be prohibited. He mentioned that City staff is not here on these holidays.

Mayor Pro Tem Sara Hutson asked to add the Code Compliance Officer to the answering system. City Administrator Ashley Wayman discussed the holiday messages and agreed to add the Code Compliance Officer.

Council Member Phil McDuffee moved to amend our current construction prohibited holiday calendar to include President's Day and Columbus / Indigenous People's Day in line with our federal holidays. Texas Independence Day will allow construction. Mayor Pro Tem Sara Hutson seconded the motion. The motion carried with 4 in favor and 0 against.

14. Discussion and possible action on status of online message board implementation

City Administrator Ashley Wayman discussed working with the IT company and explained that server options would require cost that is above the limit authorized by Council. She spoke with the company that the City of San Marcos uses and it will cost about $1,000 per year with additional setup fees. There is not a timeline yet.

Mayor Gavin Massingill clarified that residents will not be able to participate in the online discussion.

15. Discussion and possible action to increase the number of regular meetings of the Rollingwood City Council to a minimum of twice per month

Council Member Roxanne McKee discussed her reasons for bringing this item to the agenda including the pace of development and the City about to embark on a comprehensive review of residential zoning requiring workshops and citizen input. She anticipates a lot of work and decision making. She spoke about being more efficient and the problem with transparency in government with meetings going into late hours. She believes it is burdensome on City staff and deters people from running for City Council. She recommended a time limit on meetings and mentioned cities in the region that have at least 2 meetings per month.

City Council discussed this idea, the strain on staff resources, and their openness to this discussion.

Mayor Gavin Massingill discussed the commitment of two nights per month for those currently running for Mayor or Council. Staff resources would be greatly affected to provide council meetings twice per month as well as the other boards and commissions.

City Council discussed the timing of changing this during an election for Mayor and new Council Members.

Mayor Pro Tem Sara Hutson suggested that she would like to see the message board in place and the residential zoning task force created before voting on this item.

Shanthi Jayakumar, 3309 Park Hills Drive, offered her thoughts that the meeting could stop at a time limit and continue the next day.

Council Member Roxanne McKee discussed running meetings more efficiently with a time limit and the encouragement of more citizen participation.

16. Discussion and possible action to review applications and make appointments to the Utility Commission

City Administrator Ashley Wayman explained that there is one position open on the Utility Commission and two applicants for the Utility Commission. They have reapplied since the changes made to the requirements to serve on boards and commissions.

Council Member Phil McDuffee moved that City Council appoint Walt Roloson to the Utility Commission. Mayor Pro Tem Sara Hutson seconded the motion. The motion carried with 4 in favor and 0 against.

REPORTS

All reports are posted to inform the public. No discussion or action will take place on items not on the regular or consent agenda.

17. City Administrator's Report
18. Chief of Police Report
19. Municipal Court Report
20. City Financials For September 2022 - Fiscal Year 2021 - 2022
21. RCDC Financials For September 2022 - Fiscal Year 2021 - 2022
22. City Stats for September 2022
23. Contract Invoices through September 2022 - Crossroads Utility Services, Water and Wastewater Service, K. Friese + Associates - IIP & MS4, K. Friese + Associates, City Engineer
24. Crossroads Utility Services Report on Water and Wastewater for September 2022
25. City Engineer Report - K. Friese + Associates
26. Texas Central Appraisal District and Tax Assessor - Notices, Letters, Documents
27. Texas Gas Service - Notices, Letters, Documents

ADJOURNMENT OF MEETING

Mayor Gavin Massingill adjourned the meeting at 9:51 pm.

Minutes Adopted on the _____ day of _____________, 2022.

____
Gavin Massingill, Mayor

ATTEST:

____
Desiree Adair, City Secretary

FEE SCHEDULE

ARTICLE A1.000. GENERAL PROVISIONS

Sec. A1.001. Scope.

The fees listed in the fee schedule shall be charged and collected by the city for the activities or uses indicated.

Sec. A1.002. Conflicting provisions.

This fee schedule, and in particular the fees set forth herein, controls over and supersedes any conflicting provisions in the city code.

Sec. A1.003. Payment of consultant fees.

(a) Payment required. All applicants shall pay all consultant fees incurred by the city that are associated with their applications referenced in the following articles (A2.000 and A3.000). No approvals will be issued in connection with their applications until all required fees have been paid to the city, regardless of the method used for collection of such fees.

(b) Payment of deposit. When consultant fees are anticipated to be substantial, the city secretary or building official upon receipt of an application, may establish a deposit amount that is equivalent to the projected consultant fees to be incurred in connection with the application. The applicant shall deposit this amount with the city prior to any review, inspection, processing or other work being initiated by the city. A revised deposit amount may be established at any time when consultant fees are substantially different than originally projected, and additional amounts payable or refundable will be due at the time of issuance to the applicant of notice of a revised deposit amount. When a deposit is established, the application will not be considered as filed or complete until the deposit is paid. When a deposit is paid, all consultant fees incurred by the city that are associated with the application will be charged against this deposit. Upon completion of the consultant activities, the applicant shall pay any fees incurred by the city in excess of the deposit. Any excess deposit remaining after the payment of all consultant fees will be returned to the applicant.

(c) Alternate procedure for substantial consulting fees. For large or complex development projects and other applications where an estimate of fees is determined to be impracticable, the city secretary, city engineer, public works director or building official will provide a list of the types of review, inspections, and determinations to be made by city consultants, together with hourly or customary fees charged by relevant consultants for the work. In the case of any ongoing inspection or review activities, such as utility construction review, a description of the anticipated incidence of such consultant work may be provided. In cases with protracted consultant activity, periodic invoices for costs incurred by the city may be issued to the applicant and shall be due and payable within 30 days of the issue date.

ARTICLE A2.000. BUILDING FEES

Sec. A2.001. General fees.

Fees include filing fees listed below, plus $0.25 per sq. ft. of project area, excluding areas defined only by linear feet. Plan reviews are included. Permit duration is 12 months with option for permit renewal requests.

(1) Residential zoning district.

(A) Residential new construction: $600.00.

(B) Residential reconstruction: $600.00.

(C) Residential addition:

(i) Addition to residence with an increase in footprint or roof plan: $600.00.

(ii) Addition to residence with no increase in footprint or roof plan: $225.00.

(iii) Add swimming pool: $600.00.

(iv) Add accessory building 200 sq. ft. to 500 sq. ft.: $225.00.

(v) Fence greater than six ft. in height: $225.00.

(D) Residential remodel: $225.00.

(E) Extra plan review for revised or resubmitted residential plans:

(i) New, reconstruction or addition resubmittal: $300.00.

(ii) Remodel resubmittal: $175.00.

(F) Permit renewal request: $125.00.

(2) Commercial (nonresidential) zoning districts:

(A) Commercial new construction of 10,000 sq. ft. or less: $1,200.00.

(B) Commercial new over 10,000 sq. ft.: $1,500.00.

(C) Commercial addition, remodel or finish out: $600.00.

(D) Extra plan review for revised or resubmitted commercial plans:

(i) New commercial resubmittal: $600.00.

(ii) Addition, remodel, finish out resubmittal: $300.00.

(E) Permit renewal request: $125.00.

(3) Fence permit six ft. or less in height: $75.00.

(4) Copy of an occupancy certificate: $1.00.

Sec. A2.002. Emergency and utilities construction permits and duration.

(a) MEP install, alter repair or retire service within six months: $75.00.

(b) Street cut install, alter or retire gas service and repair street within six months: No fee per franchise utility provider agreement.

(c) Install bedroom emergency egress windows in sleeping areas within three months: $75.00.

Sec. A2.003. Inspections.

(a) Applicable inspections. Inspections for the purpose of measuring compliance with provisions of chapter 3 building regulations and chapter 14 zoning are required and performed under the authority of the building official.

(b) Payment of inspections required. Permittees prepay the required inspections at the time the permit is issued. At close out of the permit, permittees pay for all other inspections performed during the course of the permit, including on-site inspections, reinspections and other engineer reviews for compliance as required by the building official.

(c) Inspection fee: $75.00.

ARTICLE A3.000. DEVELOPMENT AND ZONING FEES

(a) Annexation request: $600.00.

(b) Commercial site development permit: Collect actual consultant fees incurred per section A1.003(c).

(c) Curb cut and repair permit: $175.00.

(d) Demolition:

(1) Demolish building: $600.00.

(2) Demolish structure attached to building: $225.00.

(e) Excavation or land fill fee: $175.00.

(f) House moving: $600.00.

(g) Master plan or PUD: $1,100.00 plus $0.10/sq. ft.

(h) Plat approval:

(1) Subdivision application: $1,200.00.

(2) Per lot fee: $300.00.

(i) Plat variance, per lot: $300.00.

(j) Residential irrigation permit fee: $75.00.

(k) Residential site development permit:

(1) New construction: $2,000.00.

(2) Addition: $1,200.00.

(3) Minor impervious cover addition: $500.00.

(l) Special use permit: $700.00.

(m) Vacation fee: $1,200.00.

(n) Variance: $300.00.

(o) Zoning change: $600.00.

ARTICLE A4.000. ON-SITE WASTEWATER FEES

(a) Residential: $440.00.

(b) Commercial: $550.00.

(c) Tank replacement/subst. modification: $220.00.

(d) Plan review: $82.50.

(e) Inspection fee, separate:

(1) Residential: $150.00.

(2) Commercial: $200.00.

(f) State fee: $10.00.

ARTICLE A5.000. SIGN FEES

(a) Commercial - permanent (complete construction within six months): $125.00.

(b) Commercial - temporary (display 30 days): $75.00.

(c) Multi-business/monument (complete construction within six months): $150.00.

(d) Sign variance: $165.00.

ARTICLE A6.000. LICENSES AND PERMITS

(a) Alcoholic beverage permit: one-half fee imposed by state.

(b) Reserved.

(c) Fire prevention inspection: $27.50.

(d) Massage establishment fee: $110.00.

(e) Massage operator fee: $55.00.

(f) Ham radio fee: $165.00.

(g) Reserved.

(h) Commercial solid waste permit/year/company: $110.00.

(i) Solicitation/six months: $100.00.

(j) Food establishment permits and inspections:

- (1) Food establishment permit (including food processing plant or warehouse):
  - (A) 1 to 9 employees: $310.00.
  - (B) 10 to 25 employees: $425.00.
  - (C) 26 to 50 employees: $620.00.
  - (D) 51 to 100 employees: $805.00.
  - (E) Over 100 employees: $990.00.
  - (F) Expired permit late fee: $100.00.
- (2) Mobile food unit permit (fee per unit):
  - (A) Restricted operation: $90.00.
  - (B) Unrestricted operation: $210.00.
- (3) Temporary food establishment permit:
  - (A) 2 calendar days or less: $35.00/booth.
  - (B) 3-5 calendar days: $70.00/booth.
  - (C) 6-14 calendar days: $90.00/booth.
  - (D) Expired permit fee: $100.00.
- (4) Food establishment plan review:

(A) New construction or change of owner: $250.00.

(B) Remodel of permitted facility:

(i) Greater than 10,000 sq. ft.: $250.00.

(ii) 2,500-9,999 sq. ft.: $165.00.

(iii) Less than 2,500 sq. ft.: $60.00.

(5) Food service, retail food and food processing plant or warehouse annual permit fees:

(A) Low risk/small (1C): $359.00.

(B) Low risk/medium (1B): $378.00.

(C) Low risk/large (1A): $416.00.

(D) Medium risk/small (2C): $532.00.

(E) Medium risk/medium (2B): $608.00.

(F) Medium risk/large (2A): $684.00.

(G) High risk/small (3C): $601.00.

(6) Certified farmers market, mobile vendor, temporary food establishment and vending machine annual permit fees:

(A) Certified farmers market annual permits:

(ii) Class A: $177.00.

(ii) Class B: $333.00.

(iii) Class C: $622.00.

(B) Mobile vendor annual permit fees:

(i) Application fee: $105.00.

(ii) Unrestricted permit/unit: $290.00.

(iii) Restricted permit/unit: $212.00.

(iv) Re-inspection: $13,000.00.

(v) AFD fire inspection: $125.00.

(vi) AFD fire re-inspection: $75.00.

(C) Temporary food establishments:

(i) 1 calendar day: $35.00/booth.

(ii) 2—5 calendar days: $102.00/booth.

(iii) 6—14 calendar days: $155.00/booth.

(iv) Expedited permit: $100.00 additional.

(D) Vending machines:

(i) Application fee: $120.00.

(ii) Permit fee: $25.00/machine.

(7) Food enterprise inspection fees, variance request fees:

(A) Certificate of occupancy: $224.00.

(B) Change of ownership inspection: $192.00.

(C) Variance request/HACCP review: $290.00.

(D) Inspection outside normal hours: $144.00.

(E) Re-inspection: $130.00.

(F) Central preparation facility registration: $150.00.

(8) Food enterprise plan reviews:

(A) New construction: $298.00.

(B) Remodel of permitted facility:

(i) More than 10,000 sq. ft.: $298.00.

(ii) 2,500—10,000 sq. ft.: $254.00.

(iii) Less than 2,500 sq. ft.:$211.00.

(k) Network nodes in public right-of-way:

(1) Up to five network nodes in the same application: $500.00.

(2) Each additional network node: $250.00.

(3) Each node support pole: $1,000.00.

(4) Annual rate per node in the city public right-of-way: $250.00.

(5) Rate to collocate a network node on a service pole on the public right-of-way, per pole, per year: $20.00.

(l) Residential stormwater discharge permit:

(1) Nonrefundable permit application fee: $3,500.00.

(2) Permit fee: $6.00 per square foot as reflected in the area multiplier project square footage on a residential building permit application.

(m) Alcoholic beverage, fire prevention, amateur radio antenna, solid waste, solicitation permit fees:

(1) Alcoholic beverage permit: one-half the fee imposed by the state.

(2) Fire prevention inspection: $27.50.

(3) Amateur radio antenna: $165.00.

(4) Commercial solid waste permit/year/company: $110.00.

(5) Solicitation/six months: $100.00.

ARTICLE A7.000. MISCELLANEOUS FEES

(a) Gasoline tank inspection: $55.00.

(b) Gasoline bulk storage: $110.00.

(c) Gasoline pumps: $110.00.

(d) Natural gas inspection: $55.00.

(e) Animal control fees:

(1) Impoundment fee: Established by the administrators of the city pound.

(2) Dangerous dog annual registration fee: $50.00.

(f) Property impoundment fee: $27.50.

(g) Advertisement, impoundment: $55.00.

(h) Sale, impoundment: $55.00.

(i) Posting, impoundment: $55.00.

(j) Copy charge/copy: $0.10 per page.

(k) Police accident report: $5.00.

(l) Zoning code, copy: $35.00.

(m) Returned check processing fee: $30.00.

(n) Tree maintenance business fee: $25.00.

(o) Court cost assessed for deposit to fund:

(1) For technology fund: $4.00.

(2) For building security fund: $3.00.

ARTICLE A8.000. PARK FEES

Sec. A8.001. Park pavilion fees.

(a) Reservation fee:

(1) Resident of the city: $100.00/event

(2) Non-resident: $300.00/event

(b) Deposit fee:

(1) Resident deposit fee: $250.00/event which fee may be applied to pay the cost to repair any damage occurring during the period of use and/or to clean the area in the event of excessive litter or debris.

(2) Non-resident deposit fee: $500.00/event which fee may be applied to pay the cost to repair any damage occurring during the period of use and/or to clean the area in the event of excessive litter or debris.

Sec. A8.002. Facility rental fees (excluding the pavilion).

(a) Adult fitness activities: Hatley Fields 1, 2, 3, 4 and 5 and the fieldhouse patio

(1) 1-7 attendees for 1-5 Hours per week: $1,000 annually

(2) 1-7 attendees for 6-10 hours per week: $1,200 annually

(3) 8-20 attendees for 1-5 hours per week: $1,320 annually

(4) 8-20 attendees for 6-10 hours per week: $1,800 annually

(b) All other activities: Hatley Fields 1, 2, 3, 4 and 5 and the fieldhouse patio

(1) $25/hour per location.

ARTICLE A9.000. WATER AND WASTEWATER FEES

Sec. A9.001. Water capital recovery fees.

(a) Water fees. The city will collect, on behalf of Austin and pursuant to that certain "2000 Agreement for Wholesale Water Services Between the City of Austin and the City of Rollingwood" dated effective February 3, 2000, Austin's then-current water capital recovery fee from the city's customers for each service unit connected to the city's water system at the time the connection is made. The amount of the fees shall be calculated per service unit in accordance with the provisions of chapter 25-9 of the 1999 Austin City Code, as adopted by Austin. The number of service units for which the fee is charged shall be calculated per service unit in accordance with the provisions of chapter 25-9 of the 1999 Austin City Code, as adopted by Austin.

Sec. A9.002. Water and wastewater tap fees.

(a) Water tap fee (per service unit): $3,400.00.

(b) Residential wastewater tap fee: $3,500.00. In addition, the following shall be added to the wastewater tap fee:

(1) All capital recovery fees and other charges for new service units that are in excess of the total amount of $1,400.00 charged by the City of Austin ("COA") pursuant to that Agreement for Wholesale Wastewater Service between COA and the City of Rollingwood dated January 27, 1999, as may be amended or extended from time to time; and

(2) An amount equal to 110 percent of the actual cost to the city to install a connection from the nearest available wastewater line to the boundary of the property (including the cost to restore affected street pavement and curbing).

(c) Nonresidential wastewater tap fee (per service unit): $8,500.00.

(d) Service unit table:

Water Meter Size	*Type*	*Service Units*
⅝"	Positive displacement	1
¾"	Positive displacement	1.5
1"	Positive displacement	2.5
1½"	Positive displacement	5
1½"	Turbine	8
2"	Positive displacement	8
2"	Turbine	10
3"	Compound	16
3"	Turbine	24
4"	Compound	25
4"	Turbine	42
6"	Compound	50
6"	Turbine	92
8"	Turbine	160
10"	Turbine	280

(e) Expedited fee. Installation of taps and connections for water and wastewater service is scheduled in the order a request and payment of fees is provided to the city, and in the reasonably expeditious regular course such services are provided by the city. Installation shall be arranged on a priority expedited basis upon request and payment of an additional fee calculated as follows:

The applicable tap fee will be increased by the cost charged to the city by the city's designated third-party provider of service for the work of making the requested connection to the city's system. Such additional charge shall be the cost to the city of labor provided by the city's designated third-party provider; there shall be no additional charge for regular materials or fixtures included in the standard tap fee.

Sec. A9.003. Wastewater service rates.

(a) Rates. The rates to be charged by the city for wastewater collection and treatment services to its customers will be:

(1) Residential customers. $13.07 base rate per month, plus $7.81 per 1,000 gallons based upon the current winter average.

(2) Commercial customers. $91.07 per living unit equivalent, as that living unit equivalent is defined by policy of the city, assigned to the customer per month, plus $7.81 per 1,000 gallons of water usage as measured monthly.

(b) Winter average calculation.

(1) Each year, the city will determine each customer's winter water usage during the months of November, December, January, February, and March and calculate an average monthly water usage based on usage during such winter months. There will be a minimum average of at least 1,000 gallons. This average will be used to calculate the customer's volume wastewater charges until the next year, when the average will be recalculated. In addition, each year the city will determine an average during such winter months of monthly residential usage by all residential customers. Such average will be used to calculate volume charges for a customer who did not purchase water from the city for the entirety of the most recent winter average period, including those whose water supply is provided by one or more water wells.

(2) For any residential connection that does not have adequate prior water use history from which to determine an accurate average, including those customers who do not purchase water from the city, the default average use shall be the average monthly usage of all residential water customers last determined pursuant to subsection (b)(1) of this section. Actual winter water usage for such a residential connection shall be utilized when/if the calculation is made the following year. Neither the city nor a customer shall be entitled to any adjustment for previous bills based on recalculation after employment of the default rate.

(3) For residential customers with residential irrigation meters, water use of both household and irrigation meters shall be aggregated to determine the winter average water use.

Sec. A9.004. Water service rates, fees and deposit.

(a) Water demand charge. The fees to be charged by the city for services provided to each customer during each monthly billing cycle are as follows:

Meter Size	*Monthly Fee*
⅝" or ¾"	$20.00
1"	$30.00

1.5"	$80.00
2"	$128.00
3"	$240.00
4"	$400.00
6"	$800.00
8"	$1,280.00

(b) Water use charge. The rates to be charged by the city for services provided to each customer during each monthly billing cycle are:

(1) For residential customers:

(A) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 0 gallons and 2,000 gallons: $2.00.

(B) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 2,001 gallons and 8,000 gallons: $5.00.

(C) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 8,001 gallons and 13,000 gallons: $7.00.

(D) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 13,001 gallons and 25,000 gallons: $10.00.

(E) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 25,001 gallons and 35,000 gallons: $15.00.

(F) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 35,001 gallons and 50,000 gallons: $21.00.

(G) Gallonage charge for each 1,000 gallons, or fraction thereof, over 50,000 gallons: $28.00.

(2) For commercial customers:

Charge for each 1,000 gallons, or fraction thereof: $6.25.

(3) Irrigation:

(A) Gallonage charge for each 1,000 gallons, or fraction between 0 gallons and 35,000 gallons: $7.25.

(B) Gallonage charge for each 1,000 gallons, or fraction between 35,000 gallons and 50,000 gallons: $10.75.

(C) Gallonage charge for each 1,000 gallons, or fraction over 50,000 gallons: $15.25.

(4) Water use through residential irrigation meters shall be aggregated with household water use, and billed a combined total.

(5) Rational surcharges for residential customers:

(A) Allocation 0 gallons through 10,000 gallons per month:

(i) $25.00 for the first 1,000 gallons over allocation.

(ii) $50.00 for the second 1,000 gallons over allocation.

(iii) $75.00 for the third 1,000 gallons over allocation.

(iv) $100.00 for each additional 1,000 gallons over allocation.

(B) Allocation 10,001 gallons per month or more:

(i) $50.00 per 1,000 gallons in excess of the allocation up through five percent above allocation.

(ii) $100.00 per 1,000 gallons from five percent through ten percent above allocation.

(iii) $150.00 per 1,000 gallons from ten percent through 15 percent above allocation.

(iv) $200.00 per 1,000 gallons more than 15 percent above allocation.

(6) Rational surcharges for industrial customers:

(A) Allocation 0 gallons through 20,000 gallons per month:

(i) $25.00 for the first 1,000 gallons over allocation.

(ii) $50.00 for the second 1,000 gallons over allocation.

(iii) $75.00 for the third 1,000 gallons over allocation.

(iv) $100.00 for each additional 1,000 gallons over allocation.

(B) Allocation 20,001 gallons per month or more:

(i) $50.00 per 1,000 gallons in excess of the allocation up through five percent above allocation.

(ii) $100.00 per 1,000 gallons from five percent through ten percent above allocation.

(iii) $150.00 per 1,000 gallons from ten percent through 15 percent above allocation.

(iv) $200.00 per 1,000 gallons more than 15 percent above allocation.

(c) Connection fees.

(1) Charges for connecting water meters to the city water distribution system are as follows:

¾-inch meter	$400.00
1-inch meter	$550.00
1½-inch meter	$790.00
2-inch meter	$1,125.00
3-inch meter	$2,100.00
4-inch meter	$2,900.00
6-inch meter	$5,500.00

(2) Connection fees include neither the expense of cutting and repairing the pavement, nor the expense related to the use of heavy equipment, such as backhoes, rocksaws, or jackhammers, which may be required in making such connection. These expenses will be determined by the city, and will be paid by the applicant for water services.

(d) Deposit.

(1) A cash deposit shall be paid to the city by the applicant for water service. The deposit may be drawn upon by the city to reimburse itself for any amounts past due from the customer for water or wastewater service.

(2) The required deposit shall be:

(A) Residential: $500.00 regardless of the size of water meter.

(B) Commercial shall be as follows:

⅝- or ¾-inch meter	$500.00
1-inch meter	$575.00

2-inch meter	$625.00
Larger than 2-inch meter	$800.00

Sec. A9.005. Cross-connection inspection fees.

(a) Residential property. The city's cross-connection inspection fees for residential property are as follows:

(1) Slab: $25.00.

(2) Wall: $25.00.

(3) Fixture: $50.00.

(4) Backflow: $75.00 for each device.

(5) Fees for reinspection are $50.00 each, except for reinspection of backflow prevention devices, which will be $75.00 per device. The city will charge a reinspection fee in addition to the original cross-connection inspection fee if the applicant's plumber misses the appointment for a scheduled inspection.

(b) Commercial development. The city's cross-connection inspection fee for commercial development will be determined by the city's representative based upon the size and scope of such project.

Sec. A9.006. Industrial waste permit and discharge fees.

The city's industrial waste permit and discharge fees are as follows:

(1) Annual permit fee: $400.00.

(2) Transfer fee: $50.00.

(3) Site development fee for construction plan review and inspection: $550.00.

(4) Sampling and testing charges, including BOD, COD, TSS, oil and grease and pH analysis: Cost plus ten percent.

(5) Surcharge. Any permit holder found to be discharging waste which exceeds the normal waste standards set forth in the regulations or to be discharging a substance prohibited under article 13.08 shall be assessed a pro rata portion of the surcharge assessed against Rollingwood by Austin: Determined annually, payable in monthly installments.

(6) Violation and enforcement charges. Any permit holder found to be in violation of article 13.08 shall be assessed a charge which recovers all of the city's costs relating to such violation, including but not limited to all costs of cleanup, administrative and professional fees, and fines and/or penalties levied by other governmental entities with jurisdiction: Cost plus ten percent.

Sec. A9.007. Special charges.

(a) A charge of $20.00 shall be imposed for each service call made to discontinue or reinstate water service.

(b) Checks returned by a bank for insufficient funds shall be charged $12.00 and be redeposited.

RESOLUTION NO. 2022-11-16-11

A RESOLUTION AMENDING THE FEE SCHEDULE OF THE CITY OF ROLLINGWOOD, TEXAS TO EXTABLISH PARK RENTAL RATES FOR ADULT FITNESS ACTIVITIES; PROVIDING FOR SEVERABILITY AND AN EFFECTIVE DATE

WHEREAS, the City desires to amend the city's fee schedule in to establish park rental rates for adult fitness activities.

NOW THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ROLLINGWOOD, TEXAS, THAT:

SECTION 1. The Fee Schedule of the City of Rollingwood, Texas is hereby amended as reflected in Appendix A with strikeouts being deletions and underlines being additions.

SECTION 2. This Resolution shall be effective immediately upon adoption.

SECTION 3. If any provision of this Resolution is found by a court of competent jurisdiction to be void or unenforceable, such void or unenforceable provision shall be severed as though it never formed a part of this Resolution, and all other provisions hereof shall remain in full force and effect.

PASSED AND ADOPTED BY THE CITY COUNCIL OF ROLLINGWOOD, TEXAS, on the 16th day of November, 2022.

____

Gavin Massingill, Mayor

ATTEST:

____

Desiree Adair, City Secretary

Appendix A: Fee Schedule

FEE SCHEDULE

ARTICLE A1.000. GENERAL PROVISIONS

Sec. A1.001. Scope.

The fees listed in the fee schedule shall be charged and collected by the city for the activities or uses indicated.

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This fee schedule, and in particular the fees set forth herein, controls over and supersedes any conflicting provisions in the city code.

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Sec. A2.001. General fees.

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(v) Fence greater than six ft. in height: $225.00.

(D) Residential remodel: $225.00.

(E) Extra plan review for revised or resubmitted residential plans:

(i) New, reconstruction or addition resubmittal: $300.00.

(ii) Remodel resubmittal: $175.00.

(F) Permit renewal request: $125.00.

(2) Commercial (nonresidential) zoning districts:

(A) Commercial new construction of 10,000 sq. ft. or less: $1,200.00.

(B) Commercial new over 10,000 sq. ft.: $1,500.00.

(C) Commercial addition, remodel or finish out: $600.00.

(D) Extra plan review for revised or resubmitted commercial plans:

(i) New commercial resubmittal: $600.00.

(ii) Addition, remodel, finish out resubmittal: $300.00.

(E) Permit renewal request: $125.00.

(3) Fence permit six ft. or less in height: $75.00.

(4) Copy of an occupancy certificate: $1.00.

Sec. A2.002. Emergency and utilities construction permits and duration.

(a) MEP install, alter repair or retire service within six months: $75.00.

(b) Street cut install, alter or retire gas service and repair street within six months: No fee per franchise utility provider agreement.

(c) Install bedroom emergency egress windows in sleeping areas within three months: $75.00.

Sec. A2.003. Inspections.

(a) Applicable inspections. Inspections for the purpose of measuring compliance with provisions of chapter 3 building regulations and chapter 14 zoning are required and performed under the authority of the building official.

(b) Payment of inspections required. Permittees prepay the required inspections at the time the permit is issued. At close out of the permit, permittees pay for all other inspections performed during the course of the permit, including on-site inspections, reinspections and other engineer reviews for compliance as required by the building official.

(c) Inspection fee: $75.00.

ARTICLE A3.000. DEVELOPMENT AND ZONING FEES

(a) Annexation request: $600.00.

(b) Commercial site development permit: Collect actual consultant fees incurred per section A1.003(c).

(c) Curb cut and repair permit: $175.00.

(d) Demolition:

  (1) Demolish building: $600.00.

  (2) Demolish structure attached to building: $225.00.

(e) Excavation or land fill fee: $175.00.

(f) House moving: $600.00.

(g) Master plan or PUD: $1,100.00 plus $0.10/sq. ft.

(h) Plat approval:

  (1) Subdivision application: $1,200.00.

  (2) Per lot fee: $300.00.

(i) Plat variance, per lot: $300.00.

(j) Residential irrigation permit fee: $75.00.

(k) Residential site development permit:

  (1) New construction: $2,000.00.

  (2) Addition: $1,200.00.

  (3) Minor impervious cover addition: $500.00.

(l) Special use permit: $700.00.

(m) Vacation fee: $1,200.00.

(n) Variance: $300.00.

(o) Zoning change: $600.00.

ARTICLE A4.000. ON-SITE WASTEWATER FEES

(a) Residential: $440.00.

(b) Commercial: $550.00.

(c) Tank replacement/subst. modification: $220.00.

(d) Plan review: $82.50.

(e) Inspection fee, separate:

(1) Residential: $150.00.

(2) Commercial: $200.00.

(f) State fee: $10.00.

ARTICLE A5.000. SIGN FEES

(a) Commercial - permanent (complete construction within six months): $125.00.

(b) Commercial - temporary (display 30 days): $75.00.

(c) Multi-business/monument (complete construction within six months): $150.00.

(d) Sign variance: $165.00.

ARTICLE A6.000. LICENSES AND PERMITS

(a) Alcoholic beverage permit: one-half fee imposed by state.

(b) Reserved.

(c) Fire prevention inspection: $27.50.

(d) Massage establishment fee: $110.00.

(e) Massage operator fee: $55.00.

(f) Ham radio fee: $165.00.

(g) Reserved.

(h) Commercial solid waste permit/year/company: $110.00.

(i) Solicitation/six months: $100.00.

(j) Food establishment permits and inspections:

(1) Food establishment permit (including food processing plant or warehouse):

(A) 1 to 9 employees: $310.00.

(B) 10 to 25 employees: $425.00.

(C) 26 to 50 employees: $620.00.

(D) 51 to 100 employees: $805.00.

(E) Over 100 employees: $990.00.

(F) Expired permit late fee: $100.00.

(2) Mobile food unit permit (fee per unit):

(A) Restricted operation: $90.00.

(B) Unrestricted operation: $210.00.

(3) Temporary food establishment permit:

(A) 2 calendar days or less: $35.00/booth.

(B) 3-5 calendar days: $70.00/booth.

(C) 6-14 calendar days: $90.00/booth.

(D) Expired permit fee: $100.00.

(4) Food establishment plan review:

(A) New construction or change of owner: $250.00.

(B) Remodel of permitted facility:

(i) Greater than 10,000 sq. ft.: $250.00.

(ii) 2,500-9,999 sq. ft.: $165.00.

(iii) Less than 2,500 sq. ft.: $60.00.

(5) Food service, retail food and food processing plant or warehouse annual permit fees:

(A) Low risk/small (1C): $359.00.

(B) Low risk/medium (1B): $378.00.

(C) Low risk/large (1A): $416.00.

(D) Medium risk/small (2C): $532.00.

(E) Medium risk/medium (2B): $608.00.

(F) Medium risk/large (2A): $684.00.

(G) High risk/small (3C): $601.00.

(6) Certified farmers market, mobile vendor, temporary food establishment and vending machine annual permit fees:

(A) Certified farmers market annual permits:

(ii) Class A: $177.00.

(ii) Class B: $333.00.

(iii) Class C: $622.00.

(B) Mobile vendor annual permit fees:

(i) Application fee: $105.00.

(ii) Unrestricted permit/unit: $290.00.

(iii) Restricted permit/unit: $212.00.

(iv) Re-inspection: $13,000.00.

(v) AFD fire inspection: $125.00.

(vi) AFD fire re-inspection: $75.00.

(C) Temporary food establishments:

(i) 1 calendar day: $35.00/booth.

(ii) 2—5 calendar days: $102.00/booth.

(iii) 6—14 calendar days: $155.00/booth.

(iv) Expedited permit: $100.00 additional.

(D) Vending machines:

(i) Application fee: $120.00.

(ii) Permit fee: $25.00/machine.

(7) Food enterprise inspection fees, variance request fees:

(A) Certificate of occupancy: $224.00.

(B) Change of ownership inspection: $192.00.

(C) Variance request/HACCP review: $290.00.

(D) Inspection outside normal hours: $144.00.

(E) Re-inspection: $130.00.

(F) Central preparation facility registration: $150.00.

(8) Food enterprise plan reviews:

(A) New construction: $298.00.

(B) Remodel of permitted facility:

(i) More than 10,000 sq. ft.: $298.00.

(ii) 2,500—10,000 sq. ft.: $254.00.

(iii) Less than 2,500 sq. ft.:$211.00.

(k) Network nodes in public right-of-way:

(1) Up to five network nodes in the same application: $500.00.

(2) Each additional network node: $250.00.

(3) Each node support pole: $1,000.00.

(4) Annual rate per node in the city public right-of-way: $250.00.

(5) Rate to collocate a network node on a service pole on the public right-of-way, per pole, per year: $20.00.

(l) Residential stormwater discharge permit:

(1) Nonrefundable permit application fee: $3,500.00.

(2) Permit fee: $6.00 per square foot as reflected in the area multiplier project square footage on a residential building permit application.

(m) Alcoholic beverage, fire prevention, amateur radio antenna, solid waste, solicitation permit fees:

(1) Alcoholic beverage permit: one-half the fee imposed by the state.

(2) Fire prevention inspection: $27.50.

(3) Amateur radio antenna: $165.00.

(4) Commercial solid waste permit/year/company: $110.00.

(5) Solicitation/six months: $100.00.

ARTICLE A7.000. MISCELLANEOUS FEES

(a) Gasoline tank inspection: $55.00.

(b) Gasoline bulk storage: $110.00.

(c) Gasoline pumps: $110.00.

(d) Natural gas inspection: $55.00.

(e) Animal control fees:

(1) Impoundment fee: Established by the administrators of the city pound.

(2) Dangerous dog annual registration fee: $50.00.

(f) Property impoundment fee: $27.50.

(g) Advertisement, impoundment: $55.00.

(h) Sale, impoundment: $55.00.

(i) Posting, impoundment: $55.00.

(j) Copy charge/copy: $0.10 per page.

(k) Police accident report: $5.00.

(l) Zoning code, copy: $35.00.

(m) Returned check processing fee: $30.00.

(n) Tree maintenance business fee: $25.00.

(o) Court cost assessed for deposit to fund:

(1) For technology fund: $4.00.

(2) For building security fund: $3.00.

ARTICLE A8.000. PARK FEES

Sec. A8.001. Park pavilion fees.

(a) Reservation fee:

(1) Resident of the city: $100.00/event

(2) Non-resident: $300.00/event

(b) Deposit fee:

(1) Resident deposit fee: $250.00/event which fee may be applied to pay the cost to repair any damage occurring during the period of use and/or to clean the area in the event of excessive litter or debris.

(2) Non-resident deposit fee: $500.00/event which fee may be applied to pay the cost to repair any damage occurring during the period of use and/or to clean the area in the event of excessive litter or debris.

Sec. A8.002. Facility rental fees (excluding the pavilion).

(a) Adult fitness activities: Hatley Fields 1, 2, 3, 4 and 5 and the fieldhouse patio

(1) 1-7 attendees for 1-5 Hours per week: $1,000 annually

(2) 1-7 attendees for 6-10 hours per week: $1,200 annually

(3) 8-20 attendees for 1-5 hours per week: $1,320 annually

(4) 8-20 attendees for 6-10 hours per week: $1,800 annually

~~(a)~~ (b) All other activities: Hatley Fields 1, 2, 3, 4 and 5 and the fieldhouse patio:

(1) $25/hour per location

ARTICLE A9.000. WATER AND WASTEWATER FEES

Sec. A9.001. Water capital recovery fees.

(a) Water fees. The city will collect, on behalf of Austin and pursuant to that certain "2000 Agreement for Wholesale Water Services Between the City of Austin and the City of Rollingwood" dated effective February 3, 2000, Austin's then-current water capital recovery fee from the city's customers for each service unit connected to the city's water system at the time the connection is made. The amount of the fees shall be calculated per service unit in accordance with the provisions of chapter 25-9 of the 1999 Austin City Code, as adopted by Austin. The number of service units for which the fee is charged shall be calculated per service unit in accordance with the provisions of chapter 25-9 of the 1999 Austin City Code, as adopted by Austin.

Sec. A9.002. Water and wastewater tap fees.

(a) Water tap fee (per service unit): $3,400.00.

(b) Residential wastewater tap fee: $3,500.00. In addition, the following shall be added to the wastewater tap fee:

(1) All capital recovery fees and other charges for new service units that are in excess of the total amount of $1,400.00 charged by the City of Austin ("COA") pursuant to that Agreement for Wholesale Wastewater Service between COA and the City of Rollingwood dated January 27, 1999, as may be amended or extended from time to time; and

(2) An amount equal to 110 percent of the actual cost to the city to install a connection from the nearest available wastewater line to the boundary of the property (including the cost to restore affected street pavement and curbing).

(c) Nonresidential wastewater tap fee (per service unit): $8,500.00.

(d) Service unit table:

Water Meter Size	*Type*	*Service Units*
⅝"	Positive displacement	1
¾"	Positive displacement	1.5
1"	Positive displacement	2.5

1½"	Positive displacement	5
1½"	Turbine	8
2"	Positive displacement	8
2"	Turbine	10
3"	Compound	16
3"	Turbine	24
4"	Compound	25
4"	Turbine	42
6"	Compound	50
6"	Turbine	92
8"	Turbine	160
10"	Turbine	280

(e) Expedited fee. Installation of taps and connections for water and wastewater service is scheduled in the order a request and payment of fees is provided to the city, and in the reasonably expeditious regular course such services are provided by the city. Installation shall be arranged on a priority expedited basis upon request and payment of an additional fee calculated as follows:

The applicable tap fee will be increased by the cost charged to the city by the city's designated third-party provider of service for the work of making the requested connection to the city's system. Such additional charge shall be the cost to the city of labor provided by the city's designated third-party provider; there shall be no additional charge for regular materials or fixtures included in the standard tap fee.

Sec. A9.003. Wastewater service rates.

(a) Rates. The rates to be charged by the city for wastewater collection and treatment services to its customers will be:

(1) Residential customers. $13.07 base rate per month, plus $7.81 per 1,000 gallons based upon the current winter average.

(2) Commercial customers. $91.07 per living unit equivalent, as that living unit equivalent is defined by policy of the city, assigned to the customer per month, plus $7.81 per 1,000 gallons of water usage as measured monthly.

(b) Winter average calculation.

(1) Each year, the city will determine each customer's winter water usage during the months of November, December, January, February, and March and calculate an average monthly water usage based on usage during such winter months. There will be a minimum average of at least 1,000 gallons. This average will be used to calculate the customer's volume wastewater charges until the next year, when the average will be recalculated. In addition, each year the city will determine an average during such winter months of monthly residential usage by all residential customers. Such average will be used to calculate volume charges for a customer who did not purchase water from the city for the entirety of the most recent winter average period, including those whose water supply is provided by one or more water wells.

(2) For any residential connection that does not have adequate prior water use history from which to determine an accurate average, including those customers who do not purchase water from the city, the default average use shall be the average monthly usage of all residential water customers last determined pursuant to subsection (b)(1) of this section. Actual winter water usage for such a residential connection shall be utilized when/if the calculation is made the following year. Neither the

city nor a customer shall be entitled to any adjustment for previous bills based on recalculation after employment of the default rate.

(3) For residential customers with residential irrigation meters, water use of both household and irrigation meters shall be aggregated to determine the winter average water use.

Sec. A9.004. Water service rates, fees and deposit.

(a) Water demand charge. The fees to be charged by the city for services provided to each customer during each monthly billing cycle are as follows:

Meter Size	*Monthly Fee*
⅝" or ¾"	$20.00
1"	$30.00
1.5"	$80.00
2"	$128.00
3"	$240.00
4"	$400.00
6"	$800.00
8"	$1,280.00

(b) Water use charge. The rates to be charged by the city for services provided to each customer during each monthly billing cycle are:

(1) For residential customers:

(A) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 0 gallons and 2,000 gallons: $2.00.

(B) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 2,001 gallons and 8,000 gallons: $5.00.

(C) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 8,001 gallons and 13,000 gallons: $7.00.

(D) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 13,001 gallons and 25,000 gallons: $10.00.

(E) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 25,001 gallons and 35,000 gallons: $15.00.

(F) Gallonage charge for each 1,000 gallons, or fraction thereof, of usage between 35,001 gallons and 50,000 gallons: $21.00.

(G) Gallonage charge for each 1,000 gallons, or fraction thereof, over 50,000 gallons: $28.00.

(2) For commercial customers:

Charge for each 1,000 gallons, or fraction thereof: $6.25.

(3) Irrigation:

(A) Gallonage charge for each 1,000 gallons, or fraction between 0 gallons and 35,000 gallons: $7.25.

(B) Gallonage charge for each 1,000 gallons, or fraction between 35,000 gallons and 50,000 gallons: $10.75.

(C) Gallonage charge for each 1,000 gallons, or fraction over 50,000 gallons: $15.25.

(4) Water use through residential irrigation meters shall be aggregated with household water use, and billed a combined total.

(5) Rational surcharges for residential customers:

(A) Allocation 0 gallons through 10,000 gallons per month:

(i) $25.00 for the first 1,000 gallons over allocation.

(ii) $50.00 for the second 1,000 gallons over allocation.

(iii) $75.00 for the third 1,000 gallons over allocation.

(iv) $100.00 for each additional 1,000 gallons over allocation.

(B) Allocation 10,001 gallons per month or more:

(i) $50.00 per 1,000 gallons in excess of the allocation up through five percent above allocation.

(ii) $100.00 per 1,000 gallons from five percent through ten percent above allocation.

(iii) $150.00 per 1,000 gallons from ten percent through 15 percent above allocation.

(iv) $200.00 per 1,000 gallons more than 15 percent above allocation.

(6) Rational surcharges for industrial customers:

(A) Allocation 0 gallons through 20,000 gallons per month:

(i) $25.00 for the first 1,000 gallons over allocation.

(ii) $50.00 for the second 1,000 gallons over allocation.

(iii) $75.00 for the third 1,000 gallons over allocation.

(iv) $100.00 for each additional 1,000 gallons over allocation.

(B) Allocation 20,001 gallons per month or more:

(i) $50.00 per 1,000 gallons in excess of the allocation up through five percent above allocation.

(ii) $100.00 per 1,000 gallons from five percent through ten percent above allocation.

(iii) $150.00 per 1,000 gallons from ten percent through 15 percent above allocation.

(iv) $200.00 per 1,000 gallons more than 15 percent above allocation.

(c) Connection fees.

(1) Charges for connecting water meters to the city water distribution system are as follows:

¾-inch meter	$400.00
1-inch meter	$550.00
1½-inch meter	$790.00
2-inch meter	$1,125.00
3-inch meter	$2,100.00
4-inch meter	$2,900.00
6-inch meter	$5,500.00

(2) Connection fees include neither the expense of cutting and repairing the pavement, nor the expense related to the use of heavy equipment, such as backhoes, rocksaws, or jackhammers, which may be

required in making such connection. These expenses will be determined by the city, and will be paid by the applicant for water services.

(d) Deposit.

(1) A cash deposit shall be paid to the city by the applicant for water service. The deposit may be drawn upon by the city to reimburse itself for any amounts past due from the customer for water or wastewater service.

(2) The required deposit shall be:

(A) Residential: $500.00 regardless of the size of water meter.

(B) Commercial shall be as follows:

⅝- or ¾-inch meter	$500.00
1-inch meter	$575.00
2-inch meter	$625.00
Larger than 2-inch meter	$800.00

Sec. A9.005. Cross-connection inspection fees.

(a) Residential property. The city's cross-connection inspection fees for residential property are as follows:

(1) Slab: $25.00.

(2) Wall: $25.00.

(3) Fixture: $50.00.

(4) Backflow: $75.00 for each device.

(5) Fees for reinspection are $50.00 each, except for reinspection of backflow prevention devices, which will be $75.00 per device. The city will charge a reinspection fee in addition to the original cross-connection inspection fee if the applicant's plumber misses the appointment for a scheduled inspection.

(b) Commercial development. The city's cross-connection inspection fee for commercial development will be determined by the city's representative based upon the size and scope of such project.

Sec. A9.006. Industrial waste permit and discharge fees.

The city's industrial waste permit and discharge fees are as follows:

(1) Annual permit fee: $400.00.

(2) Transfer fee: $50.00.

(3) Site development fee for construction plan review and inspection: $550.00.

(4) Sampling and testing charges, including BOD, COD, TSS, oil and grease and pH analysis: Cost plus ten percent.

(5) Surcharge. Any permit holder found to be discharging waste which exceeds the normal waste standards set forth in the regulations or to be discharging a substance prohibited under article 13.08 shall be assessed a pro rata portion of the surcharge assessed against Rollingwood by Austin: Determined annually, payable in monthly installments.

(6) Violation and enforcement charges. Any permit holder found to be in violation of article 13.08 shall be assessed a charge which recovers all of the city's costs relating to such violation, including but not limited to all costs of cleanup, administrative and professional fees, and fines and/or penalties levied by other governmental entities with jurisdiction: Cost plus ten percent.

Sec. A9.007. Special charges.

(a) A charge of $20.00 shall be imposed for each service call made to discontinue or reinstate water service.

(b) Checks returned by a bank for insufficient funds shall be charged $12.00 and be redeposited.

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Staff

Agenda Item:

Discussion and possible action on a Resolution amending the fee schedule to reflect the park rental rates for adult fitness activities as approved at the October 19, 2022 City Council Meeting

Description:

At the October City Council Meeting the City Council approved a recommendation from the Park Commission to amend the facility rental rates for adult fitness activities.

This item is to to formally update the fee changes consistent with what was adopted.

Action Requested:

To approve a Resolution amending the fee schedule to reflect the park rental rates for adult fitness activities as approved at the October 19, 2022 City Council Meeting

Fiscal Impacts:

No significant fiscal impact anticipated at this time

Attachments:

- Resolution amending the fee schedule with Appendix A, proposed amendments
- Clean version of Fee Schedule amended as proposed

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Staff

Agenda Item:

Discussion and possible action on an Ordinance amending section 32-38 No parking signs of the City's Code of Ordinances to correct printing errors and reflect action previously taken by the City Council

Description:

At the May 18, 2022 City Council Meeting, the City Council discussed inconsistencies between the no parking areas in the city that were specified in the code, and those that were actually identified in the city with no parking signs and yellow curbs. The proposed changes were discussed and were to be brought back at the next meeting for final adoption in the form of an ordinance.

At the June 15, 2022 City Council Meeting the ordinance that was brought back and adopted by the City Council contained an error that was not consistent with the discussions at the May meeting. The discussion regarding Edgegrove Drive was to amend the no parking area to be consistent with what had been painted previously, which was from Bee Caves Road to Rollingwood Drive, but the Ordinance stated that the no parking area was only from Bee Caves Road to Timberline Drive.

This ordinance amends Section 32-38 (3) to strike “Timberline” and add “Rollingwood” Drive.

Action Requested:

To consider approval of an Ordinance amending section 32-38 No parking signs of the City's Code of Ordinances to correct printing errors and reflect action previously taken by the City Council

Fiscal Impacts:

No significant fiscal impact anticipated at this time

Attachments:

- Resolution amending Section 32-38 of the City’s Code of Ordinances

ORDINANCE NO. 2022-11-16-12

AN ORDINANCE AMENDING PART I OF THE CITY'S CODE OF ORDINANCES, CHAPTER 32, ARTICLE II, SECTION 32-38 NO PARKING SIGNS

WHEREAS, the City of Rollingwood is a General Law Type A City under the statutes of the State of Texas; and

WHEREAS, the City Council of the City of Rollingwood ("City Council") previously directed the placement, replacement, and maintenance of no parking signs on various streets; and

WHEREAS, at the June 15, 2022 City Council Meeting, the City Council found and determined that revisions to Section 32-38 of the City's Code of Ordinances were necessary, based on earlier public discussions regarding the desired amendments to this section; and

WHEREAS, the ordinance passed contained one error that did not reflect previous discussions regarding the desired amendments to this section; and

WHEREAS, the City Council now finds and determines it necessary to further amend Section 32-38 of the City's Code of Ordinances to correct that error; and

WHEREAS, the City Council finds and determines that the amendments to the no parking regulations provided for herein are in the best interests of the public health and safety of the public.

NOW THEREFORE BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF ROLLINGWOOD, TEXAS, THAT:

SECTION 1. All the above premises are hereby found to be true and correct legislative and factual findings of the City Council and are hereby approved and incorporated into the body of this Ordinance as if copied in their entirety.

SECTION 2. Part I of the City's Code of Ordinances Chapter 32, Article II, Section 32-38 is hereby amended as follows, with strikethroughs being deletions and underlines being additions:

The city council hereby prohibits parking in the following areas and manner and has directed the placement of no parking signs as follows:

(1) *Bee Cave Woods Drive.* Along both sides of Bee Cave Woods Drive beginning at its intersection with Bee Cave Road and terminating at the end of the city's jurisdictional limit.

(2) *Bettis Boulevard.* On the north and south curbs of Bettis Boulevard, in the 2300 block of Bettis Boulevard, between the hours of 9:00 p.m. and 6:00 a.m.

(3) *Edgegrove Drive*. On the east and west curbs of Edgegrove Drive between Bee Caves Road and ~~Timberline~~ Rollingwood Drive.

(4) *Gentry Drive*. On the north curb of Gentry Drive from Rollingwood Drive to Nixon Drive and on the south curb of Gentry Drive from Rollingwood Drive for a distance of 150 feet.

(5) *Hatley Drive*. On the east and west curbs of Hatley Drive between Wallis Drive and Ashworth Drive.

(6) *Nixon Drive*.

a. On the west curb of Nixon Drive between Gentry Drive and Park Hills Drive.

b. On the east curb of Nixon Drive between the parking lot entrance and Park Hills Drive.

(7) *Rollingwood Drive*.

a. On the north curb of Rollingwood Drive between Wallis Drive and Gentry Drive.

b. On the south curb of Rollingwood Drive between Riley Road and Timberline Drive.

(8) *Wallis Drive*. On the west curb of Wallis Drive extending 250 feet north from Rollingwood Drive.

(9) *Timberline Drive*.

a. On the north curb of Timberline Drive from Inwood Drive to the driveway of 4811 Timberline Drive.

b. On the south curb of Timberline Drive from Inwood Drive to the driveway of 4808 Timberline Drive

(10) *Ashworth Drive*. On the west curb of Ashworth Drive between the driveway of 202 Ashworth Drive and Hatley Drive.

SECTION 3. All provisions of the ordinances of the City of Rollingwood in conflict with the provisions of this ordinance are hereby repealed to the extent of such conflict, and all other provisions of the ordinances of the City of Rollingwood not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 4. Should any sentence, paragraph, clause, phrase or section of this ordinance be adjudged or held to be unconstitutional, illegal or invalid, the same shall not affect the validity of this ordinance as a whole, or any part or provision thereof other than the part so decided to be invalid, illegal or unconstitutional, and shall not affect the validity of the Code of Ordinances as a whole.

SECTION 5. This ordinance shall take effect immediately from and after its passage and the publication of the caption as the law provides.

APPROVED, PASSED AND ADOPTED by the City Council of the City of Rollingwood, Texas, on the 16th day of November, 2022.

APPROVED:

____
Gavin Massingill, Mayor

ATTEST:

____
Desiree Adair, City Secretary

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Staff

Agenda Item:

Discussion and possible action on an appeal of the City Engineer's denial of a request for alternative methods of design for drainage facilities for 208 Ashworth Drive

Description:

The property owner of 208 Ashworth Drive is in the process of obtaining building permits for a new residence and swimming pool. They have proposed construction plans that include a maximum cut of approximately fourteen (14) feet of depth into the existing natural terrain of the property, which is not in compliance with section 103-235(5) of the city's Code of Ordinances, which limits maximum allowable depths of cut to eight (8) vertical feet.

The applicant originally submitted a request for a variance to the Board of Adjustment, but after legal review, it was determined that the Board of Adjustment was not the correct avenue for this request as section 103-235(5) is not in the Zoning Code. Please note that this processing error is why the applicant's letter is addressed to the Board of Adjustment and refers to seeking a variance, however, the request has not changed other than that it is now being considered as an appeal to the City Council.

It was then determined that the next step for this request was for it to be submitted as a request for an alternative method of design per section 103-206(b) of the City's Code of Ordinances. This section states that "Alternative methods of design of drainage facilities may be considered where performance is demonstrated through sound engineering practices to meet the performance requirements of this article. If any condition requiring some additional measure of protection is identified as necessary to conform to the purpose identified in section 103-199, the applicant's engineer shall make provision therefor in the design of the development."

The City Engineer reviewed the request for relief from Section 103-235(5) and recommended denial on the basis that the alternative method of design provisions of the code are not applicable to a request such as this. They interpreted the alternative method of design process to apply to the design of drainage facilities only; not site design criteria in general, such as cut or fill.

The City Engineer further noted that although the applicant has demonstrated that the proposed cut would not negatively impact surrounding properties, the alternative method of design process does not apply in this case.

The applicant's only other recourse based on the relief procedures provided by the City's Code of Ordinances is to appeal the City Engineers determination to the City Council, Section 103-208(a) of the city's Code of Ordinances, for further consideration and potential approval.

Action Requested:

Take action on an appeal of the City Engineer's denial of a request for approval of an alternative methods of design for drainage facilities at 208 Ashworth Drive

Fiscal Impacts:

No significant fiscal impact anticipated at this time

Attachments:

- 208 Ashworth Drive – Drainage Plans
- 208 Ashworth Drive – Site plan
- 208 Ashworth Drive – Pictures
- 208 Ashworth Drive – Applicant Submittal Letter and Attachments
- Memo from K. Friese and Associates Re: Alternative Method of Design

DRAINAGE PLANS FOR:
RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746
SUBMITTAL DATE: ARPIL 10, 2022

OWNER: Andrew Richardson
208 Ashworth Drive
Rollingwood, TX 78747

ARCHITECT: Finn Nordfjord
Cornerstone Architects
7000 Bee Caves Rd., Suite 200
Austin, TX 78746
(512) 329-0007

ENGINEER/ PERSON PREPARING PLAN: Chris Maxwell-Gaines, P.E.
Innovative Water Solutions LLC
501 W. Powell Lane, Suite 206
Austin, TX 78753
(512) 490-0932

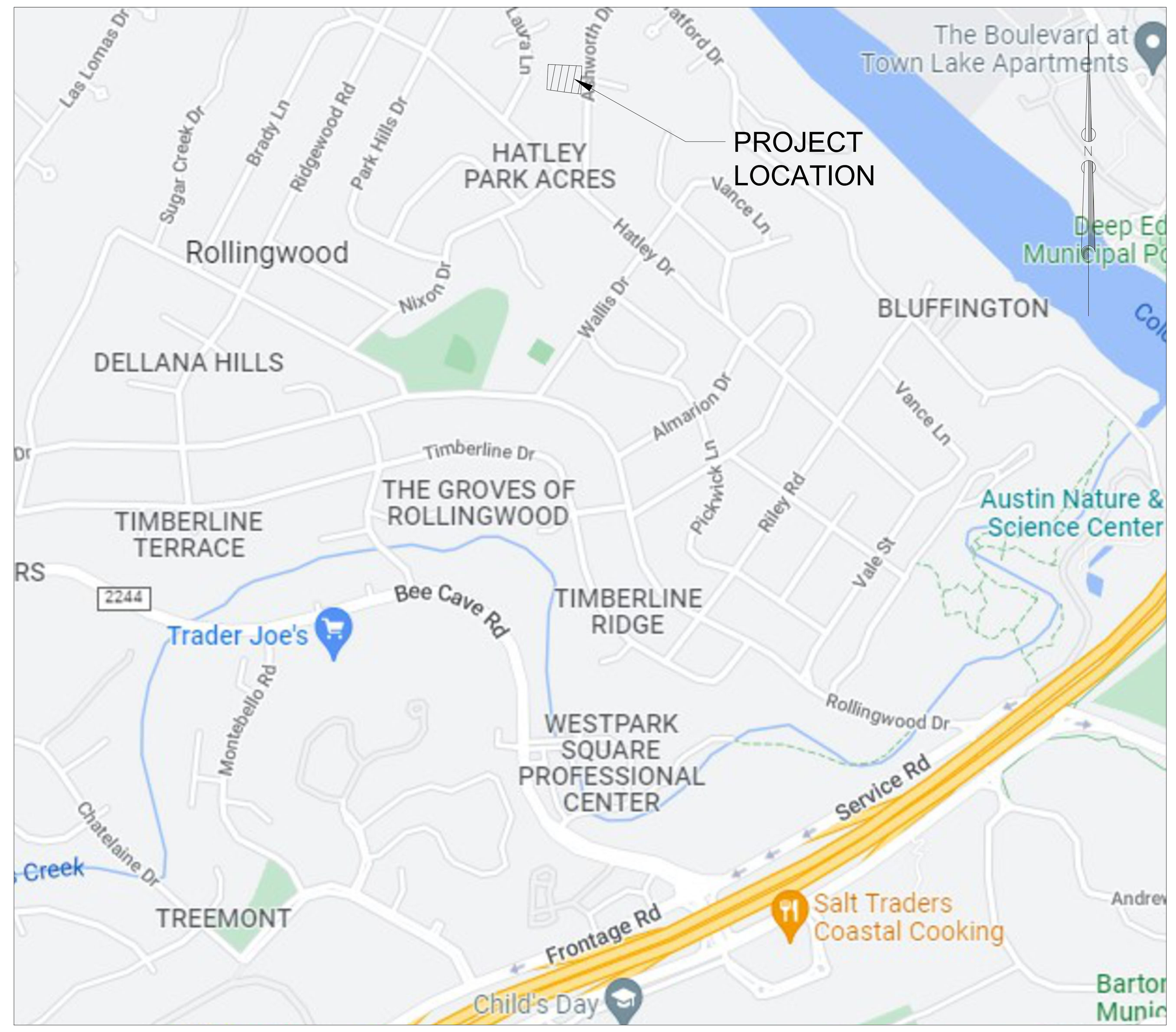
PROJECT ADDRESS: 208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746

PARCEL ID: 110540

ACREAGE: 0.407 AC

LEGAL DESCRIPTION: LOT 21 ROLLINGWOOD PARK ESTATES SEC 2

FLOODPLAIN: THIS PROPERTY DOES NOT LIE WITHIN THE 100 YEAR FLOOD- PLAIN, AND HAS A ZONE "X" RATING AS SHOWN ON FEMA FIRM MAP 48453C0445K, DATED JANUARY 22, 2020.



VICINITY MAP
N.T.S.

INDEX OF SHEETS

GENERAL NOTES:

1. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAIN WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF ROLLINGWOOD MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
2. CONTRACTOR SHALL CALL THE ONE CALL SYSTEM (1-800-344-8377) FOR UTILITY LOCATIONS PRIOR TO ANY WORK IN CITY EASEMENTS OR STREET R.O.W.
3. FOR SLOPES OR TRENCHES GREATER THAN FIVE FEET IN DEPTH: ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE REGULATIONS OF THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA STANDARDS MAY BE PURCHASED FROM OSHA, 611 EAST 6TH STREET, AUSTIN, TEXAS.)
4. ALL SITE WORK MUST ALSO COMPLY WITH ENVIRONMENTAL REGULATIONS.
5. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TRAFFIC CONTROL PERMIT PRIOR TO CONSTRUCTION IN THE RIGHT-OF-WAY.

PROJECT DESCRIPTION:

DEMOLITION OF THE EXISTING TWO STORY HOUSE AND CONSTRUCTION OF A NEW TWO STORY HOUSE WITH POOL / PATIO, AND TERRACED BACKYARD.

APPROVED BY:

CITY OF ROLLINGWOOD DATE

REVISIONS/CORRECTIONS:

NO.	REVISION DESCRIPTION	REVIEWED BY	DATE

NO.	BY	DATE	REVISION
1	CMG	9/6/22	CHANGES TO LANDSCAPE DESIGN
2	CMG	10/3/22	DRAINAGE REVIEW CHANGES

PROJECT NO. 208 ASHWORTH
FILE NO: 208 ASHWORTH DRAINAGE-2203
DATE: APRIL 2022
SCALE: AS SHOWN

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

Innovative Water Solutions

RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING

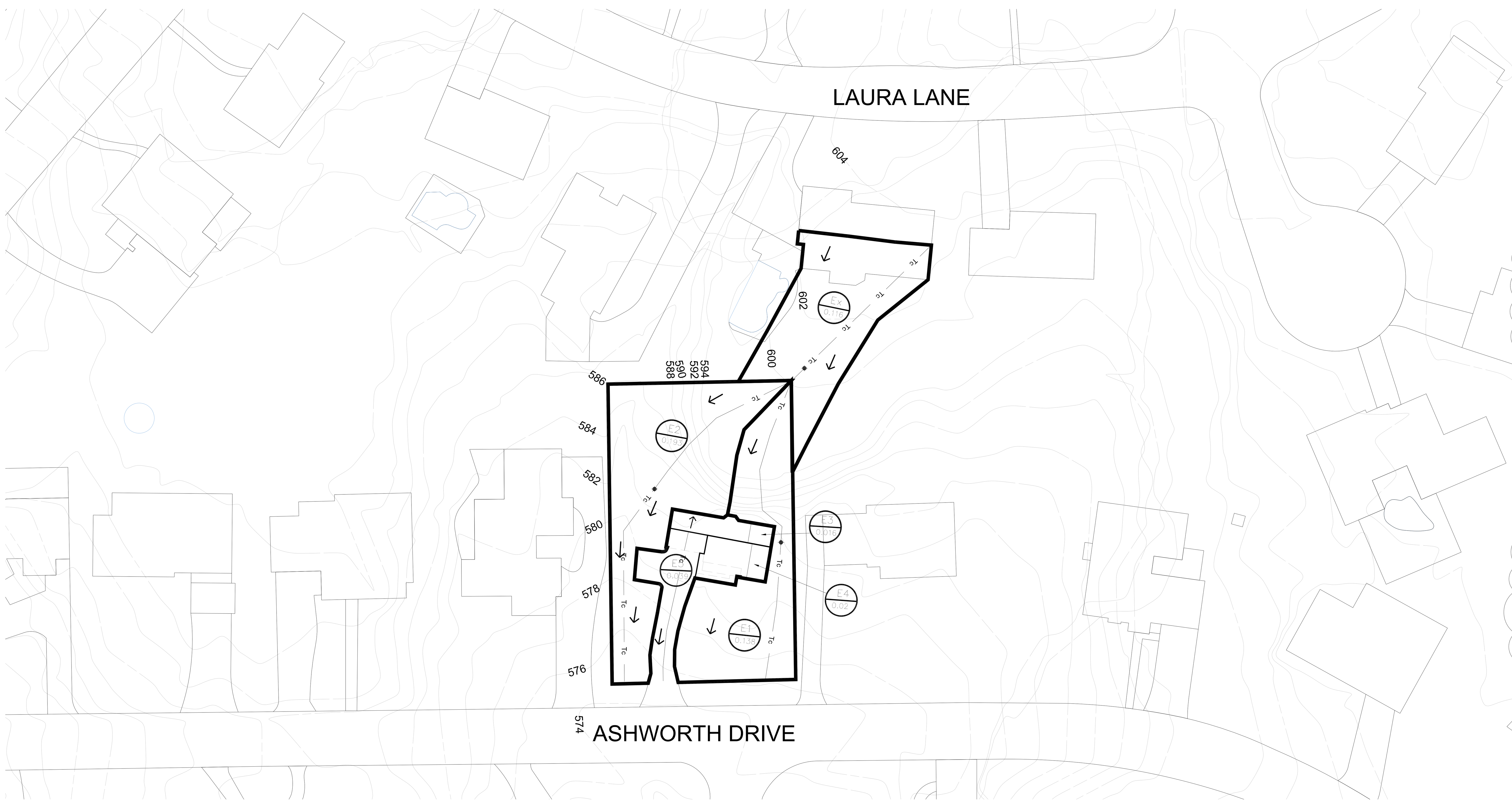
P.O. Box 9963
Austin, Texas 78766
Phone: (512) 490-0932
http://www.watercache.com

COVER PAGE

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746

STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED PROFESSIONAL ENGINEER

4/10/2022



1 EXISTING DRAINAGE AREA MAP

SCALE: 1" = 40'

Impervious Cover Report

208 Ashworth Drive, Rollingwood, TX

Area Description	Existing SF	Existing %	Proposed SF	Proposed %	WPAP Requirements SF	WPAP Requirements %
Lot	17743.12		17743.12		17743.12	
Residence	1,662.21	9.4%	5160.84	29.1%	1995	11.2%
Driveway	1,448.92	8.2%	659.43	3.7%	659.43	3.7%
Sidewalks/Porches	76.27	0.4%	592.89	3.3%	592.89	3.3%
Wood Deck (50%)	0	0.0%	0	0.0%	0	0.0%
Pool	0	0.0%	275.03	1.6%	275.03	1.6%
AC Pads	0	0.0%	21.33	0.1%	21.33	0.1%
Total	3187.4	18.0%	6709.52	37.8%	3543.68	20.0%

Net Increase in Impervious Cover: **3522.12** sf

Time of Concentration (T_c) Calculation

Area	L_{sheet} (feet)	$L_{shallow\ concentrated}$ (feet)	n	S	T_c (min)	T_{lag} (min)
Ex	100	10.9	0.24	0.027	11.2	6.7
E1	100	78.8	0.24	0.128	6.2	3.7
E2	100	116.2	0.24	0.115	6.6	4.0
E3	11.67		0.015	0.083	0.1	0.1
E4	20.2		0.015	0.083	0.2	0.1
E5	86.3		0.015	0.06	0.8	0.5
P1	100	93.92	0.24	0.133	6.1	3.7
P2	100	156.9	0.24	0.09	7.4	4.4
P3	65.4		0.015	0.083	0.6	0.3
P4	17.5		0.015	0.083	0.2	0.1
P5	59.5		0.015	0.088	0.5	0.3

Note: For any T_{lag} below 5, the minimum used in HEC-HMS model is 5.0 minutes.

Hydrologic Calculcations (SCS Method)

208 Ashworth Drive, Rollingwood, TX

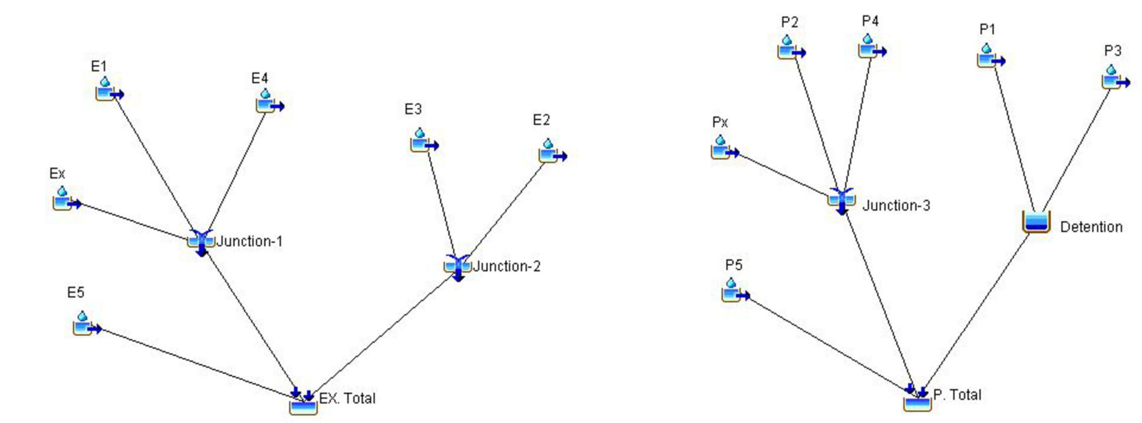
Hydrologic Element	Drainage Area (mi^2)	2 yr Peak discharge (cfs)	10 yr Peak discharge (cfs)	25 yr Peak discharge (cfs)	100 yr Peak discharge (cfs)
Existing					
Ex	0.00018159	0.3	0.6	0.8	1.2
E1	0.00021686	0.3	0.6	0.9	1.4
E2	0.00030296	0.4	0.9	1.3	1.9
E3	2.4553E-05	0.1	0.1	0.1	0.2
E4	3.15E-05	0.1	0.1	0.2	0.2
E5	6.0579E-05	0.1	0.2	0.3	0.4
Ex. Total	0.00081804	1.3	2.6	3.5	5.3
Proposed					
Px	0.00018159	0.3	0.6	0.8	1.2
P1	0.00025138	0.4	0.8	1.1	1.6
P2	0.00016049	0.2	0.5	0.7	1.0
P3	0.00011852	0.3	0.4	0.6	0.8
P4	2.8512E-05	0.1	0.1	0.1	0.2
P5	7.7535E-05	0.2	0.3	0.4	0.5
Detention	0.000382	0.3	0.4	0.4	0.4
P. Total	0.00081804	1.1	1.8	2.3	3.3

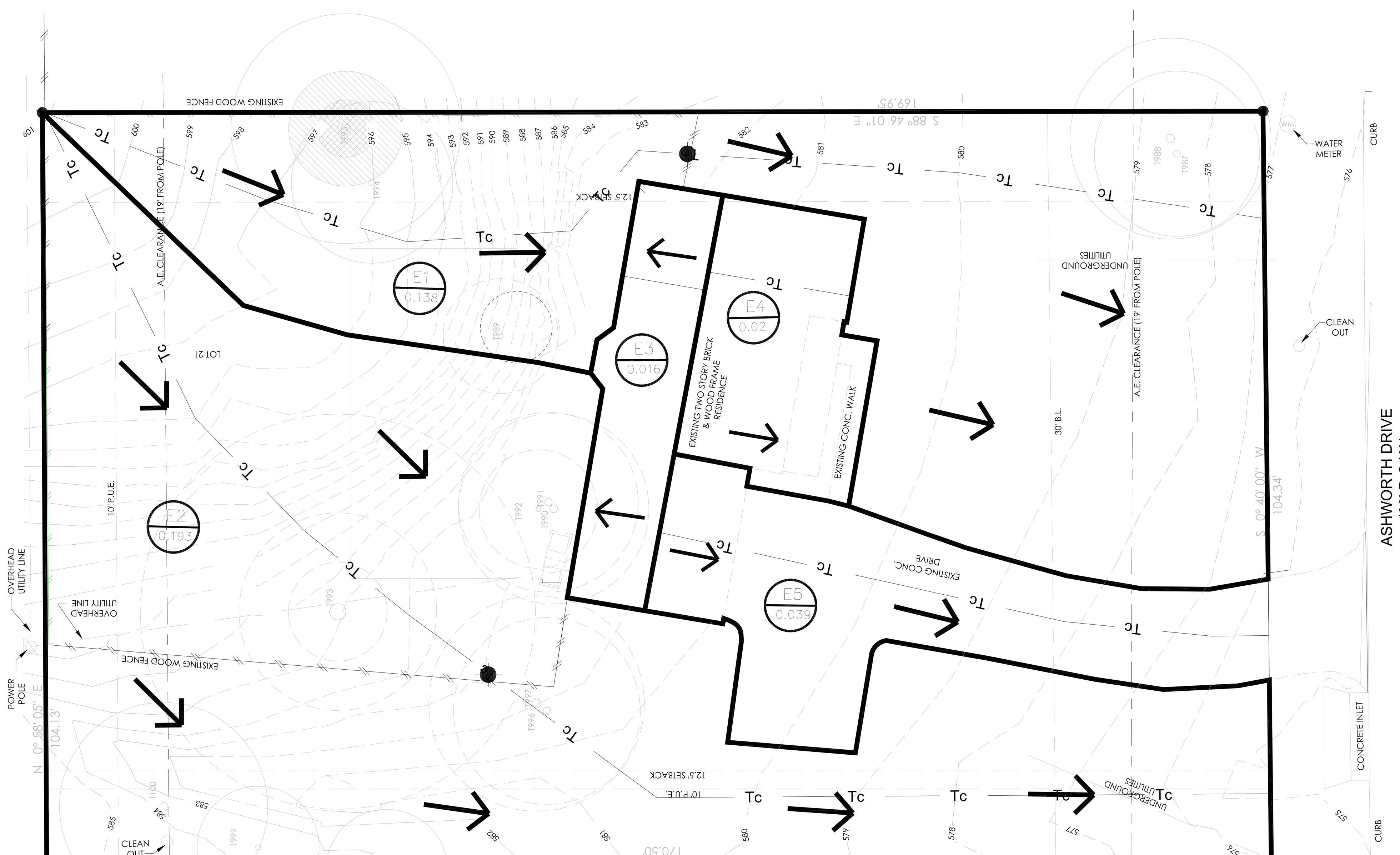
1

Impervious Cover

Hydrologic Element	Pervious SCS Number	Impervious SCS Number	Weighted SCS Number	Impervious Cover %
Ex	80	98	85.8	32.0%
E1	80	98	80.0	0.0%
E2	80	98	80.0	0.0%
E3	80	98	98.0	100.0%
E4	80	98	98.0	100.0%
E5	80	98	98.0	100.0%
P1	80	98	80.7	4.0%
P2	80	98	80.7	3.8%
P3	80	98	98.0	100.0%
P4	80	98	98.0	100.0%
P5	80	98	98.0	100.0%

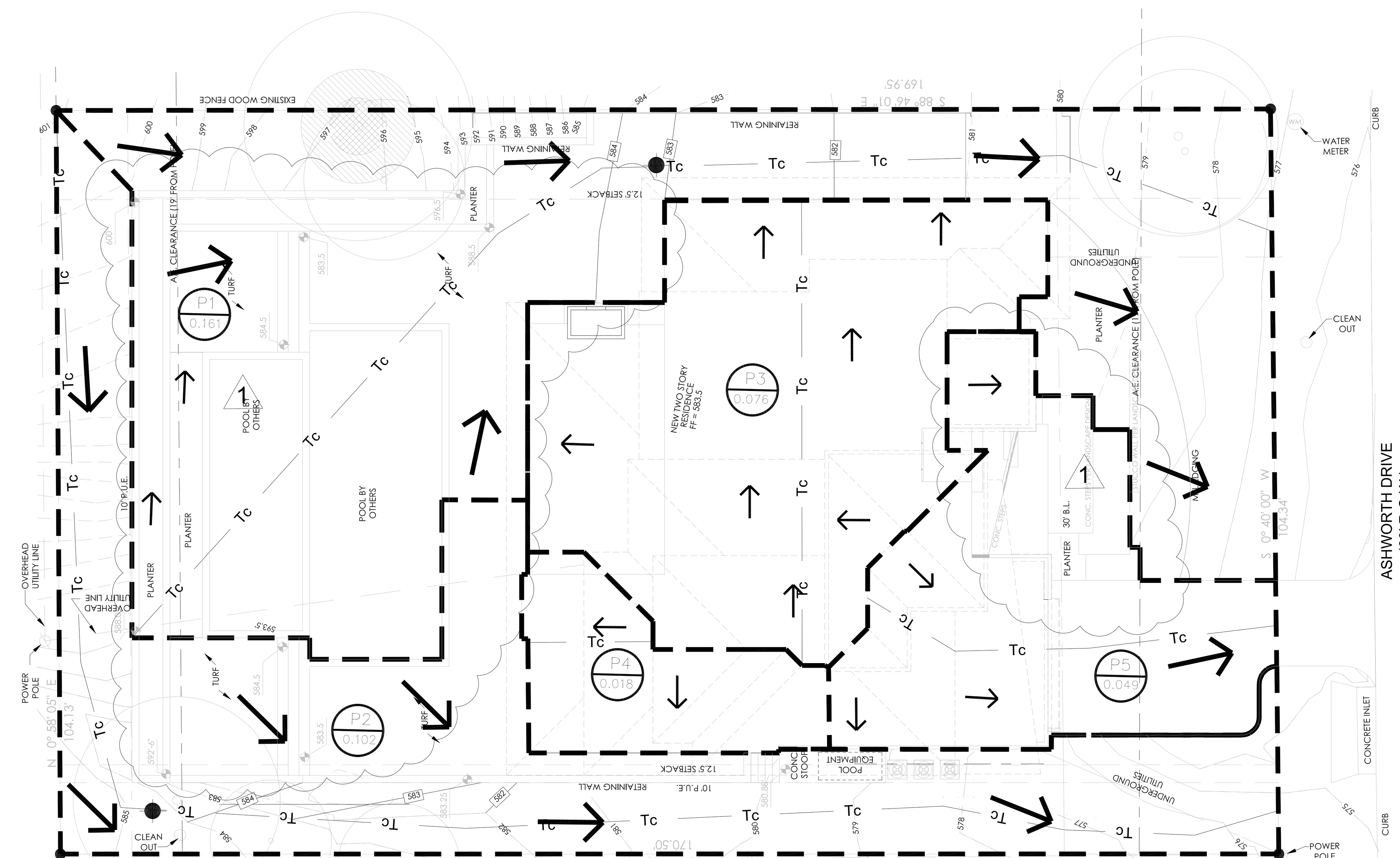
HEC-HMS MODEL





2 EXISTING ON-SITE DRAINAGE MAP

SCALE: 1" = 15'



3 PROPOSED DRAINAGE AREA MAP

SCALE: 1" = 15'

DRAINAGE LEGEND:

- EXISTING DRAINAGE AREA
- PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION
- EXISTING CONTOUR
- PROPOSED CONTOUR
- DIRECTION OF FLOW
- SPOT ELEVATION
- FLOW TRANSITION POINT

2

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY CHRIS MAXWELL-GAINES, P.E. 99248, ON APRIL 10, 2022. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Innovative Water Solutions
"Water Focused" Engineering & Planning
TX PE FIRM REG. #11414
501 W. POWELL LN., STE. 206
AUSTIN, TEXAS 78753
OFFICE: 512-490-0932 *www.watercache.com*

STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED PROFESSIONAL ENGINEER

NO.	BY	DATE	REVISION
1	CMG	9/6/22	CHANGE TO LANDSCAPE DESIGN
2	CMG	10/3/22	DRAINAGE REVIEW CHANGES

PROJECT NO. RICHARDSON RESIDENCE
FILE NO: 208 ASHWORTH DRIVE PLAN.DWG
DATE: APRIL 2022
SCALE: AS SHOWN

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

Innovative Water Solutions
RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING
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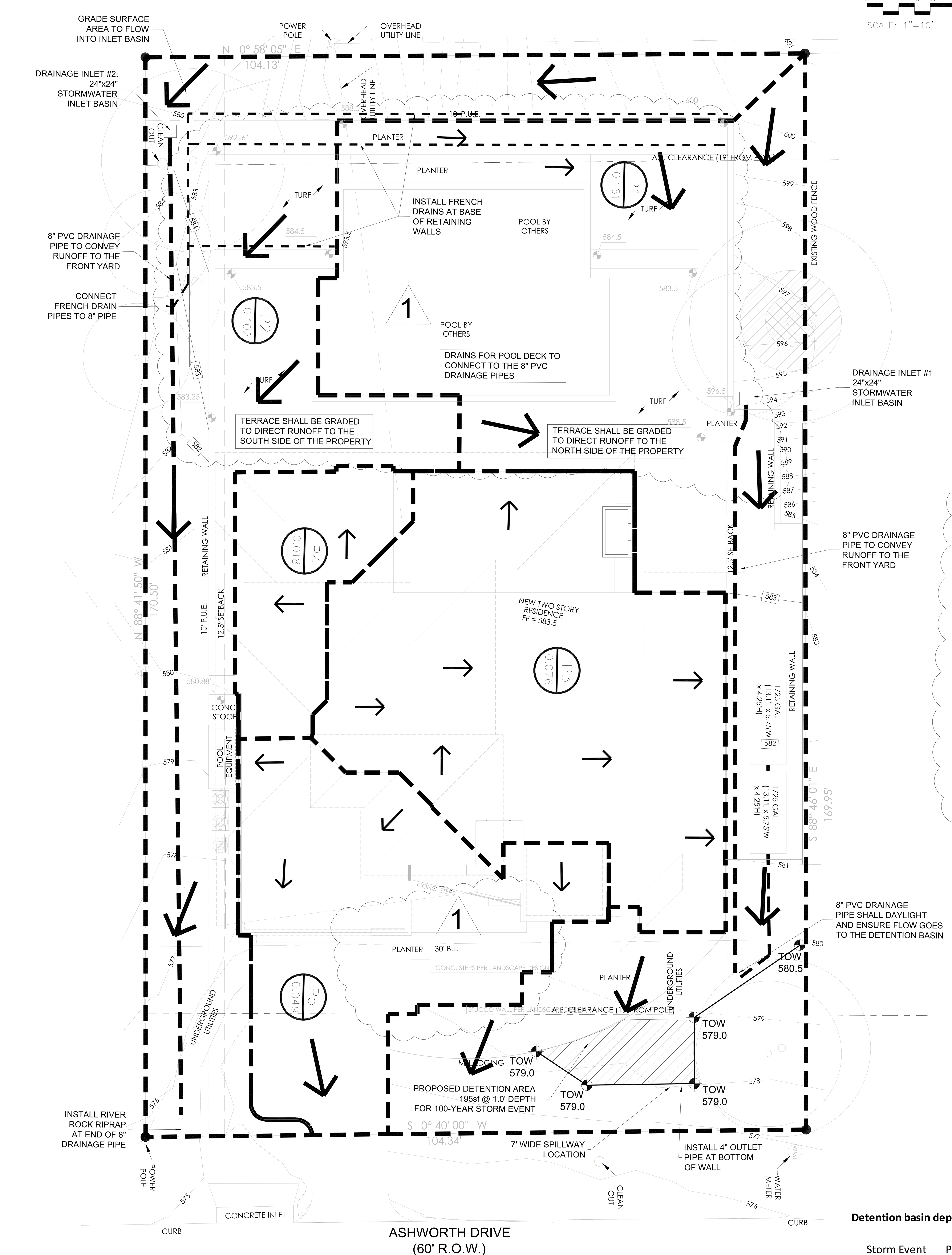
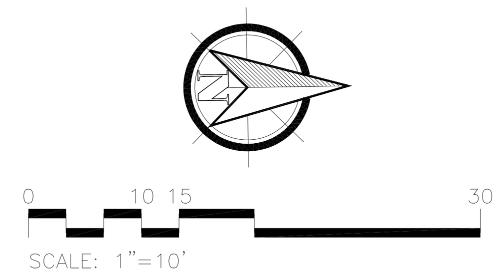
DRAINAGE AREA MAPS AND CALCULATIONS

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX





DRAINAGE LEGEND:

- E5 — EXISTING DRAINAGE AREA
- P1 — PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION
- EXISTING CONTOUR
- PROPOSED CONTOUR
- DIRECTION OF FLOW
- 615.0 SPOT ELEVATION
- FLOW TRANSITION POINT

Impervious Cover Report

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Total	3187.4	18.0%	6709.52	37.8%	3543.68	20.0%

Net Increase in Impervious Cover: **3522.12** sf

1

Drainage Pipe Flow Calculations

	C	i (in/hr)	A (ac)	Q (cfs)
Drainage Inlet #1 Area	0.33	6.307	0.0844	**0.176**
Drainage Inlet #2 Area	0.33	6.307	0.0915	**0.190**

Q = C * I * A

where,

Q = peak runoff (cfs)

C = composite coefficient

i = average intensity of rainfall for a period of time equal to the time of concentration (in/hr)

A = area contributing runoff to the point of design (ac)

	n	A	R	S	Q (cfs)
Drainage Inlet #1 Pipe Capacit	0.012	0.349	0.16667	0.029	**3.174352**
Drainage Inlet #1 Pipe Capacit	0.012	0.349	0.16667	0.0516	**4.234294**

Q = (1.49/n) * (AR)^2/3 * S^1/2

where,

Q = Pipe Flow, cfs

A = Cross-sectional area of flow, ft 2

n = Coefficient of roughness of pipe

R = Hydraulic radius = A/W p , ft

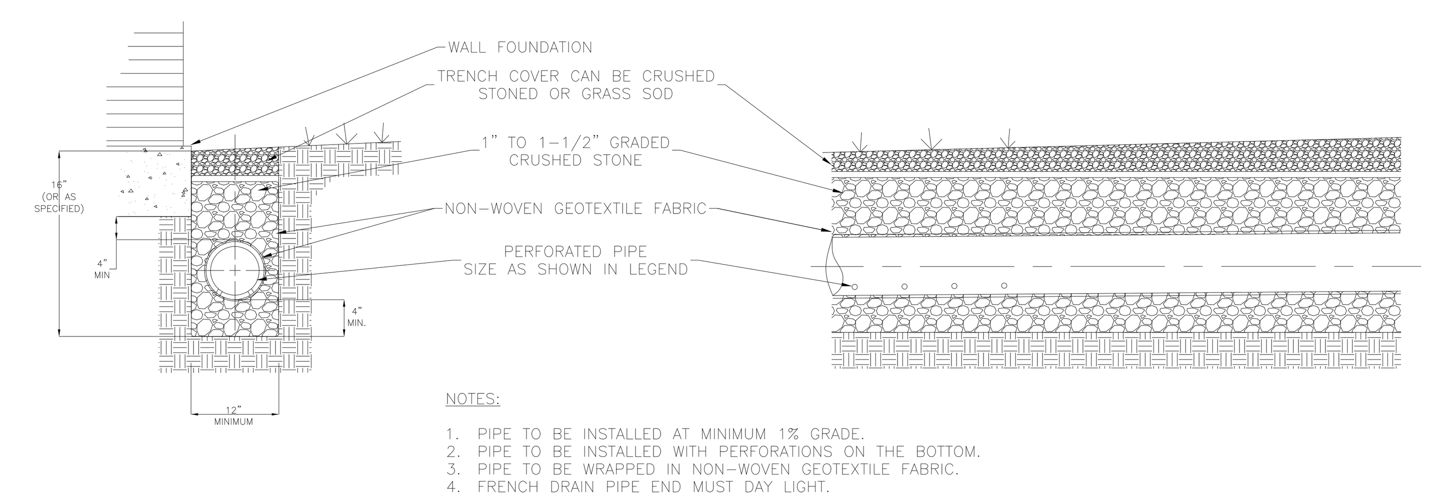
S = Friction slope in pipe, ft/ft

NOTE:
FLOW FROM THE FRENCH DRAIN PIPE WILL BE MINIMUM AS IT IS A SYSTEM TO RELIEVE HYDROSTATIC PRESSURE ON THE RETAINING WALLS.

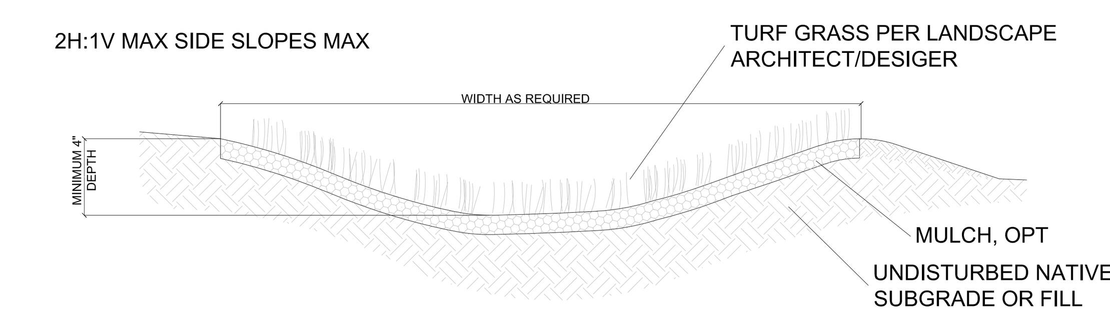
2

GENERAL SITE NOTES:

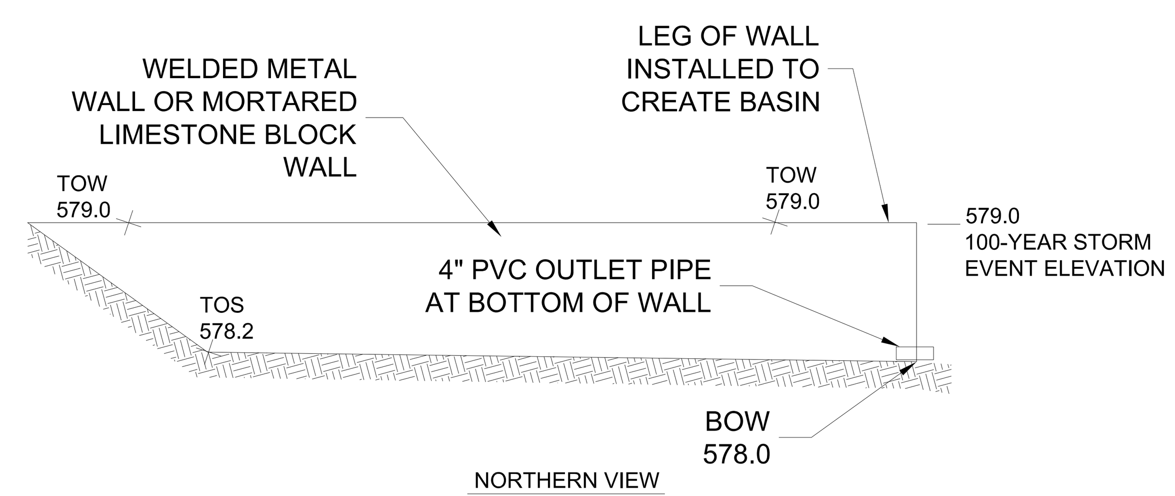
1. THE CONTRACTOR TO PROVIDE FINISHED GRADING AS SHOWN ON PLANS TO PROVIDE PROPER DRAINAGE OF SURFACE WATER AWAY FROM THE BUILDING(S).
2. FINAL OF LOCATION OF PROPOSED RESIDENCE SHALL BE DETERMINED BY THE CONTRACTOR.
3. UTILITY LINE LOCATIONS ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY FOR EXACT LOCATIONS.
4. ANY EXISTING PAVEMENT, CURBS, AND/OR SIDEWALKS DAMAGED OR REMOVED WILL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S SOLE EXPENSE.
5. EROSION CONTROL BARRIERS SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
6. STABILIZED TEMPORARY CONSTRUCTION ENTRANCE SHALL BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION UNLESS AN EXISTING IMPERVIOUS SURFACE OR DRIVEWAY IS BEING USED AS THE CONSTRUCTION SITE ENTRANCE.
7. ALL CONSTRUCTION MATERIALS AND WASTE SHALL BE STORED ONSITE DURING CONSTRUCTION.
8. LANDSCAPE PLANS TO BE PROVIDED BY OTHERS.
9. NO EXISTING TREES OR TREE LIMBS SHALL BE REMOVED OR DISTURBED WITHOUT OWNER APPROVAL.
10. CONTRACTOR SHALL CLEAN UP AREAS AFFECTED BY DAILY WORK AND REMOVE DEBRIS AND MATERIALS FROM THE SITE UPON COMPLETION OF THE WORK.
11. DISPOSAL OF SPOIL IS THE RESPONSIBILITY OF THE CONTRACTOR.
12. CONTRACTOR SHALL THOROUGHLY REVIEW PLANS AND ALL RELATED CONSTRUCTION DOCUMENTS TO VERIFY AND COORDINATE DIMENSIONS, LOCATIONS, ELEVATIONS, FLOW LINES, PLACEMENT AND APPLICABILITY OF CONSTRUCTION COMPONENTS AS WELL AS THEIR RELATIONSHIP TO EACH OTHER AND THE EXISTING CONDITIONS.
13. ANY DISCREPANCIES, CONFLICTS, AND OMISSIONS THAT ARE CRITICAL TO THE BID SHALL BE ADDRESSED BY THE CONTRACTOR PRIOR TO HIS/HER BID, OR INCLUDED IN THE BID AS A PROPOSAL SOLUTION AND CHANGES TO DELIVER A COMPLETE PROJECT. ANY CHANGES AND ADDITIONAL WORKS REQUIRED TO CLARIFY DISCREPANCIES, CONFLICTS, AND OMISSIONS THAT ARE NOT IDENTIFIED WITH THE BID ARE CONSIDERED NON-CRITICAL TO THE BID, AND SHALL BE COMPLETED AT NO ADDITIONAL COST TO THE OWNER.
14. CONTRACTOR SHALL BE COMPETENT AND EXPERIENCED IN THE TYPE OF CONSTRUCTION USED AND HAVE FULL KNOWLEDGE OF CONSTRUCTION METHODS AND PROCEDURES. CONTRACTOR SHALL COORDINATE ALL TRADES TO PROVIDE A COMPLETE PROJECT.
15. THESE DRAWINGS, IN GENERAL, ARE DIAGRAMMATIC, AND NOT INTENDED TO BE USED AS A MANUAL. FABRICATION, CONSTRUCTION METHODS, AND PLACEMENT SHALL COMPLY WITH STANDARD CONSTRUCTION PRACTICE AND APPLICABLE LOCAL CODE(S). IN THE ABSENCE OF THE LOCAL CODE, THE INTERNAL BUILDING CODE (LATEST EDITION) SHALL APPLY.
16. THE EXACT LOCATIONS OF STRUCTURES AND IMPROVEMENTS SHOWN ON ENGINEER'S PLANS ARE BASED ON THE ARCHITECTURAL SITE PLAN AND/OR OWNER'S PLAN. THE ARCHITECT AND THE CONTRACTOR, ARE RESPONSIBLE FOR VERIFYING ALL SITE RESTRICTIONS, SUCH AS BUILDING SETBACKS, RESTRICTIVE COVENANTS, PROPERTY LINES, AND HOMEOWNERS ASSOCIATIONS LIMITATIONS.
17. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH OCCUR DUE TO THEIR FAILURE TO LOCATE AND PRESERVE ANY AND ALL UTILITIES.

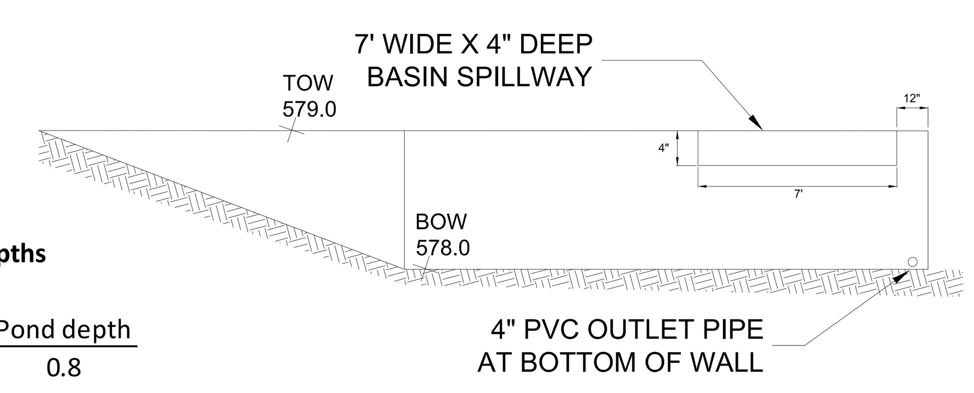


FRENCH DRAIN DETAIL
SCALE: NTS



VEGETATED SWALE DETAIL
SCALE: NTS

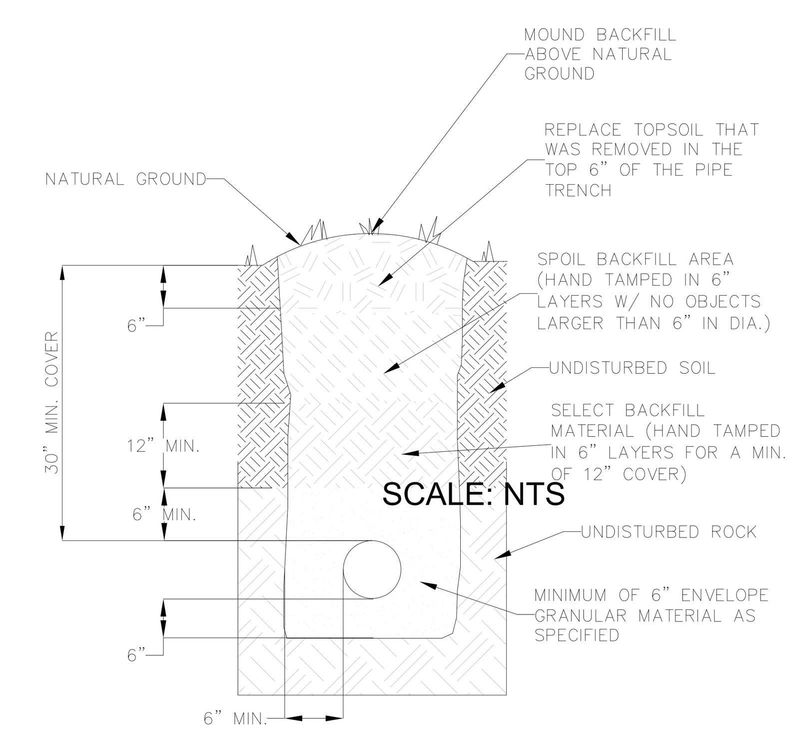




DETENTION BASIN ELEVATIONS
SCALE: NTS

Detention basin depths

Storm Event	Pond depth
2-year	0.8
10-year	0.9
25-year	0.9
100-year	1.0



PIPE EMBEDMENT DETAIL
SCALE: NTS

FOR RAINWATER HARVESTING SYSTEM DESIGN AND DETAILS, SEE SHEET 5.

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY CHRIS MAXWELL-GAINES, P.E. 99248, ON APRIL 10, 2022. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

STATE OF TEXAS
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PROJECT NO. RICHARDSON RESIDENCE
FILE NO: 208 ASHWORTH DRAINAGE PLAN.DWG
DATE: APRIL 2022
SCALE: 1"=10'

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

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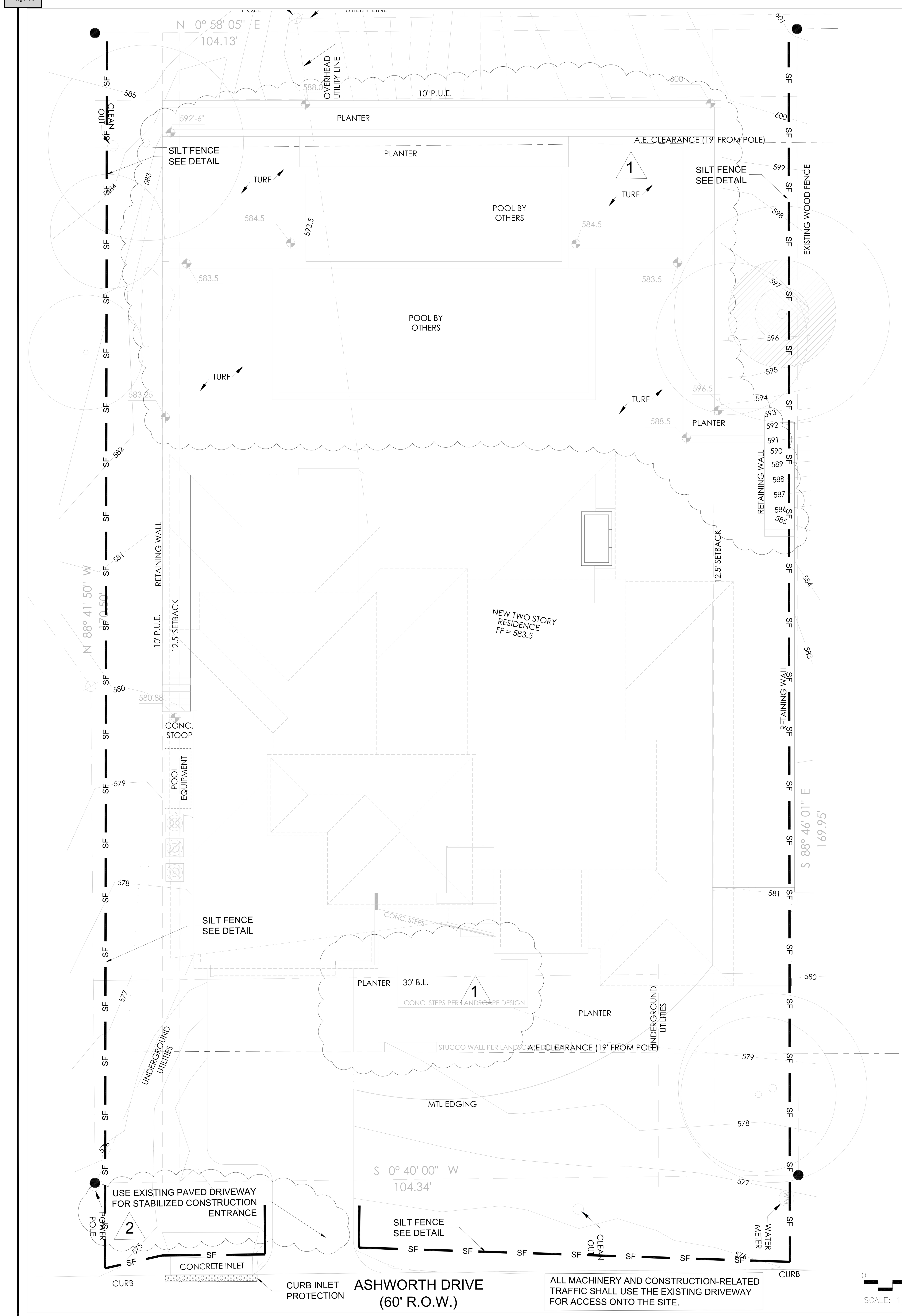
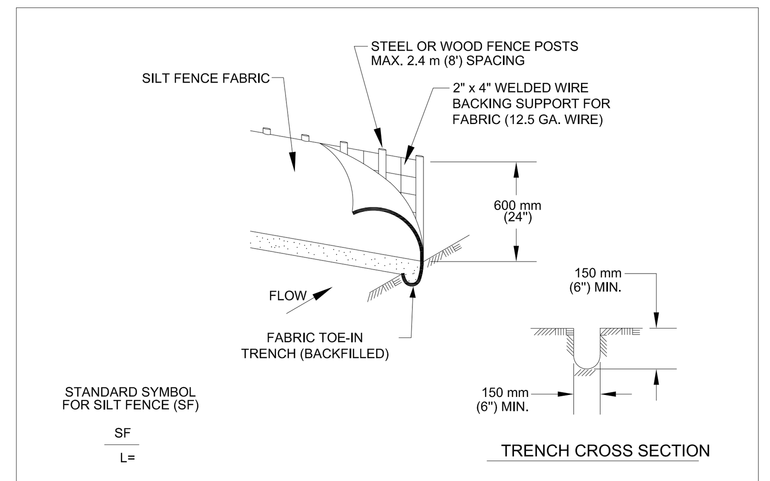
PROPOSED DRAINAGE AND GRADING PLAN

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX



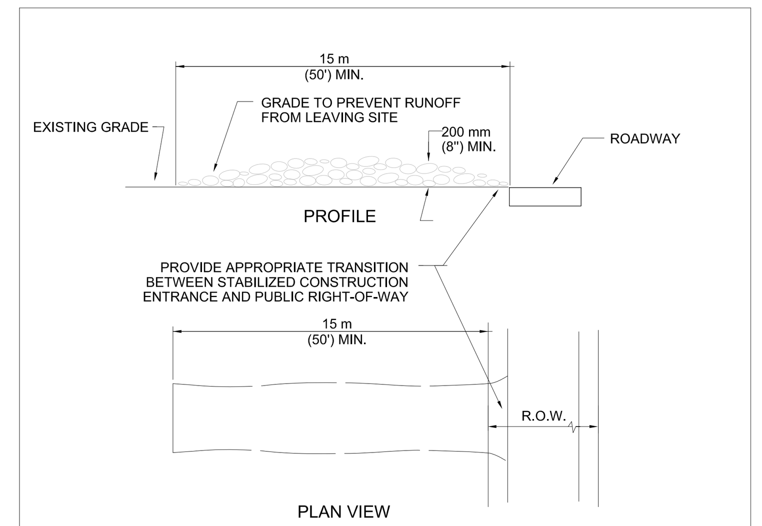
EROSION CONTROL LEGEND:

- LIMITS OF CONSTRUCTION
- SILT FENCE
- PROPERTY BOUNDARY
- STABILIZED CONSTRUCTION ENTRANCE
- EXISTING CONTOUR
- INLET PROTECTION



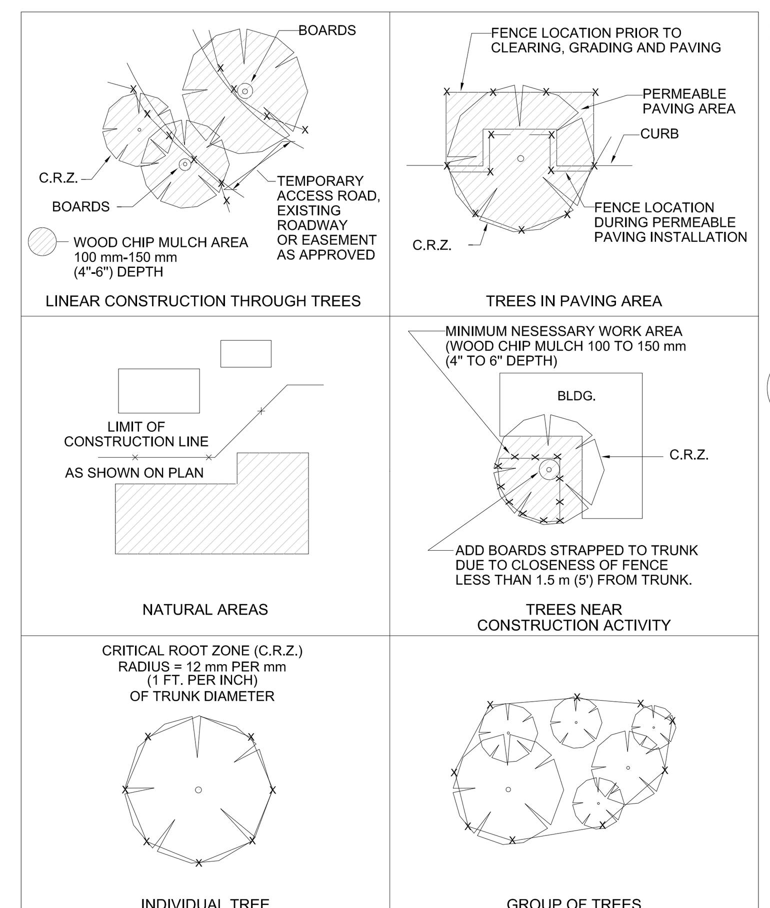
1. STEEL OR WOOD POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 300 mm (12 INCHES). IF WOOD POSTS CANNOT ACHIEVE 300 mm (12 inches) DEPTH, USE STEEL POSTS.
2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW.
3. THE TRENCH MUST BE A MINIMUM OF 150 mm (6 inches) DEEP AND 150 mm (6 inches) WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.
4. SILT FENCE FABRIC SHOULD BE SECURELY FASTENED TO EACH STEEL OR WOOD SUPPORT POST OR TO WOVEN WIRE , WHICH IS IN TURN ATTACHED TO THE STEEL OR WOOD FENCE POST.
5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL EVENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 150 mm (6 inches). THE SILT SHALL BE DISPOSED OF ON AN APPROVED SITE AND IN SUCH A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.

CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT		SILT FENCE	
RECORD COPY SIGNED BY MORGAN BYARS	09/01/2011 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 642S-1



NOTES:
1. STONE SIZE: 75-125 mm (3-5") OPEN GRADED ROCK.
2. LENGTH: AS EFFECTIVE BUT NOT LESS THAN 15 m (50').
3. THICKNESS: NOT LESS THAN 200 mm (8").
4. WIDTH: NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS/EGRESS.
5. WASHING: WHEN NECESSARY, VEHICLE WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE AND DRAINS INTO AN APPROVED TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.
6. MAINTENANCE: THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADWAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AS WELL AS REPAIR AND CLEAN OUT OF ANY MEASURE DEVICES USED TO TRAP SEDIMENT. ALL SEDIMENTS THAT IS SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADWAY MUST BE REMOVED IMMEDIATELY.
7. DRAINAGE: ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.

CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT		STABILIZED CONSTRUCTION ENTRANCE	
RECORD COPY SIGNED BY J. PATRICK MURPHY	5/23/00 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 641S-1



CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT		TREE PROTECTION FENCE LOCATIONS	
RECORD COPY SIGNED BY J. PATRICK MURPHY	11/15/99 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 610S-1

EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL INSTALL EROSION/SEDIMENTATION CONTROLS AND TREE/NATURAL AREA PROTECTIVE FENCING PRIOR TO ANY SITE PREPARATION WORK (CLEARING, GRUBBING OR EXCAVATION).
2. THE PLACEMENT OF EROSION/SEDIMENTATION CONTROLS SHALL BE IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND INSPECTING, ON A REGULAR BASIS, ALL EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES INCLUDING THE SILT FENCES, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC. DURING CONSTRUCTION/DEMOLITION AND INCLUDING THE REMOVAL AND PROPER DISPOSAL OF ANY ACCUMULATED SILT AND DEBRIS.
4. THE CONTRACTOR IS REQUIRED TO INSPECT THE CONTROLS AND FENCES AT WEEKLY INTERVALS AND AFTER SIGNIFICANT RAINFALL EVENTS TO INSURE THAT THEY ARE FUNCTIONING PROPERLY. THE PERSON(S) RESPONSIBLE FOR MAINTENANCE OF CONTROLS AND FENCES SHALL IMMEDIATELY MAKE ANY NECESSARY REPAIRS TO DAMAGED AREAS. SILT ACCUMULATION AT CONTROLS MUST BE REMOVED WHEN THE DEPTH REACHES SIX (6) INCHES.
5. ANY MAJOR VARIATION IN MATERIALS OR LOCATIONS OF CONTROLS OR FENCES FROM THOSE SHOWN ON THE APPROVED PLANS WILL REQUIRE A REVISION AND MUST BE APPROVED BY THE REVIEWING ENGINEER, ENVIRONMENTAL SPECIALIST OR CITY ARBORIST AS APPROPRIATE. MAJOR REVISIONS MUST BE APPROVED BY THE CITY. MINOR CHANGES TO BE MADE AS FIELD REVISIONS TO THE EROSION AND SEDIMENTATION CONTROL PLAN MAY BE REQUIRED BY THE ENVIRONMENTAL INSPECTOR DURING THE COURSE OF CONSTRUCTION TO CORRECT CONTROL INADEQUACIES.

2

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND INSPECTING, ON A REGULAR BASIS, ALL EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES INCLUDING THE SILT FENCES, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC., DURING CONSTRUCTION/DEMOLITION AND INCLUDING THE REMOVAL AND PROPER DISPOSAL OF ANY ACCUMULATED SILT AND DEBRIS.
7. THE CONTRACTOR SHALL NOT BEGIN ANY WORK UNTIL TREE PROTECTION AND THE EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES SUCH AS SILT FENCE, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC. HAVE BEEN INSTALLED.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE STREETS FREE OF MUD, DIRT, DEBRIS AND MATERIAL AT ALL TIMES AND SHALL CLEAN/SWEEP THE STREETS ON A REGULAR BASIS AND AT THE DIRECTION OF THE CITY.
9. INCREASED STORMWATER PEAK FLOWS DURING CONSTRUCTION MUST BE MITIGATED WITH TEMPORARY BEST MANAGEMENT PRACTICES TO PREVENT HARM TO NEIGHBORING PROPERTIES.
10. THE VEGETATIVE STABILIZATION OF AREAS DISTURBED BY CONSTRUCTION SHALL BE AS FOLLOWS:

TEMPORARY VEGETATIVE STABILIZATION:

5. FROM SEPTEMBER 15 TO MARCH 1, SEEDING SHALL BE WITH COOL SEASON COVER CROPS (WHEAT AT 0.5 POUNDS PER 1000 SF, OATS AT 0.5 POUNDS PER 1000 SF, CEREAL RYE GRAIN AT 0.5 POUNDS PER 1000 SF) WITH A TOTAL RATE OF 1.5 POUNDS PER 1000 SF. COOL SEASON COVER CROPS ARE NOT PERMANENT EROSION CONTROL.
6. FROM MARCH 2 TO SEPTEMBER 14, SEEDING SHALL BE WITH HULLED BERMUDA AT A RATE OF 1 POUNDS PER 1000 SF.

A. FERTILIZER SHALL BE WATER SOLUBLE WITH AN ANALYSIS OF 15-15-15 TO BE APPLIED ONCE AT PLANTING AND ONCE DURING THE PERIOD OF ESTABLISHMENT AT A RATE OF 1/2 POUND PER 1000 SF.
B. HYDROMULCH SHALL COMPLY WITH TABLE1, BELOW.
C. TEMPORARY EROSION CONTROL SHALL BE ACCEPTABLE WHEN THE GRASS HAS GROWN AT LEAST 1½ INCHES HIGH WITH 95% COVERAGE, PROVIDED NO BARE SPOTS LARGER THAN 16 SQUARE FEET EXIST.
D. WHEN REQUIRED, NATIVE GRASS SEEDING SHALL COMPLY WITH REQUIREMENTS OF THE CITY OF AUSTIN ENVIRONMENTAL CRITERIA MANUAL.

PERMANENT VEGETATIVE STABILIZATION:

1. FROM SEPTEMBER 15 TO MARCH 1, SEEDING IS CONSIDERED TO BE TEMPORARY STABILIZATION ONLY. IF COOL SEASON COVER CROPS EXIST WHERE PERMANENT VEGETATIVE STABILIZATION IS DESIRED, THE GRASSES SHALL BE MOWED TO A HEIGHT OF LESS THAN ONE-HALF (½) INCH AND THE AREA SHALL BE RE-SEEDED IN ACCORDANCE WITH 2. BELOW.
2. FROM MARCH 2 TO SEPTEMBER 14, SEEDING SHALL BE WITH HULLED BERMUDA AT A RATE OF 1 POUND PER 1000 SF WITH A PURITY OF 95% WITH 85% GERMINATION. BERMUDA GRASS IS A WARM SEASON GRASS AND IS CONSIDERED PERMANENT EROSION CONTROL.

A. FERTILIZER SHALL BE A WATER SOLUBLE WITH AN ANALYSIS OF 15-15-15 TO BE APPLIED ONCE AT PLANTING AND ONCE DURING THE PERIOD OF ESTABLISHMENT AT A RATE OF ½ POUND PER 1000 SF.
B. HYDROMULCH SHALL COMPLY WITH TABLE 2, BELOW.
C. THE PLANTED AREA SHALL BE IRRIGATED OR SPRINKLED IN A MANNER THAT WILL NOT ERODE THE TOPSOIL, BUT WILL SUFFICIENTLY SOAK THE SOIL TO A DEPTH OF SIX INCHES. THE IRRIGATION SHALL OCCUR AT DAILY INTERVALS (MINIMUM) DURING THE FIRST TWO MONTHS. RAINFALL OCCURRENCES OF ½ INCH OR MORE SHALL POSTPONE THE WATERING SCHEDULE FOR ONE WEEK.
D. PERMANENT EROSION CONTROL SHALL BE ACCEPTABLE WHEN THE GRASS HAS GROWN AT LEAST 1½ INCHES HIGH WITH 95% COVERAGE, PROVIDED NO BARE SPOTS LARGER THAN 16 SQUARE FEET EXIST.

SEQUENCE OF CONSTRUCTION AND MAJOR ACTIVITIES:

PRIOR TO SITE GRADING ACTIVITIES:

1. INSTALL TEMPORARY EROSION AND SEDIMENTATION CONTROLS AS SHOWN ON THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN PRIOR TO SITE DISTURBANCE.
2. INSTALL TREE PROTECTION AS SHOWN ON THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN PRIOR TO SITE DISTURBANCE.
3. SCHEDULE A PRECONSTRUCTION MEETING WITH CONTRACTORS AS NECESSARY.
4. CONTACT "TEXAS 811" AT 811 TO LOCATE EXISTING UTILITIES.

2

SITE GRADING:

5. BEGIN SITE CLEARING GRUBBING, AND/OR TOPSOIL STRIPPING, AND DEMOLITION ACTIVITIES.
6. ESTABLISH SOIL STOCKPILE, PROVIDE COVER, AND INSTALL SILT FENCE AROUND PERIMETER.
7. CONTRACTOR SHALL TAKE SPECIAL CARE WHEN GRADING IN THE VICINITY OF CRITICAL ROOT ZONES.
8. STABILIZE DISTURBED AREAS WITH BARE GROUND WHERE CONSTRUCTION WILL CEASE FOR MORE THAN 14 DAYS WITH VEGETATION OR OTHER SOIL STABILIZATION MEASURES TO PREVENT EROSION.
9. CONSTRUCT SITE UTILITIES AND STORM SEWER. CONSTRUCT DRIVEWAYS, HARDSCAPE, AND RESIDENCE.
10. ROUGH CUT OF THE PERMANENT STORMWATER DETENTION FACILITY SHALL BE INSTALLED SO THAT IT IS AVAILABLE DURING THE CONSTRUCTION PHASE

FINALIZATION:

11. COMPLETE CONSTRUCTION AND START REVEGETATION OF THE SITE AND INSTALLATION OF LANDSCAPING.
12. PERMANENT WATER QUALITY CONTROLS AND DETENTION POND SHALL BE CLEANED OUT AND SEDIMENT BUILDUP SHALL BE REMOVED PRIOR TO/ CONCURRENTLY WITH REVEGETATION OF SITE.
13. REMOVE TEMPORARY EROSION AND SEDIMENTATION CONTROLS AND COMPLETE ANY NECESSARY FINAL REVEGETATION RESULTING FROM REMOVAL OF THE CONTROLS. CONDUCT ANY MAINTENANCE AND REHABILITATION OF THE WATER QUALITY PONDS OR CONTROLS.
14. MONITOR VEGETATED AREAS UNTIL VEGETATION IS ESTABLISHED AND/ OR MONITOR STABILIZED AREAS UNTIL FINAL STABILIZATION IS REACHED.
15. SCHEDULE INSPECTION VISIT BY DESIGN ENGINEER TO PROVIDE LETTER OF CONCURRENCE.
16. SCHEDULE FINAL INSPECTION WITH CITY INSPECTOR.

MAINTENANCE REQUIREMENTS AND SCHEDULE FOR DETENTION PONDS

INSPECT POND AFTER INTENSE RAINFALL EVENTS AND ON A REGULAR BASIS FOR THE FOLLOWING:

1. INSPECT THE ENTIRE POND INCLUDING THE WEIR AND DRAINAGE OUTLET PIPES FOR ACCUMULATED SEDIMENT, PAPER, TRASH, AND DEBRIS AND REMOVE AS NEEDED.
2. INSPECT POND FOR BARE SOIL AND REVEGETATE AS NEEDED.
3. MAINTAIN VEGETATION TO PREVENT HEIGHT FROM EXCEEDING EIGHTEEN (18) INCHES.
4. MEASURE DEPTH AND WIDTHS OF POND AND RESHAPE POND AS NECESSARY TO MAINTAIN SHAPE PER APPROVED DRAINAGE PLAN. NOTE: OVERTIME, THE POND WILL ACCUMULATE SEDIMENT, LAWN CLIPPINGS, AND LEAVES THAT WILL BUILD UP AND VOLUME WILL BE LOST IF NOT MAINTAINED AND RESHAPED AS NEEDED.
5. INSPECT POND FOR SIGNS OF EROSION OR ANY SHIFTING, COLLAPSING, OR DETERMINATION OF THE POND BERM, OUTLET PIPES, AND WEIRS AND RESTORE TO APPROVED DRAINAGE PLAN DESIGN.

Innovative Water Solutions
"Water Focused" Engineering & Planning
TX PE FIRM REG. #11414
501 W. POWELL LN., STE. 206
AUSTIN, TEXAS 78753
OFFICE: 512-490-0932 www.watercache.com

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY CHRIS MAXWELL-GAINES, P.E. 99248, ON APRIL 10, 2022. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

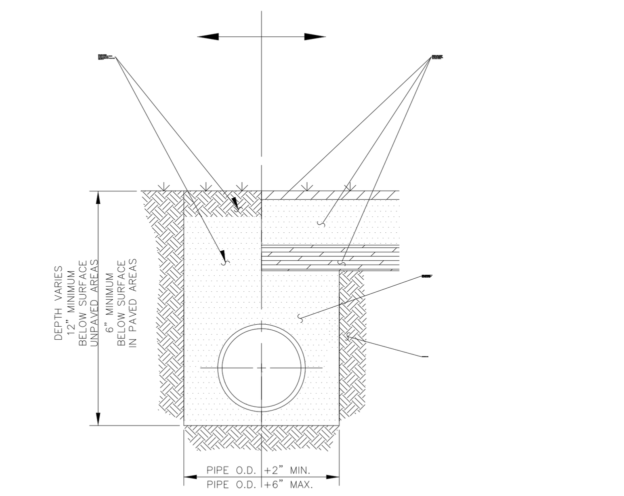
EROSION AND SEDIMENTATION CONTROL PLAN DETAILS AND NOTES

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX

NO.	BY	DATE	REVISION
1	CMG	9/6/22	CHANGES TO LANDSCAPE DESIGN
2	CMG	10/3/22	DRAINAGE REVIEW CHANGES

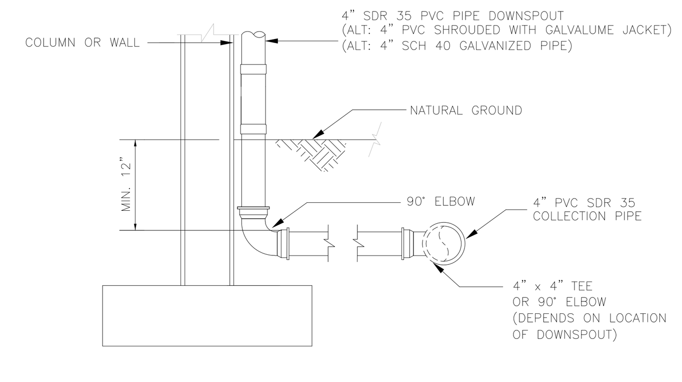
PROJECT NO. 208 ASHWORTH	DESIGNED BY: CMG
FILE NO: 208 ASHWORTH DRAINAGE PLAN.DWG	DRAWN BY: CMG
DATE: APRIL 2022	CHECKED BY: BW
SCALE: 1/8" = 1'	

Innovative Water Solutions
RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING
P.O. Box 9963
Austin, Texas 78766
Phone: (512) 490-0932
http://www.watercache.com



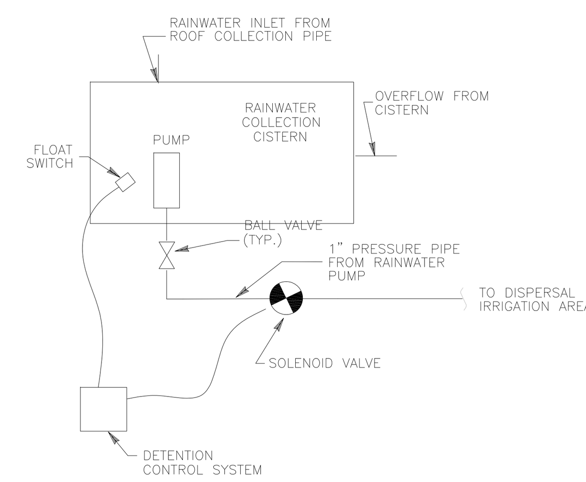
RAINWATER COLLECTION PIPE EMBEDMENT (PAVED & NON-PAVED SURFACES)

SCALE: NTS



DOWNSPOUT TO COLLECTOR PIPE

SCALE: NTS



RAINWATER COLLECTION SYSTEM AND DETENTION CONTROL SYSTEM SCHEMATIC

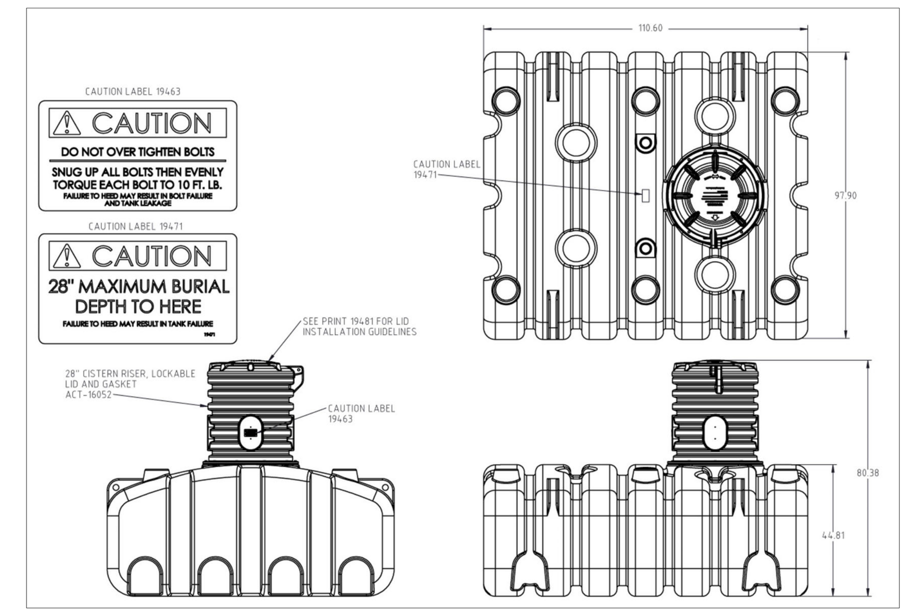
SCALE: NTS

SYSTEM SPECIFICATIONS:

RAINWATER CISTERN: (2) 1,725 GALLON UNDERGROUND POLYETHYLENE CISTERNS
PUMP: GRUNDFOS SBA 3–45 A, 1 HP SUBMERSIBLE PUMP, 115v
CONTROL SYSTEM: DETENTION TIMER AND CONTROL SYSTEM, PROVIDED BY IWS

CONTROL SYSTEM:

ONCE FLOAT SWITCH IN CISTERN IS ACTIVATED, THE CONTROL SYSTEM WILL DELAY 12 HOURS. AFTER 12 HOURS, THE ACTUATED VALVE WILL OPEN AT 3 HOUR INTERVALS FOR 5 MINUTES. THERE WILL BE A 3 HOUR WAIT TIME BETWEEN DISPERSAL EVENTS.

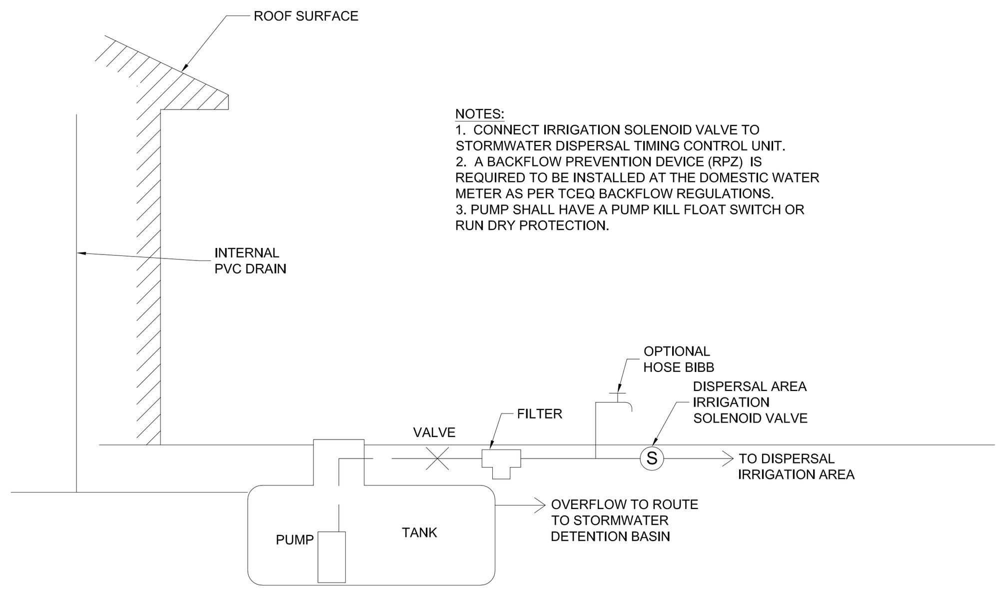


CISTERN DRAWING

SCALE: NTS

RAINWATER COLLECTION SYSTEM NOTES:

1. THIS PROPERTY DOES NOT REQUIRE A TCEQ EDWARDS AQUIFER WATER POLLUTION ABATEMENT PLAN (WPAP) SINCE THE EFFECTIVE IMPERVIOUS COVER IS BELOW 20%. THE EFFECTIVE IMPERVIOUS COVER WAS REDUCED TO 20% THROUGH THE IMPLEMENTATION OF A RAINWATER COLLECCTION SYSTEM. THE RAINWATER COLLECTION SYSTEM HAS BEEN DESIGNED TO CAPTURE RAINWATER FROM THE ROOF AREAS IN ORDER TO REDUCE THE TOTAL IMPERVIOUS COVER TO LESS THAN 20%. TCEQ DOES NOT INCLUDE ROOF AREAS IN THE CALCULATION OF IMPERVIOUS COVER IF THE ROOF AREAS ARE BEING COLLECTED INTO A RAINWATER COLLECTION SYSTEM. THE HARVESTED RAINWATER SHALL BE DOSED OUT OF THE TANK WITHIN 7 DAYS AS PER TCEQ CHAPTER 213. THE PROPERTY OWNER WILL EXECUTE A DEED AFFIDAVIT THAT WILL DOCUMENT THE PROPERTY'S EXEMPTION FROM EDWARDS AQUIFER WPAP AND REQUIRE THE PROPERTY OWNER TO MAINTAIN THE PROPER OPERATION OF THE RAINWATER COLLECTION SYSTEM.
2. RAINWATER COLLECTION SYSTEM SHALL COLLECT RAINWATER TO BE USED SOLELY FOR IRRIGATION PURPOSES ONLY AND BE RELEASED OUTDOORS. NO CONNECTION TO ANY INDOOR PLUMBING SHALL BE MADE.
3. THE RAINWATER COLLECTION PIPING AND OVERFLOW PIPING SHALL BE BURIED A MINIMUM OF 6".
4. OVERFLOW WATER FROM THE RAINWATER COLLECTION CISTERN SHALL BE ROUTED AS SHOWN ON PLANS TO FLOW AWAY FROM ANY STRUCTURE.
5. THE REQUIRED VOLUME OF RAINWATER MUST BE EMPTIED WITHIN 7 DAYS AFTER A RAIN EVENT ENDS.
6. DISPERSAL RATE. THE INFILTRATION RATE AT WHICH THE SOIL CAN ACCEPT THE IRRIGATED STORM WATER MUST BE ESTABLISHED USING THE STEPS OUTLINED IN SECTION 1.6.7.4. OTHER METHODS OF DEMONSTRATING SITE–SPECIFIC PERMEABILITY MAY BE APPROVED BY THE DIRECTOR. THE APPLICATION RATE MAY NOT EXCEED THE INFILTRATION RATE ON ANY PORTION OF THE DISPERSAL AREA.
7. DISPERSAL AREA. CALCULATIONS MUST BE PROVIDED WHICH DEMONSTRATE THAT ADEQUATE DISPERSAL AREA WILL BE PROVIDED BASED ON THE APPLICATION RATE, SOIL PERMEABILITY, WATER QUALITY VOLUME, AND THE ACTUAL IRRIGATION TIME. THE IRRIGATION AREA AND SYSTEM MUST BE INCLUDED WITHIN THE WATER QUALITY EASEMENT.
8. DISPERSAL AREA SLOPE. DISPERSAL MUST NOT OCCUR ON LAND WITH SLOPES GREATER THAN 10%.
9. ALL DISPERSAL SYSTEM DISTRIBUTION AND LATERAL PIPING MUST BE SCHEDULE 40 PURPLE PVC. ALL PIPES AND ELECTRICAL BUNDLES PASSING BENEATH DRIVEWAYS OR PAVED AREAS MUST BE SLEEVED WITH PVC CLASS 200 PIPE WITH SOLVENT WELDED JOINTS. SLEEVE DIAMETER MUST EQUAL TWICE THAT OF THE PIPE OR ELECTRICAL BUNDLE. BURIED PIPING MUST BE MARKED WITH DETECTABLE MARKING TAPE LABELED "CAUTION: BURIED NON–POTABLE WATER LINE BELOW".
10. VALVES. ALL VALVES MUST BE DESIGNED SPECIFICALLY FOR SEDIMENT BEARING WATER, AND BE OF APPROPRIATE DESIGN FOR THE INTENDED PURPOSE. ALL REMOTE CONTROL, GATE, AND QUICK COUPLING VALVES MUST BE LOCATED IN TEN–INCH OR LARGER PLASTIC VALVE BOXES WITH PURPLE CAPS. ALL PIPES AND VALVES MUST BE MARKED TO INDICATE THAT THEY CONTAIN NON–POTABLE WATER. ALL PIPING MUST BE BURIED TO PROTECT IT FROM WEATHER AND VANDALISM. THE DEPTH AND METHOD OF BURIAL MUST BE ADEQUATE TO PROTECT THE PIPE FROM VEHICULAR TRAFFIC SUCH AS MAINTENANCE EQUIPMENT. VELOCITIES IN ALL PIPELINES SHOULD BE SUFFICIENT TO PREVENT SETTLING OF SOLIDS. THE IRRIGATION DESIGN AND LAYOUT MUST BE INTEGRATED WITH THE TREE PROTECTION PLAN AND PRESENTED AS PART OF THE SITE PLAN OR SUBDIVISION CONSTRUCTION PLAN.
11. VEGETATION. THE IRRIGATION AREA MUST HAVE NATIVE VEGETATION OR BE RESTORED OR RE–ESTABLISHED WITH NATIVE VEGETATION, UNLESS APPROVED BY THE DIRECTOR. THESE AREAS MUST NOT RECEIVE ANY FERTILIZERS, PESTICIDES, OR HERBICIDES.
12. SOIL. A MINIMUM OF 12 INCHES OF SOIL, WITH THE IDENTIFIED PERMEABILITY RATES, MUST BE PRESENT IN THE DISPERSAL AREA. SOIL ENHANCEMENT IS ALLOWED TO ACHIEVE THIS REQUIREMENT.



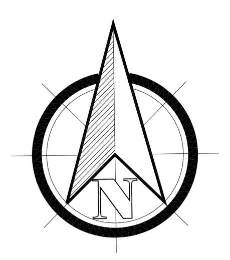
SYSTEM DRAWING

SCALE: NTS

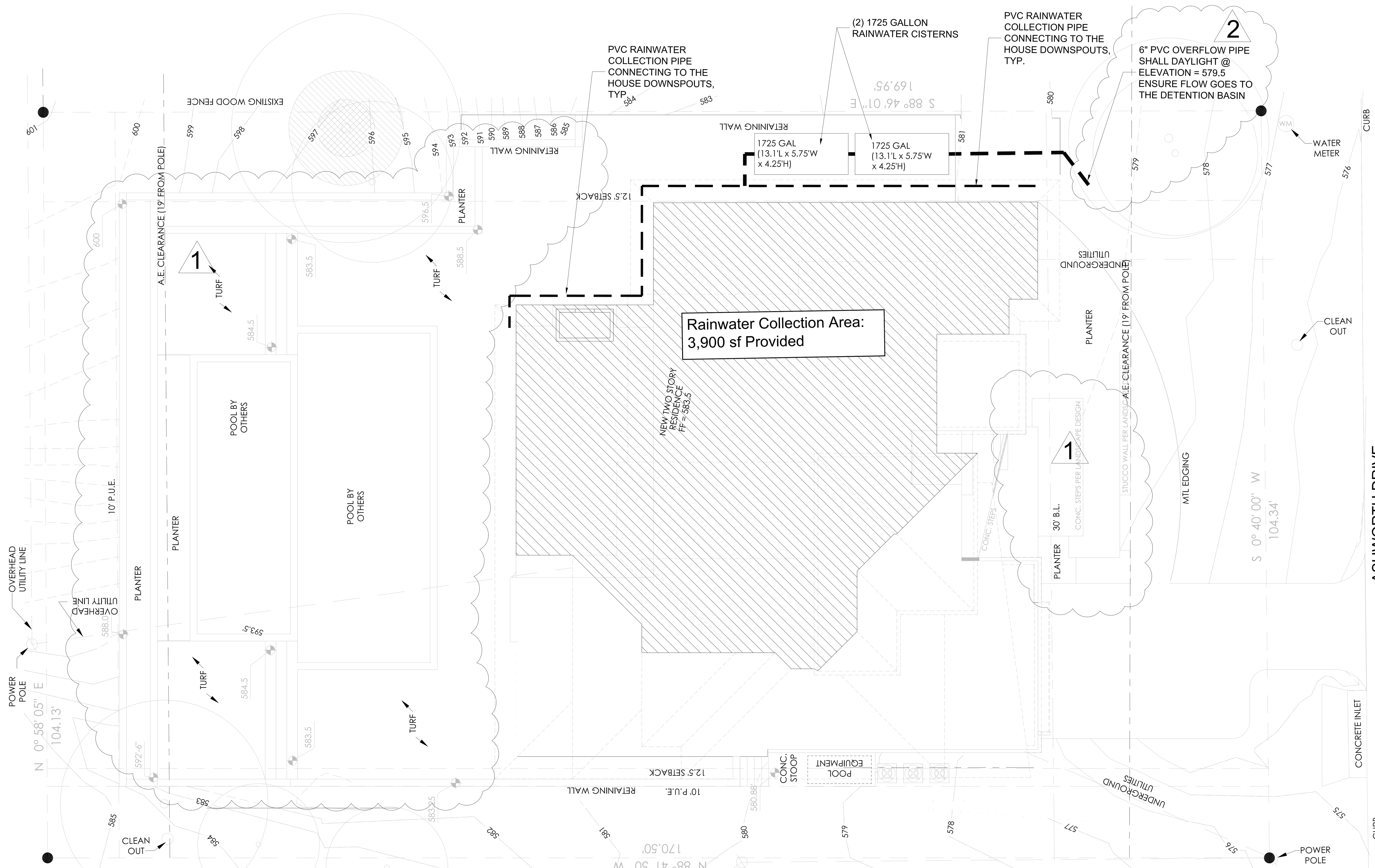
NOTES:
1. CONNECT IRRIGATION SOLENOID VALVE TO STORMWATER DISPERSAL TIMING CONTROL UNIT.
2. A BACKFLOW PREVENTION DEVICE (RPZ) IS REQUIRED TO BE INSTALLED AT THE DOMESTIC WATER METER AS PER TCEQ BACKFLOW REGULATIONS.
3. PUMP SHALL HAVE A PUMP KILL FLOAT SWITCH OR RUN DRY PROTECTION.

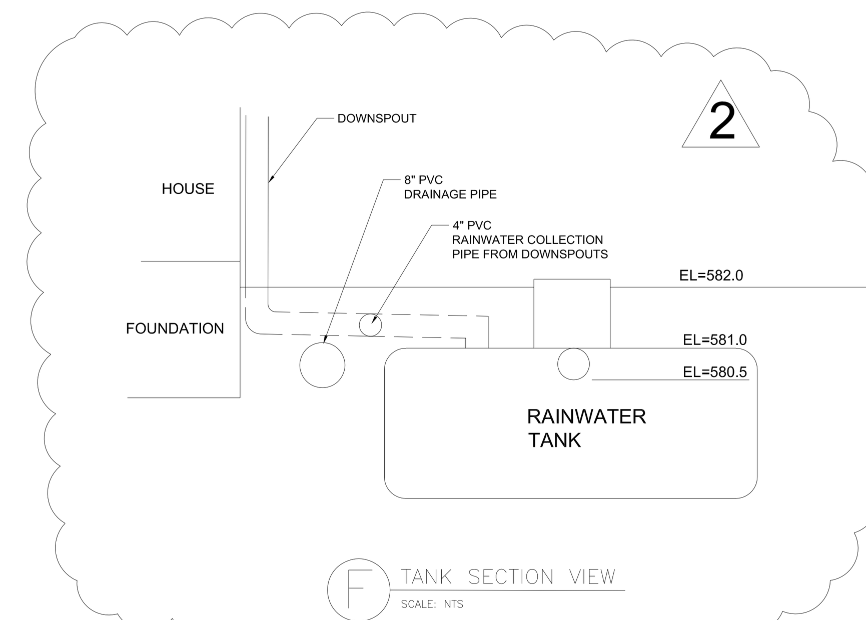
LEGEND:
- GUTTER & DOWNSPOUT LOCATION
- 4" RAINWATER COLLECTION PIPING
- 1.25" PRESSURE LINE
- WASTEWATER
- ELECTRICAL CONDUIT
- GAS LINE
- RAINWATER COLLECTION AREA

NOTE: SEE ARCHITECTURAL PLANS FOR EXACT DOWNSPOUT LOCATIONS



HARVESTED RAINWATER SHALL BE DISPERSED INTO AN IRRIGATION AREA AROUND THE HOUSE





TANK SECTION VIEW

SCALE: NTS

TCEQ Edward's Aquifer WPAP Rainwater Harvesting System Design Calculations 208 Ashworth Drive, Rollingwood, TX		
Area of lot (sf)		17,743
Impervious Cover (sf)	20%	3,549
Impervious Cover - Proposed (sf)		6709.52
Impervious Cover - Required capture (sf)		3,161
Required Rainwater Capture Depth (inches)		1.5
Water Quality Volume (gallons)		**2,955**
On-site soil		Cs
Soil Infiltration Rate (in/hr)		0.06
Drawdown Time (hours)		168
Required Irrigation Field Area (sf): WQV/(Infil rate x drawdown)		470.371
Provided Irrigation Field Area (sf)		**470.4**

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STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED PROFESSIONAL ENGINEER

Innovative Water Solutions
"Water Focused" Engineering & Planning
TX PE FIRM REG. #11414
501 W. POWELL LN., STE. 206
AUSTIN, TEXAS 78753
OFFICE: 512-490-0932 www.watercache.com

NO.	BY	DATE	REVISION
1	CMG	9/6/22	CHANGES TO LANDSCAPE DESIGN
2	CMG	10/3/22	DRAINAGE REVIEW CHANGES

PROJECT NO. 208 ASHWORTH
FILE NO: 208 ASHWORTH DRAINAGE–PLAN.DWG
DATE: APRIL 2022
SCALE: 1"=10'

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

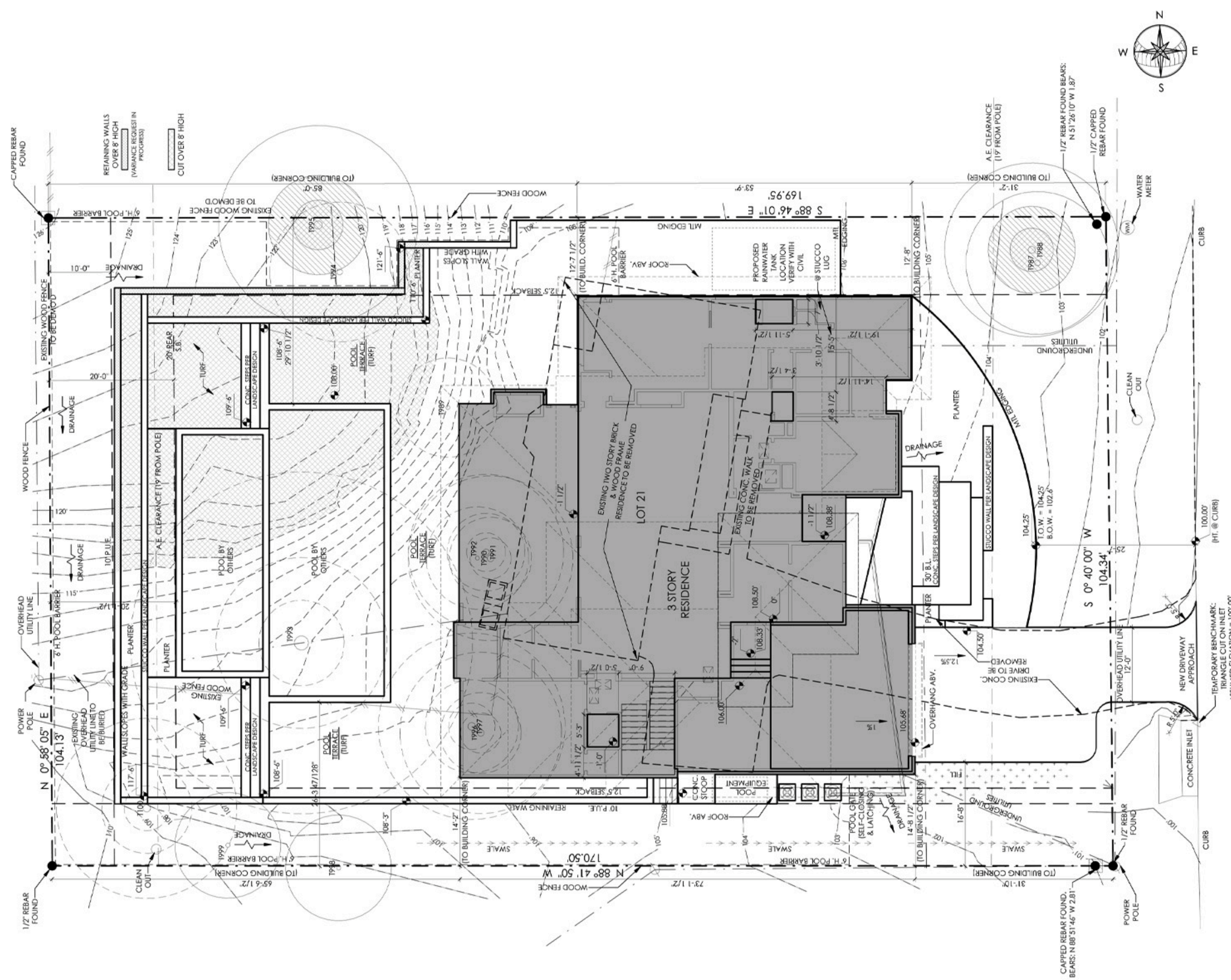
Innovative Water Solutions
RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING
P.O. Box 9963
Austin, Texas 78766
Phone: (512) 490–0932
http://www.watercache.com

RAINWATER HARVESTING SYSTEM FOR TCEQ REQUIREMENTS

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX

REGISTERED ARCHITECT
RODNEY E. PALMER
17477
STATE OF TEXAS

09/14/22



208 ASHWORTH DR.
ROLLINGWOOD, TX 78746

SITE PLAN
1"=20'-0"

CORNERSTONE
ARCHITECTS
7000 BEE CAVES RD. SUITE 200 AUSTIN TX 78746 512.329.0007
CORNERSTONEARCHITECTSLLP.COM

August 22, 2022

City of Rollingwood
Board of Adjustment

RE: Cut Depth Variance Request
208 Ashworth Drive

Dear BOA Commissioners,

I am requesting your approval of a request to exceed the maximum cut depth of 8 vertical feet, as stated in Section 103-325.6.1.E. As you can see on the attached existing topography map labeled Exhibit A, there is a 17 foot tall hill in the northwest corner of the lot, which will negatively impact drainage for my proposed new residence, and which makes the majority of the rear yard unsafe and unusable. I am proposing to cut a depth of up to approximately 14 vertical feet, as shown on Exhibit B. Cuts will be retained by proposed vertical concrete walls, as shown. No cuts or proposed retaining walls will be closer than 10 feet from adjacent properties, as is required in Section 105-325.6.1.G.

I am proposing to construct a swimming pool, cabana, and lawn area on the regraded portions per Exhibit C. To assure that the proposed grade changes will not negatively impact adjacent property owners or adjacent street flow, I hired Chris Maxwell Gaines, P.E., with the firm Innovative Water Solutions to provide full drainage plans, which are attached as Exhibit D.

As is required in Section 107-492 (b) of the City Code, I believe this variance request is not contrary to the public interest, because granting this variance will allow this lot to be redeveloped in a manner similar to other surrounding residential lots, with no negative impact on surrounding properties or area drainage patterns. I also believe that the current topography of this lot constitutes a special condition, where a literary enforcement of the 8 foot cut limit would result in an unnecessary hardship for this property. Finally, I believe that the granting of this variance request will result in compliance with the spirit of this chapter, and substantial justice will result.

Please let me know if any additional information is needed to support my variance request.

Sincerely,

Andrew Richardson
Owner

Attachments

August 22, 2022

City of Rollingwood
408 Nixon Dr.
Austin, TX 78746

RE: 208 Ashworth

Dear City Reviewers:

I, Andrew Richardson, property owner of 208 Ashworth, do hereby authorize Jim Wittliff (agent), of Land Answers, Inc. to apply for any variances and/or permits associated with the property.

Sincerely,

Signature: ______________________________

Printed Name: Andrew Richardson

August 29, 2022

City of Rollingwood
403 Nixon Drive
Rollingwood, TX, 78746
Attention: Rollingwood Board of Adjustment Members

Re: Variance request by the owners of 208 Ashworth Drive to cut more than an eight (8) foot depth (up to fourteen (14) feet) in the rear yard of such property in order to construct a new residence and swimming pool (the "Variance Request")

Ladies and Gentlemen:

From a preliminary review of the Variance Request and accompanying general plans set forth on Exhibit A attached hereto, I do not oppose the aesthetics of such Variance Request; provided, however, this letter should not be deemed to (i) be an endorsement to any specific current or future plans related to such Variance Request as I have not reviewed any such plans (and I am not a structural engineer) or (ii) limit any of my future rights and/or remedies at law or otherwise that I may have as a result of any harms that the granting of such Variance Request and accompanying improvements may cause my property at 210 Ashworth Drive.

Sincerely,

Thomas D. Gianturco

Thomas Gianturco
210 Ashworth Drive
Rollingwood, TX, 78746

September 8, 2022

City of Rollingwood
403 Nixon Drive
Rollingwood, TX, 78746
Attention: Rollingwood Board of Adjustment Members

Re: Variance request by the owners of 208 Ashworth Drive to cut more than an eight (8) foot depth (up to fourteen (14) feet) in the rear yard of such property in order to construct a new residence and swimming pool (the "Variance Request")

Ladies and Gentlemen:

From a preliminary review of the Variance Request and accompanying general plans set forth on Exhibit A attached hereto, I do not oppose the aesthetics of such Variance Request; provided, however, this letter should not be deemed to (i) be an endorsement to any specific current or future plans related to such Variance Request as I have not reviewed any such plans (and I am not a structural engineer) or (ii) limit any of my future rights and/or remedies at law or otherwise that I may have as a result of any harms that the granting of such Variance Request and accompanying improvements may cause my property at 107 Laura Ln.

Sincerely,

Scott R Burns

Scott Burns
107 Laura Ln
Rollingwood, TX, 78746

Letter of Support
Cut & Fill Variance Request
208 Ashworth Drive

Dear City of Rollingwood Board of Adjustment Members:

I wish to register my support for my neighbor's variance request to cut more than an eight foot depth in the rear yard of his property, in order to construct a new residence and swimming pool. Due to the unusual existing topography in our neighborhood, this variance request to cut up to approximately 14 feet will be necessary to create a usable back yard and to provide safe and efficient drainage flows, per the attached plan. I understand that no cuts are proposed within ten feet of the rear or side property lines, per City regulations.

Genie Nyer
Printed Name

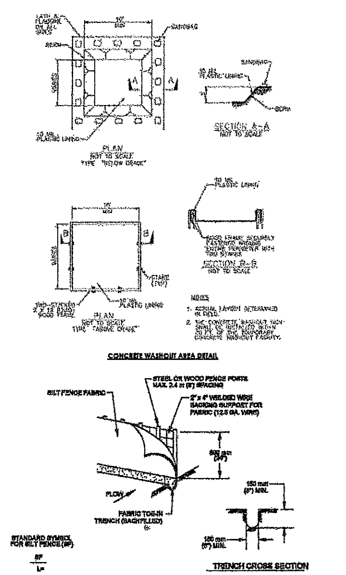
Sep 8, 2022
Date

Genie Nyer
Signature

206 Ashworth Dr, Rollingwood, TX 78746
Address

EXISTING

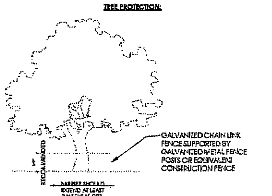
PROPOSED



FLOOD CERTIFICATION
THIS AREA IS NOT DEPICTED AS BEING IN A SPECIAL FLOOD HAZARD AREA PER FEMA'S FLOOD INSURANCE RATE MAP 48453C0445K, DATED 01/22/2020. IT IS REPRESENTED AS IN ZONE "X". HOWEVER, AT THE PRESENT TIME NO ELEVATIONS, DRAINAGE, OR FLOOD STUDIES HAVE BEEN PERFORMED AND INFORMATION IS BASED SOLELY UPON SAID MAP. THE SURVEYOR DOES NOT ASSUME RESPONSIBILITY AS TO ANY INFORMATION PROVIDED BY SAID MAP AND DOES NOT IMPLY THAT THE PROPERTY AND/OR THE STRUCTURES THEREON WILL BE FREE OF FLOOD DAMAGE. FOR FURTHER INFORMATION CONTACT YOUR FLOOD PLAIN ADMINISTRATOR.

ROLLINGWOOD SITE PLAN NOTES

TREE PROTECTION:



IT IS THE ARCHITECT'S AND OWNER'S INTENT TO PROTECT ALL TREES IN PROXIMITY TO THE CONSTRUCTION AREA FROM DAMAGE OR INJURY DUE TO CONSTRUCTION. THE SUGGESTIONS FOR TREE PROTECTION PROVIDED IN THESE DRAWINGS ARE EXPLICITLY NOT GUARANTEED TO FULLY PROTECT THE TREES, IT IS HIGHLY RECOMMENDED THAT A TREE SPECIALIST BE HIRED AND THAT SUCH COST BE REVIEWED WITH OWNER FOR APPROVAL PRIOR TO PROCUREMENT OF TREE SPECIALIST SERVICES. IF CONTRACTOR DOES NOT REVIEW WITH OWNER HIS OR HER WILLINGNESS OR NON-WILLINGNESS TO HIRE SUCH SPECIALIST, THEN IT WILL BE CONSTRUED AS CONTRACTORS WILLINGNESS TO ACCEPT LIABILITY FOR PROTECTING THE TREES FROM ANY DAMAGE THROUGHOUT THE CONSTRUCTION PROCESS.

ROLLINGWOOD SITE PLAN NOTES

TREE LEGEND

- ½ CRITICAL ROOT ZONE (NO CUT/FILL)
- ¼ CRITICAL ROOT ZONE (NO CUT/FILL > 4")
- DRIP ZONE

ROLLINGWOOD CONSTRUCTION REQUIREMENTS

- CONSTRUCTION HOURS ARE FROM 7:00 A.M. TO 7:00 P.M. MONDAY THROUGH FRIDAY. CONSTRUCTION AND DEMOLITION ARE NOT PERMITTED DURING CITY HOLIDAYS OR ON WEEKENDS.
- QUIET INTERIOR CONSTRUCTION WORK IS PERMITTED BETWEEN THE HOURS OF 10:00AM AND 4:00PM ON SATURDAYS IF THE WORK MEETS THE FOLLOWING REQUIREMENTS:
  - TAKES PLACE WHOLLY WITHIN A DRIED-IN STRUCTURE:
  - DOES NOT REQUIRE LARGE EQUIPMENT SUCH AS CEMENT TRUCKS, DOZERS, CRANES OR DUMP TRUCKS;
  - DOES NOT CREATE A NUISANCE CONDITION RELATED TO NOISE, TRAFFIC, ODOR, DUST, OR OTHER CONDITIONS, AND IS NOT IN VIOLATION OF ANY OTHER CITY ORDINANCE.
- A SIGN NOTING THE CONSTRUCTION HOURS SHALL BE POSTED ON SITE AT OR PRIOR TO THE PRECONSTRUCTION MEETING, AND SHALL REMAIN FOR THE DURATION OF THE PROJECT.
- HEAVY CONSTRUCTION VEHICLES MUST COMPLY WITH DESIGNATED CONSTRUCTION ROUTES.
- SILT FENCES MUST BE IN PLACE BEFORE THE START OF CONSTRUCTION, AND REMAIN UNTIL LANDSCAPING IS COMPLETED.
- DIRT, FILL, GRAVEL, OR OTHER PERVIOUS MATERIALS MUST BE STORED WITHIN A SILT FENCE, OR SECURELY COVERED WITH A WATER-RESISTANT TARP.
- CONSTRUCTION SITES MUST BE KEPT CLEAN AT ALL TIMES, FREE OF TRASH AND DEBRIS. CONSTRUCTION SITES MUST HAVE A SOLID-SIDED TRASH CONTAINER, CANNOT BE OVER FILLED, AND MUST BE REGULARLY EMPTIED.
- THE LOCATION OF PORTABLE TOILETS, CONSTRUCTION CONTAINERS, AND MATERIALS STAGING NEEDS TO BE NOTED ON A SITE PLAN AND SUBMITTED AT OR BEFORE THE PRE-CONSTRUCTION MEETING.
- A SET OF STAMPED, OR OTHERWISE APPROVED PLANS BY THE OFFICE OF DEVELOPMENT SERVICES MUST BE KEPT ON SITE AT ALL TIMES. NO CHANGES TO THE PLANS SHALL BE MADE WITHOUT APPROVAL FROM THE OFFICE OF DEVELOPMENT SERVICES.
- A COPY OF THE BUILDING PERMIT ISSUED BY THE OFFICE OF DEVELOPMENT SERVICES SHALL BE KEPT ON SITE AT ALL TIMES, AND SHALL LIST ALL REQUIRED INSPECTIONS AS DETAILED IN THE PLAN REVIEW.

TO READ THE ENTIRE CODE AS IT RELATES TO THE MANNER OF CONDUCTING CONSTRUCTION, SEE SECTIONS 101-245 TO 101-254, OR VISIT:

HTTPS://LIBRARY.MUNICODE.COM/TX/ROLLINGWOOD/CODES/CODE_OF_ORDINANCES?NODEID=PTIILADECO_CH101BUCO_ARTVIMACOCORE

CITY OF ROLLINGWOOD CONSTRUCTION NOTES:

1. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(F)**, ALL FENCES SHALL BE MAINTAINED IN GOOD CONDITION.
2. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(D)**, IF A FENCE ALONG THE SIDE OR REAR OF A LOT OR PROPERTY IS ERECTED TO THE PROPERTY LINE, ADEQUATE ACCESS TO UTILITY LINES AND METERS SHALL BE PROVIDED.
3. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(B)(7)**. IF ONLY ONE SIDE OF THE FENCE IS STAINED WOOD OR OTHER FINISHED MATERIAL, THE FINISHED SIDE SHALL FACE AWAY FROM THE INTERIOR OF THE PROPERTY; IF SUPPORT COMPONENTS ARE PROVIDED ON ONLY ONE SIDE OF THE FENCE, SUCH SUPPORT COMPONENTS SHALL BE ON THE SIDE FACING THE INTERIOR OF THE PROPERTY.
4. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(B)(9)**. NO CHAIN LINK, BARBED WIRE, OR ELECTRIFIED FENCES SHALL BE INSTALLED OR MAINTAINED.
5. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(B)(10)**. NO FENCE, INCLUDING DECORATIVE OR ORNAMENTAL FENCE TOPS, SHALL BE DESIGNED TO INCLUDE OR BE CONSTRUCTED OF BARBED WIRE, BROKEN GLASS OR ANY EXPOSED SHARP OR POINTED MATERIALS THAT MAY PENETRATE OR IMPALE PERSONS OR ANIMALS.
6. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-35(G)**, OUTDOOR SWIMMING POOLS ERECTED, CONSTRUCTED OR SUBSTANTIALLY ALTERED AFTER MARCH 1, 1988, SHALL BE COMPLETELY ENCLOSED BY A FENCE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS ADOPTED BY THE CITY. IF THE POOL IS ABOVE GROUND BY THE REQUIRED HEIGHT, PLEASE SHOW HOW STAIRS WILL BE ENCLOSED TO PREVENT ACCESS TO THE POOL.
7. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-35(F)**, OVERHEAD LIGHTING IN SWIMMING POOL AREAS IS PROHIBITED.
8. PER CITY OF ROLLINGWOOD CITY ORDINANCE SECTION **107-71**. EXCEPT AS MAY BE REQUIRED BY APPLICABLE CODES, NO CHIMNEY, ATTIC VENT, LIGHTNING ROD OR REQUIRED EQUIPMENT MAY EXTEND MORE THAN THREE FEET ABOVE THE HIGHEST POINT OF THE COPING OF A FLAT ROOF/DECK LINE OF A MANSARD ROOF/ THE GABLE OF A PITCHED OR HIPPED ROOF.
9. NO PORTION OF ANY BUILDING OR STRUCTURE MAY EXCEED 35 FEET IN HEIGHT, PER ROLLINGWOOD CITY ORDINANCE SECTION **107-71**. PLEASE PROVIDE THE GROUND ELEVATION USED FOR THE REFERENCE DATUM.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND INSPECTING, ON A REGULAR BASIS, ALL EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES INCLUDING THE SILT FENCES, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC., DURING CONSTRUCTION/DEMOLITION AND INCLUDING THE REMOVAL AND PROPER DISPOSAL OF ANY ACCUMULATED SILT AND DEBRIS.
11. (B) THE CONTRACTOR SHALL NOT BEGIN ANY WORK UNTIL TREE PROTECTION AND THE EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES SUCH AS SILT FENCE, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC., HAVE BEEN INSTALLED.
12. (C) THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE STREETS FREE OF MUD, DIRT, DEBRIS AND MATERIAL AT ALL TIMES AND SHALL CLEAN/SWEEP THE STREETS ON A REGULAR BASIS AND AT THE DIRECTION OF THE CITY.
13. INCREASED STORMWATER PEAK FLOWS DURING CONSTRUCTION MUST BE MITIGATED WITH TEMPORARY BEST MANAGEMENT PRACTICES TO PREVENT HARM TO NEIGHBORING PROPERTIES.

TREE LIST

DEMO	TAG NO.	SIZE	SPECIES
REMOVE	T100	14.5"	MULTI-STEM MAGNOLIA
	T987	11.5"	OAK
	T988	14"	OAK
REMOVE	T989	8"	HACK
REMOVE	T990	13.25"	OAK
REMOVE	T991	12.5"	OAK
REMOVE	T992	8.25"	OAK
REMOVE	T993	27.5"	OAK
REMOVE	T994	11.25"	OAK
	T995	16"	OAK
REMOVE	T996	13"	OAK
REMOVE	T997	15"	OAK
	T998	8.5"	HACK
	T999	8.5"	HACK

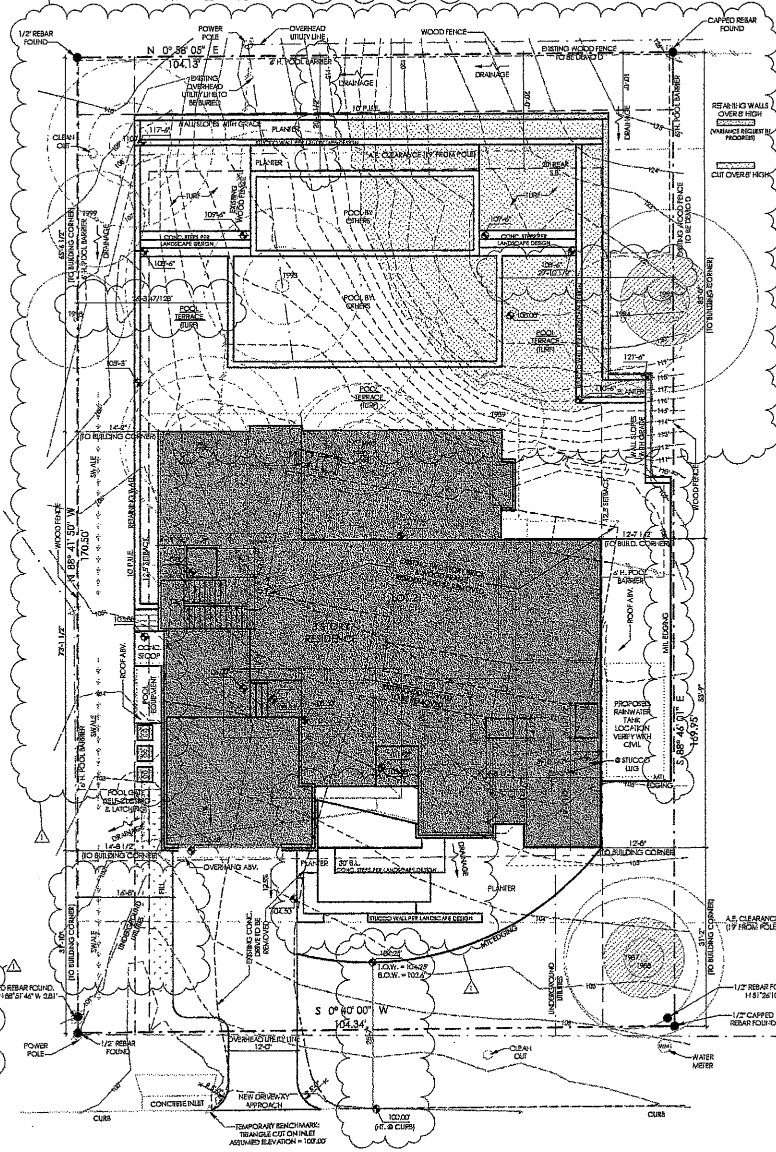
LEGAL DESCRIPTION

208 ASHWORTH DRIVE, LOT 21, ROLLINGWOOD PARK ESTATES SECTION 2, ROLLINGWOOD TX, 78746, TRAVIS COUNTY

BUILDING HEIGHT:
REFERENCE DATUM SELECTED: 112' (102' + 10')

AUTOMATIC SPRINKLER SYSTEM

A FULL RESIDENTIAL SPRINKLER SYSTEM DESIGNED, INSTALLED AND TESTED IN ACCORDANCE WITH THE NFPA 13D OR THE 2021 IRC P2904 STANDARDS WILL BE INSTALLED IN THIS PROPERTY. THE PLANS FOR THE SPRINKLER SYSTEM MUST DESIGNED AND INSTALLED BY A TEXAS LICENSED SPRINKLER CONTRACTOR FOR NFPA 13D SYSTEMS OR A TEXAS LICENSED PLUMBER WITH THE IRC P2904 ENDORSEMENT ON THEIR LICENSE. THE SPRINKLER PLANS MUST BE SUBMITTED, REVIEWED, APPROVED, TESTED AND INSPECTED BY AFD PRIOR TO COVERING THE WALLS AND CEILINGS. A FLOW TEST OF THE MOST DEMANDING AREA WILL BE REQUIRED.



IMPERVIOUS COVER CALCULATIONS

TOTAL LOT AREA: 17,743.12 SF

AREA NAME	EXISTING	ADDED	TOTAL
RESIDENCE	1,662.21 SF	3,498.63 SF	5,160.84 SF
A/C PADS	0.00 SF	21.33 SF	21.33 SF
CONC. WALKWAY	76.27 SF	541.84 SF	618.11 SF
DRIVEWAY	1,448.92 SF	-789.49 SF	659.43 SF
POOL COPING	0.00 SF	192.08 SF	192.08 SF
POOL EQUIPMENT	0.00 SF	46.95 SF	46.95 SF
POOL STORAGE	0.00 SF	36.00 SF	36.00 SF
POOL TERRACE	0.00 SF	0.00 SF	0.00 SF
TOTAL IMPERVIOUS	3,187.40 SF	3,547.34 SF	6,734.74 SF

TOTAL PROJECT IMPERVIOUS COVERAGE @ 6,734.74 SF = 37.96%

CURRENT ADOPTED CODES

THESE PLANS AND SPECIFICATIONS HAVE BEEN DRAWN IN ACCORDANCE WITH THE FOLLOWING APPLICABLE ADOPTED CODES:

1. INTERNATIONAL BUILDING CODE - 2015 EDITION
2. INTERNATIONAL RESIDENTIAL CODE FOR ONE- AND TWO- FAMILY DWELLINGS - 2015 EDITION.
3. UNIFORM PLUMBING CODE - 2015 EDITION OR AS ADOPTED BY THE SERVICE PROVIDER.
4. INTERNATIONAL MECHANICAL CODE - 2015 EDITION.
5. NATIONAL ELECTRICAL CODE 2014 EDITION.
6. INTERNATIONAL ENERGY CONSERVATION CODE - 2015 EDITION.
7. INTERNATIONAL FIRE CODE - 2015 EDITION AS AMENDED BY TRAVIS COUNTY EMERGENCY SERVICE DISTRICT NO. 6.
8. INTERNATIONAL GAS CODE - 2015 EDITION.

SITE LEGEND

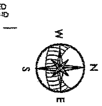
- CONSTRUCTION FENCE
- SILT FENCE
- BENCHMARK
- ET ELECTRIC TRANSFORMER
- EB ELECTRIC BOX
- EM ELECTRIC METER
- DI DROP INLET
- S SEWER
- CO CLEANOUT
- G GAS METER
- GM GAS MARKER
- WM WATER METER
- T TELEPHONE PEDESTAL
- C C.A.T.V. PEDESTAL
- FO FIBER OPTICS
- TC TELECOMMUNICATIONS
- MW MANHOLE - WATER
- MT MANHOLE - TELEPHONE
- ME MANHOLE - ELECTRIC
- SE MANHOLE - SEWER
- UTILITY POLE
- FIRE HYDRANT

POOL NOTES:

1. NEW RAILING TO BE IN ACCORDANCE WITH SECTIONS 305.2.1 THROUGH 305.7 IN 2015 INTERNATIONAL SWIMMING POOL AND SPA CODE.
2. ALL WINDOWS & DOORS WITH DIRECT ACCESS TO THE POOL / SPA TO HAVE AN ALARM THAT PRODUCES AUDIBLE WARNING WHEN OPENED IN ACCORDANCE WITH UL 2017.

GENERAL SITE NOTES

1. BUILDER TO RESCULPTURE TOPO/FINISH GRADE TO PROVIDE PROPER DRAINAGE OF SURFACE WATER AWAY FROM BUILDING AS REQ'D.
2. FINAL LOCATION OF PROPOSED RESIDENCE TO BE DETERMINED BY BUILDER.
3. EXPOSED FOUNDATION TO BE MINIMUM OF 8" AND A MAXIMUM OF 18" ABOVE FINISHED GRADE OR PER SUBDIVISION REQUIREMENTS. UNDERPIN ALL EXPOSED FOUNDATIONS.
4. THERE ARE NO STORM SEWER INLETS WITHIN THE LOT FRONTAGE OR 10'-0" BEYOND THE SIDE PROPERTY LINES.
5. UTILITY LINE LOCATIONS ARE APPROXIMATES- GENERAL CONTRACTOR TO FIELD VERIFY FOR EXACT LOCATIONS.
6. VERIFY METER AND UTILITY SERVICE LOCATIONS PRIOR TO INSTALLATION.
7. EROSION CONTROL BARRIERS TO BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
8. STABILIZED TEMPORARY CONSTRUCTION DRIVEWAY TO BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
9. CONFIRM ALL DRIVEWAY, WALKWAY AND PVC LAYOUTS/LOCATIONS PRIOR TO COMMENCING WORK.
10. PROVIDE CONTROL AND EXPANSION JOINTS AS REQUIRED ON CONCRETE DRIVES, WALKS AND PATIOS.
11. ALL EXTERIOR HVAC EQUIPMENT TO BE SCREENED PER CITY REQUIREMENTS, DEED RESTRICTIONS OF SUBDIVISION OR NEIGHBORHOOD ASSOCIATION.
12. GARBAGE RECEPTACLES TO BE STORED IN GARAGE OR SCREENED FROM VIEW AND ANIMAL ACCESS.
13. LOCATION OF MAILBOX AND EXTERIOR DRIVEWAY LIGHT(S) TO BE VERIFIED PRIOR TO INSTALLATION.
14. ALL CONSTRUCTION MATERIALS AND WASTE TO BE STORED ON SITE DURING CONSTRUCTION.
15. LANDSCAPE PLANS TO BE PROVIDED BY OTHERS AND PERMIT FOR SAME TO BE OBTAINED SEPARATELY FROM THESE PLANS.
16. NO EXISTING TREES TO BE REMOVED OR DISTURBED WITHOUT OWNER APPROVAL.
17. ALL STUMPS AND ROOTS SHALL BE REMOVED FROM THE SOIL TO A DEPTH OF 12" BELOW THE SURFACE OF THE GROUND IN THE AREA OF THE BUILDING.
18. CONTRACTOR SHALL CLEAN UP AREAS AFFECTED BY DAILY WORK AND REMOVE DEBRIS AND MATERIALS FROM THE SITE UPON COMPLETION OF THE WORK.



① **SITE PLAN**
1" = 10'-0"

CORNERSTONE
ARCHITECTS
7000 BEE CAVES RD. SUITE 200 AUSTIN TX 78746 512.329.0007

A CUSTOM RESIDENCE FOR RICHARDSON FAMILY
208 ASHWORTH DR.
ROLLINGWOOD, TX 78746

REVISION:
1 8/31/2022 Permit/design update

REGISTERED ARCHITECT RODNEY E. PALMER 17477 STATE OF TEXAS

CDs
09/07/2022

RICHARDSON CUSTOM

SHEET: A1
1 of 18

PROJECT NO: 21113
DRAWN BY: SN
DATE: 09/07/2022
CHECKED BY: XX
PROJECT MGR: SN

PERMIT SET: 2022-03-08

30' 0 30'

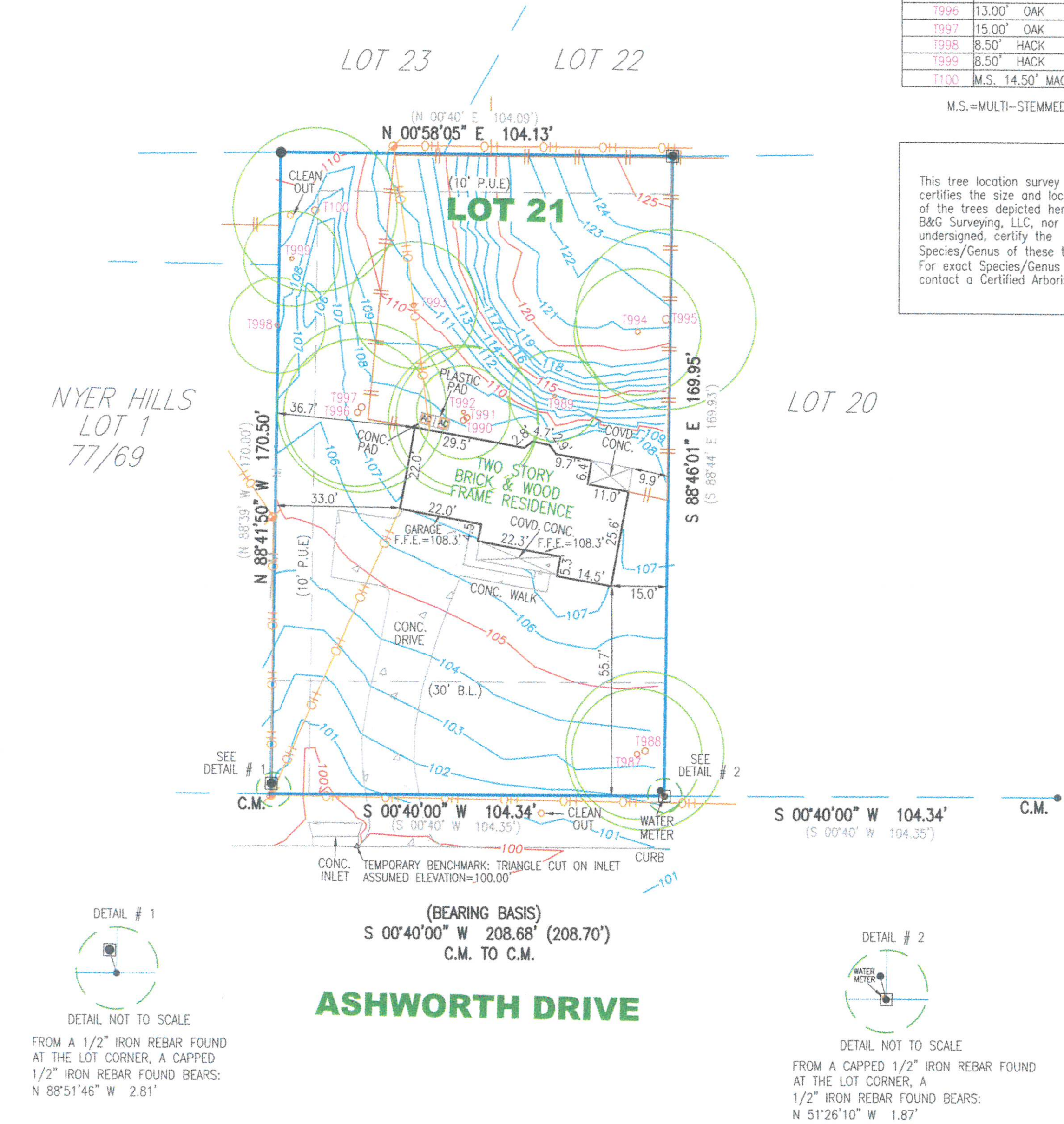
EXHIBIT A

TREE LEGEND

TAG NO.	TREE DESCRIPTION
T987	11.50' OAK
T988	14.00' OAK
T989	8.00' HACK
T990	13.25' OAK
T991	12.50' OAK
T992	8.25' OAK
T993	27.50' OAK
T994	11.25' OAK
T995	16.00' OAK
T996	13.00' OAK
T997	15.00' OAK
T998	8.50' HACK
T999	8.50' HACK
T100	M.S. 14.50' MAGNOLIA

M.S.=MULTI-STEMMED

This tree location survey certifies the size and location of the trees depicted hereon. B&G Surveying, LLC, nor the undersigned, certify the Species/Genus of these trees. For exact Species/Genus contact a Certified Arborist.



LEGEND

- 1/2" REBAR FOUND
- 1/2" CAPPED REBAR SET
- 1/2" IRON PIPE FOUND
- 60D NAIL FOUND
- 60D NAIL SET
- CAPPED REBAR FOUND
- "X" SET IN CONCRETE
- "X" FOUND IN CONCRETE
- COTTON SPINDLE FOUND
- PUNCH HOLE FOUND
- BREAK IN SCALE
- CHAIN LINK FENCE
- WOOD FENCE
- METAL FENCE
- B.L. BUILDING LINE
- P.U.E. PUBLIC UTILITY EASEMENT
- D.E. DRAINAGE EASEMENT
- ( ) PER PLAT
- C.M. CONTROL MONUMENT
- R.O.W. RIGHT OF WAY
- OH OVERHEAD UTILITY LINE
- POWER POLE
- AC AIR CONDITIONER
- TP TRANSFORMER PAD

TO THE LIENHOLDER AND / OR PRESENT OWNERS OF THE PREMISES SURVEYED.

IMPORTANT NOTICE
This Survey was prepared without the benefit of a title commitment. There may be additional setback lines, easements and interests which are relevant to this property and unknown to B & G SURVEYING, LLC. Building dimensions are approximate.

STREET ADDRESS: 208 ASHWORTH DRIVE CITY: ROLLINGWOOD COUNTY: TRAVIS STATE OF TEXAS
LOT: 21 SUBDIVISION: ROLLINGWOOD PARK ESTATES SECTION 2 VOL/CAB 79 PG/SLD 1 PLAT RECORDS
REFERENCE NAME: ANDREW RICHARDSON

MAYA/GF TREES & TOPO ADDED: 07/15/21

B & G SURVEYING, LLC
FIRM REGISTRATION NO. 100363-00
WWW.BANDGSURVEY.COM
1404 West North Loop Blvd.
Austin, Texas 78756 – Office 512*458-6969

JOB #: B0321021_TA
DATE: 07/03/21
SCALE: 1"= 30'

FIELD WORK BY	DUSTIN	07/01/21
CALC'D BY	JOSE	07/02/21
DRAFTED BY	MAYA	07/02/21
CHECKED BY	VG/ML	07/02/21

10
180 1311 ajt

AMENDMENT TO RESTRICTIONS

FILM CODE
00005741400

WHEREAS, David and Linda Barstow are the record owners of that certain real property described as follows:

Lot Twenty-two (22), ROLLINGWOOD PARK ESTATES SECTION TWO, a subdivision in Travis County, Texas, according to the map or plat of record in Volume 79, Pages 1-2, Plat Records of Travis County, Texas.

("Lot 22"); and

WHEREAS, pursuant to documents recorded in Volume 6858, Page 2201, Volume 7439, Page 314, Volume 8540, Page 627, and Volume 8540, Page 704, Deed Records of Travis County, Texas, the owner of Lot Twenty-one (21), ROLLINGWOOD PARK ESTATES SECTION TWO, a subdivision in Travis County, Texas, according to the map or plat of record in Volume 79, Pages 1-2, Plat Records of Travis County, Texas ("Lot 21") is restricted from erecting or constructing any building or structure other than a fence within 40 feet of the rear property line of Lot 21 (the "Restriction"); and

WHEREAS, the owners of Lots 21 and 22 desire to amend the Restriction; and

WHEREAS, the only party that can release or amend the Restriction is the owner of Lot 22;

NOW, THEREFORE, for Ten Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged and confessed, the undersigned owners of Lot 22 do hereby amend the Restriction to read in its entirety as follows:

"The owner of Lot 21 may not erect or construct any building or structure (except for fences) within 20 feet of the rear property line of Lot 21. Within 40 feet of the rear property line of Lot 21, the owner of Lot 21 may not erect or construct any building or structure (except for fences) that has its highest point higher than the current two-story residence that exists on Lot 21. Regardless, no storage building of any kind may be built within 40 feet of the rear property line of Lot 21."

Executed this first day of June, 1998.

David Barstow
David Barstow

Linda Barstow
Linda Barstow

STATE OF TEXAS §
COUNTY OF TRAVIS §

This instrument was acknowledged before me on 6/1, 1998 by David Barstow.

Donna L. Watson
Notary Public, State of Texas

STATE OF TEXAS §
COUNTY OF TRAVIS §

This instrument was acknowledged before me on 6/1, 1998 by Linda Barstow.

DONNA L. WATSON
NOTARY PUBLIC
State of Texas
Comm. Exp. 09-11-99

Donna L. Watson
Notary Public, State of Texas

REAL PROPERTY RECORDS
TRAVIS COUNTY TEXAS

13196 324

Ret to
James J. Hill
1500-B Waterloo Trail
Austin Tx 78704

FILED

98 JUN -3 PM 4:27

DANA DEBEAUVOIR
COUNTY CLERK
TRAVIS COUNTY, TEXAS

STATE OF TEXAS COUNTY OF TRAVIS
I hereby certify that this instrument was FILED on the date and at the time stamped hereon by me; and was duly RECORDED, in the Volume and Page of the named RECORDS of Travis County, Texas, as stamped hereon by me.

JUN 8 1998

COUNTY CLERK
TRAVIS COUNTY, TEXAS

REAL PROPERTY RECORDS
TRAVIS COUNTY, TEXAS

13196 3243

RECEIPT#: A00118136 - TRANS#: 45621 - DEPT: REGULAR RECORD $11.00
CASHIER: MONED - FILE DATE: 6/3/98 - TRANS DATE: 6/4/98
PAID BY: CHECK# 15601428

EXHIBIT D

DRAINAGE PLANS FOR:
RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746
SUBMITTAL DATE: ARPIL 10, 2022

OWNER:	Andrew Richardson 208 Ashworth Drive Rollingwood, TX 78747
ARCHITECT:	Finn Nordfjord Cornerstone Architects 7000 Bee Caves Rd., Suite 200 Austin, TX 78746 (512) 329-0007
ENGINEER/ PERSON PREPARING PLAN:	Chris Maxwell-Gaines, P.E. Innovative Water Solutions LLC 501 W. Powell Lane, Suite 206 Austin, TX 78753 (512) 490-0932

PROJECT ADDRESS:	208 ASHWORTH DRIVE ROLLINGWOOD, TX 78746
PARCEL ID:	110540
ACREAGE:	0.407 AC
LEGAL DESCRIPTION:	LOT 21 ROLLINGWOOD PARK ESTATES SEC 2
FLOODPLAIN:	THIS PROPERTY DOES NOT LIE WITHIN THE 100 YEAR FLOOD- PLAIN, AND HAS A ZONE "X" RATING AS SHOWN ON FEMA FIRM MAP 48453C0445K, DATED JANUARY 22, 2020.

GENERAL NOTES:

1. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAIN WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF ROLLINGWOOD MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
2. CONTRACTOR SHALL CALL THE ONE CALL SYSTEM (1-800-344-8377) FOR UTILITY LOCATIONS PRIOR TO ANY WORK IN CITY EASEMENTS OR STREET R.O.W.
3. FOR SLOPES OR TRENCHES GREATER THAN FIVE FEET IN DEPTH: ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE REGULATIONS OF THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA STANDARDS MAY BE PURCHASED FROM OSHA, 611 EAST 6TH STREET, AUSTIN, TEXAS.)
4. ALL SITE WORK MUST ALSO COMPLY WITH ENVIRONMENTAL REGULATIONS.
5. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TRAFFIC CONTROL PERMIT PRIOR TO CONSTRUCTION IN THE RIGHT-OF-WAY.

VICINITY MAP

N.T.S.

PROJECT DESCRIPTION:

DEMOLITION OF THE EXISTING TWO STORY HOUSE AND CONSTRUCTION OF A NEW TWO STORY HOUSE WITH POOL / PATIO, AND TERRACED BACKYARD.

NDEX OF SHEETS

APPROVED BY:

CITY OF ROLLINGWOOD DATE

REVISIONS/CORRECTIONS:

NO.	REVISION DESCRIPTION	REVIEWED BY	DATE

NO.	BY	DATE	REVISION
1	CMG	9/6/22	CHANGES TO LANDSCAPE DESIGN

PROJECT NO. 208 ASHWORTH
FILE NO: 208 ASHWORTH DRAINAGE-2203
DATE: APRIL 2022
SCALE: AS SHOWN

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

Innovative Water Solutions
RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING
P.O. Box 9963
Austin, Texas 78766
Phone: (512) 490-0932
http://www.watercache.com

COVER PAGE

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746

STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED PROFESSIONAL ENGINEER
4/10/2022

SHT 1 OF 5

Impervious Cover Report
208 Ashworth Drive, Rollingwood, TX

Area Description	Existing SF	Existing %	Proposed SF	Proposed %	WPAP Requirements SF	WPAP Requirements %
Lot	17743.12		17743.12		17743.12	
Residence	1,662.21	9.4%	5160.84	29.1%	1995	11.2%
Driveway	1,448.92	8.2%	659.43	3.7%	659.43	3.7%
Sidewalks/Porches	76.27	0.4%	592.89	3.3%	592.89	3.3%
Wood Deck (50%)	0	0.0%	0	0.0%	0	0.0%
Pool	0	0.0%	275.03	1.6%	275.03	1.6%
AC Pads	0	0.0%	21.33	0.1%	21.33	0.1%
Total	3187.4	18.0%	6709.52	37.8%	3543.68	20.0%

Net Increase in Impervious Cover: **3522.12** sf

Time of Concentration (T_c) Calculation

Area	L_{sheet} (feet)	$L_{shallow\ concentrated}$ (feet)	n	S	T_t (min)	T_{lag} (min)
Ex	100	10.9	0.24	0.027	11.2	6.7
E1	100	78.8	0.24	0.128	6.2	3.7
E2	100	116.2	0.24	0.115	6.6	4.0
E3	11.67		0.015	0.083	0.1	0.1
E4	20.2		0.015	0.083	0.2	0.1
E5	86.3		0.015	0.06	0.8	0.5
P1	100	93.92	0.24	0.133	6.1	3.7
P2	100	156.9	0.24	0.09	7.4	4.4
P3	65.4		0.015	0.083	0.6	0.3
P4	17.5		0.015	0.083	0.2	0.1
P5	59.5		0.015	0.088	0.5	0.3

Note: For any T_{lag} below 5, the minimum used in HEC-HMS model is 5.0 minutes.

Impervious Cover

Hydrologic Element	Pervious SCS Number	Impervious SCS Number	Weighted SCS Number	Impervious Cover %
Ex	80	98	85.8	32.0%
E1	80	98	80.0	0.0%
E2	80	98	80.0	0.0%
E3	80	98	98.0	100.0%
E4	80	98	98.0	100.0%
E5	80	98	98.0	100.0%
P1	80	98	80.7	4.0%
P2	80	98	80.7	3.8%
P3	80	98	98.0	100.0%
P4	80	98	98.0	100.0%
P5	80	98	98.0	100.0%

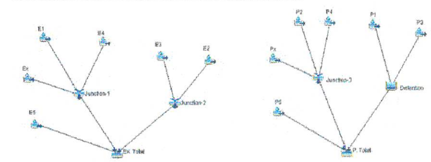
Hydrologic Calculations (SCS Method)
208 Ashworth Drive, Rollingwood, TX

Hydrologic Element	Drainage Area (mi^2)	2 yr Peak discharge (cfs)	10 yr Peak discharge (cfs)	25 yr Peak discharge (cfs)	100 yr Peak discharge (cfs)
Existing					
Ex	0.00018159	0.3	0.6	0.8	1.2
E1	0.00021686	0.3	0.6	0.9	1.4
E2	0.00030296	0.4	0.9	1.3	1.9
E3	2.4553E-05	0.1	0.1	0.1	0.2
E4	3.15E-05	0.1	0.1	0.2	0.2
E5	6.0579E-05	0.1	0.2	0.3	0.4
Ex. Total	0.00081804	1.3	2.6	3.5	5.3
Proposed					
Px	0.00018159	0.3	0.6	0.8	1.2
P1	0.00025138	0.4	0.8	1.1	1.6
P2	0.00016049	0.2	0.5	0.7	1.0
P3	0.00011852	0.3	0.4	0.6	0.8
P4	2.8512E-05	0.1	0.1	0.1	0.2
P5	7.7535E-05	0.2	0.3	0.4	0.5
Detention	0.000382	0.3	0.4	0.4	0.4
P. Total	0.00081804	1.1	1.8	2.3	3.3

1

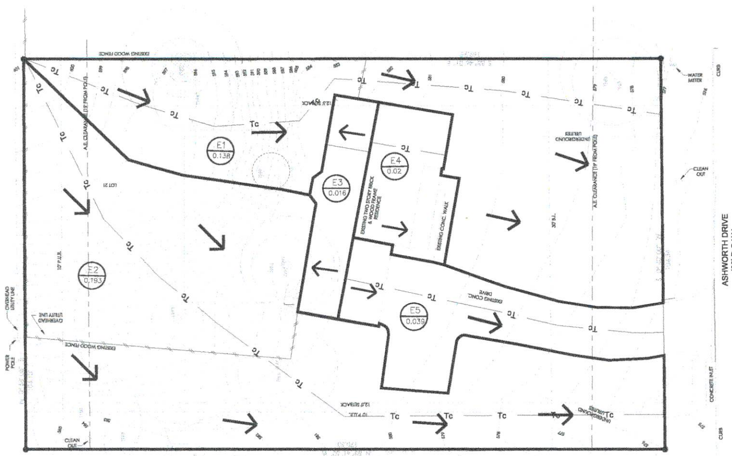
1 EXISTING DRAINAGE AREA MAP
SCALE: 1" = 40'

HEC-HMS MODEL

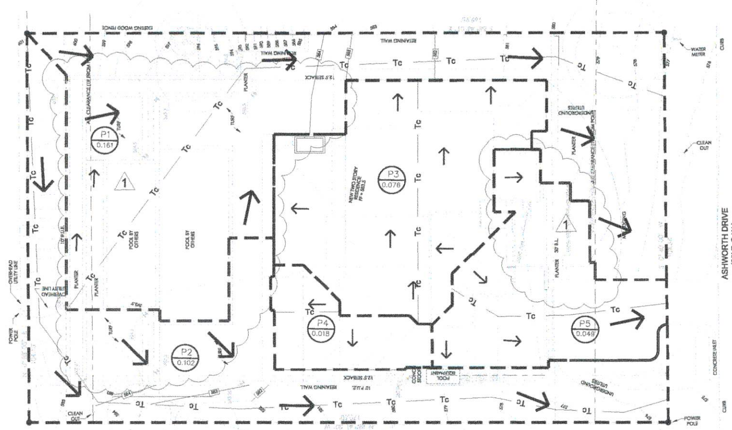


DRAINAGE LEGEND:

- E5 / 0.234 — EXISTING DRAINAGE AREA
- P1 / 0.112 — PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- Tc — TIME OF CONCENTRATION
- EXISTING CONTOUR
- PROPOSED CONTOUR
- DIRECTION OF FLOW
- 615.0 — SPOT ELEVATION



2 EXISTING ON-SITE DRAINAGE MAP
SCALE: 1" = 15'



3 PROPOSED DRAINAGE AREA MAP
SCALE: 1" = 15'

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AUSTIN, TEXAS 78753
OFFICE: 512-490-0932 www.watercache.com

NO.	BY	DATE	REVISION
1	CMG	9/6/22	CHANGE TO LANDSCAPE DESIGN

PROJECT NO. RICHARDSON RESIDENCE
FILE NO: 208 ASHWORTH DRIVE PLAN.DWG
DATE: APRIL 2022
SCALE: AS SHOWN

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

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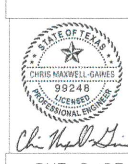
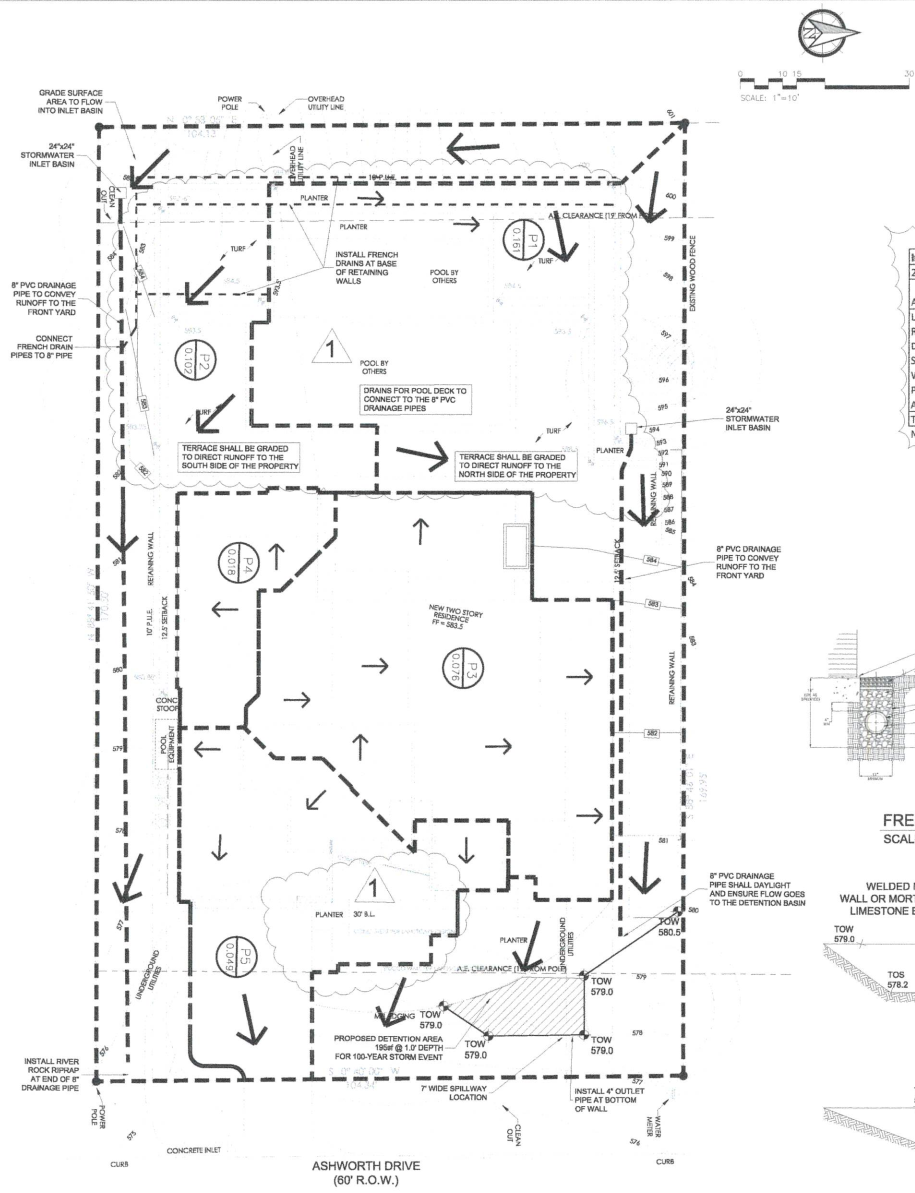
DRAINAGE AREA MAPS AND CALCULATIONS

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX



SHT 2 OF 5



DRAINAGE LEGEND:

- E5 0.234 — EXISTING DRAINAGE AREA
- P1 0.112 — PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION
- EXISTING CONTOUR
- 615 — PROPOSED CONTOUR
- DIRECTION OF FLOW
- 615.0 — SPOT ELEVATION

Impervious Cover Report						
208 Ashworth Drive, Rollingwood, TX						
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Net Increase in Impervious Cover: **3522.12** sf

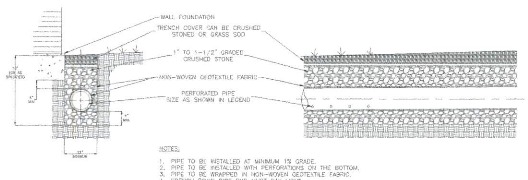
1

Detention basin depths

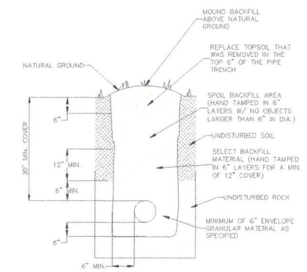
Storm Event	Pond depth
2-year	0.8
10-year	0.9
25-year	0.9
100-year	1.0

GENERAL SITE NOTES:

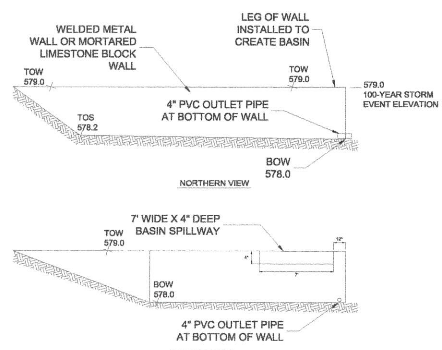
1. THE CONTRACTOR TO PROVIDE FINISHED GRADING AS SHOWN ON PLANS TO PROVIDE PROPER DRAINAGE OF SURFACE WATER AWAY FROM THE BUILDING(S).
2. FINAL OF LOCATION OF PROPOSED RESIDENCE SHALL BE DETERMINED BY THE CONTRACTOR.
3. UTILITY LINE LOCATIONS ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY FOR EXACT LOCATIONS.
4. ANY EXISTING PAVEMENT, CURBS, AND/OR SIDEWALKS DAMAGED OR REMOVED WILL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S SOLE EXPENSE.
5. EROSION CONTROL BARRIERS SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
6. STABILIZED TEMPORARY CONSTRUCTION ENTRANCE SHALL BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION UNLESS AN EXISTING IMPERVIOUS SURFACE OR DRIVEWAY IS BEING USED AS THE CONSTRUCTION SITE ENTRANCE.
7. ALL CONSTRUCTION MATERIALS AND WASTE SHALL BE STORED ONSITE DURING CONSTRUCTION.
8. LANDSCAPE PLANS TO BE PROVIDED BY OTHERS.
9. NO EXISTING TREES OR TREE LIMBS SHALL BE REMOVED OR DISTURBED WITHOUT OWNER APPROVAL.
10. CONTRACTOR SHALL CLEAN UP AREAS AFFECTED BY DAILY WORK AND REMOVE DEBRIS AND MATERIALS FROM THE SITE UPON COMPLETION OF THE WORK.
11. DISPOSAL OF SPOIL IS THE RESPONSIBILITY OF THE CONTRACTOR.
12. CONTRACTOR SHALL THOROUGHLY REVIEW PLANS AND ALL RELATED CONSTRUCTION DOCUMENTS TO VERIFY AND COORDINATE DIMENSIONS, LOCATIONS, ELEVATIONS, FLOW LINES, PLACEMENT AND APPLICABILITY OF CONSTRUCTION COMPONENTS AS WELL AS THEIR RELATIONSHIP TO EACH OTHER AND THE EXISTING CONDITIONS.
13. ANY DISCREPANCIES, CONFLICTS, AND OMISSIONS THAT ARE CRITICAL TO THE BID SHALL BE ADDRESSED BY THE CONTRACTOR PRIOR TO HIS/HER BID, OR INCLUDED IN THE BID AS A PROPOSAL SOLUTION AND CHANGES TO DELIVER A COMPLETE PROJECT. ANY CHANGES AND ADDITIONAL WORKS REQUIRED TO CLARIFY DISCREPANCIES, CONFLICTS, AND OMISSIONS THAT ARE NOT IDENTIFIED WITH THE BID ARE CONSIDERED NON-CRITICAL TO THE BID, AND SHALL BE COMPLETED AT NO ADDITIONAL COST TO THE OWNER.
14. CONTRACTOR SHALL BE COMPETENT AND EXPERIENCED IN THE TYPE OF CONSTRUCTION USED AND HAVE FULL KNOWLEDGE OF CONSTRUCTION METHODS AND PROCEDURES. CONTRACTOR SHALL COORDINATE ALL TRADES TO PROVIDE A COMPLETE PROJECT.
15. THESE DRAWINGS, IN GENERAL, ARE DIAGRAMMATIC, AND NOT INTENDED TO BE USED AS A MANUAL. FABRICATION, CONSTRUCTION METHODS, AND PLACEMENT SHALL COMPLY WITH STANDARD CONSTRUCTION PRACTICE AND APPLICABLE LOCAL CODE(S). IN THE ABSENCE OF THE LOCAL CODE, THE INTERNAL BUILDING CODE (LATEST EDITION) SHALL APPLY.
16. THE EXACT LOCATIONS OF STRUCTURES AND IMPROVEMENTS SHOWN ON ENGINEER'S PLANS ARE BASED ON THE ARCHITECTURAL SITE PLAN AND/OR OWNER'S PLAN. THE ARCHITECT AND THE CONTRACTOR, ARE RESPONSIBLE FOR VERIFYING ALL SITE RESTRICTIONS, SUCH AS BUILDING SETBACKS, RESTRICTIVE COVENANTS, PROPERTY LINES, AND HOMEOWNERS ASSOCIATIONS LIMITATIONS.
17. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH OCCUR DUE TO THEIR FAILURE TO LOCATE AND PRESERVE ANY AND ALL UTILITIES.



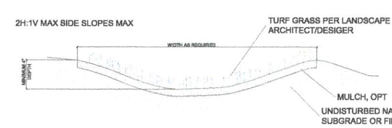
FRENCH DRAIN DETAIL
SCALE: NTS



PIPE EMBEDMENT DETAIL
SCALE: NTS



DETENTION BASIN ELEVATIONS
SCALE: NTS



VEGETATED SWALE DETAIL
SCALE: NTS

FOR RAINWATER HARVESTING SYSTEM DESIGN AND DETAILS, SEE SHEET 5.

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NO.	BY	DATE	REVISION
1	CMG	6/6/22	CHANGES TO LANDSCAPE DESIGN

PROJECT NO. RICHARDSON RESIDENCE
FILE NO: 208 ASHWORTH DRAINAGE PLANNING
DATE: APRIL 2022
SCALE: 1"=10'

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

Innovative Water Solutions

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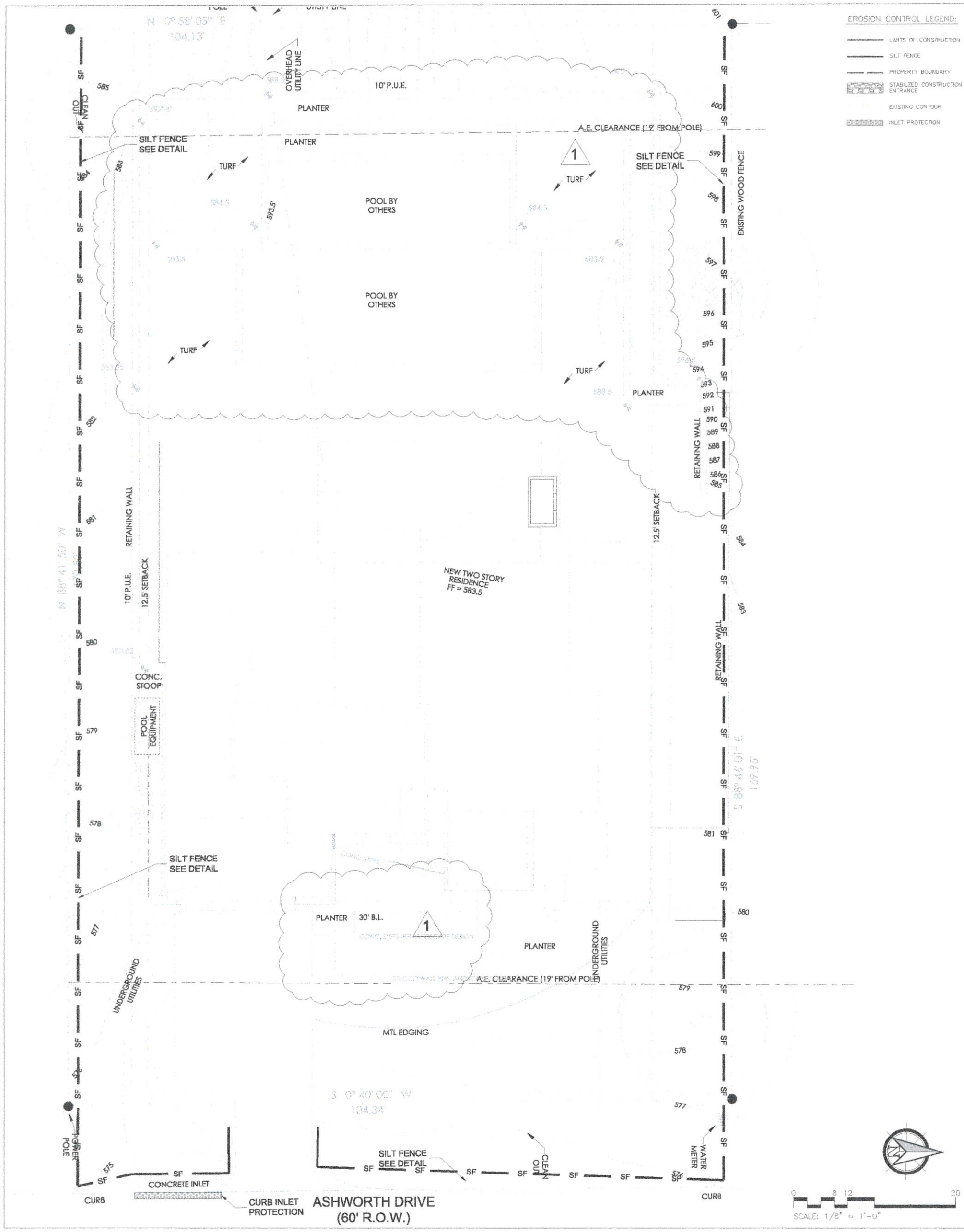
PROPOSED DRAINAGE AND GRADING PLAN

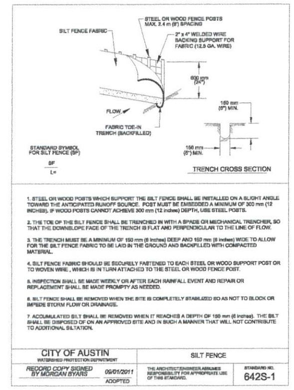
RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX

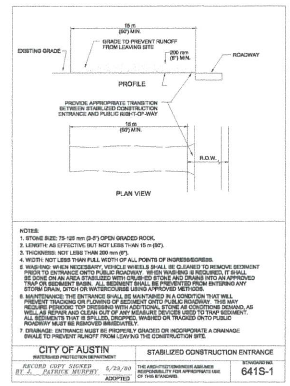
SHT 3 OF 5

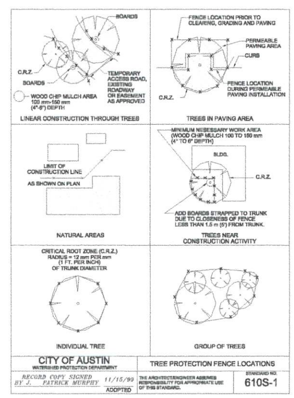


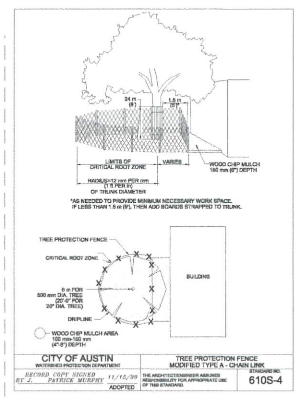
EROSION CONTROL LEGEND:

- LIMITS OF CONSTRUCTION
- SILT FENCE
- PROPERTY BOUNDARY
- STABILIZED CONSTRUCTION ENTRANCE
- EXISTING CONTOUR
- INLET PROTECTION









EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL INSTALL EROSION/SEDIMENTATION CONTROLS AND TREE/NATURAL AREA PROTECTIVE FENCING PRIOR TO ANY SITE PREPARATION WORK (CLEARING, GRUBBING OR EXCAVATION).
2. THE PLACEMENT OF EROSION/SEDIMENTATION CONTROLS SHALL BE IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND INSPECTING, ON A REGULAR BASIS, ALL EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES INCLUDING THE SILT FENCES, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC. DURING CONSTRUCTION/DEMOLITION AND INCLUDING THE REMOVAL AND PROPER DISPOSAL OF ANY ACCUMULATED SILT AND DEBRIS.
4. THE CONTRACTOR IS REQUIRED TO INSPECT THE CONTROLS AND FENCES AT WEEKLY INTERVALS AND AFTER SIGNIFICANT RAINFALL EVENTS TO INSURE THAT THEY ARE FUNCTIONING PROPERLY. THE PERSON(S) RESPONSIBLE FOR MAINTENANCE OF CONTROLS AND FENCES SHALL IMMEDIATELY MAKE ANY NECESSARY REPAIRS TO DAMAGED AREAS. SILT ACCUMULATION AT CONTROLS MUST BE REMOVED WHEN THE DEPTH REACHES SIX (6) INCHES.
5. THE CONTRACTOR SHALL NOT BEGIN ANY WORK UNTIL TREE PROTECTION AND THE EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES SUCH AS SILT FENCE, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC. HAVE BEEN INSTALLED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE STREETS FREE OF MUD, DIRT, DEBRIS AND MATERIAL AT ALL TIMES AND SHALL CLEAN/SWEEP THE STREETS ON A REGULAR BASIS AND AT THE DIRECTION OF THE CITY.
7. INCREASED STORMWATER PEAK FLOWS DURING CONSTRUCTION MUST BE MITIGATED WITH TEMPORARY BEST MANAGEMENT PRACTICES TO PREVENT HARM TO NEIGHBORING PROPERTIES.
8. ANY MAJOR VARIATION IN MATERIALS OR LOCATIONS OF CONTROLS OR FENCES FROM THOSE SHOWN ON THE APPROVED PLANS WILL REQUIRE A REVISION AND MUST BE APPROVED BY THE REVIEWING ENGINEER, ENVIRONMENTAL SPECIALIST OR CITY ABORIST AS APPROPRIATE. MAJOR REVISIONS MUST BE APPROVED BY THE CITY. MINOR CHANGES TO BE MADE AS FIELD REVISIONS TO THE EROSION AND SEDIMENTATION CONTROL PLAN MAY BE REQUIRED BY THE ENVIRONMENTAL INSPECTOR DURING THE COURSE OF CONSTRUCTION TO CORRECT CONTROL INADEQUACIES.
9. THE VEGETATIVE STABILIZATION OF AREAS DISTURBED BY CONSTRUCTION SHALL BE AS FOLLOWS:

TEMPORARY VEGETATIVE STABILIZATION:

1. FROM SEPTEMBER 15 TO MARCH 1, SEEDING SHALL BE WITH COOL SEASON COVER CROPS (WHEAT AT 0.5 POUNDS PER 1000 SF, OATS AT 0.5 POUNDS PER 1000 SF, CEREAL RYE GRAIN AT 0.5 POUNDS PER 1000 SF) WITH A TOTAL RATE OF 1.5 POUNDS PER 1000 SF. COOL SEASON COVER CROPS ARE NOT PERMANENT EROSION CONTROL.
2. FROM MARCH 2 TO SEPTEMBER 14, SEEDING SHALL BE WITH HULLED BERMUDA AT A RATE OF 1 POUNDS PER 1000 SF.

A. FERTILIZER SHALL BE WATER SOLUBLE WITH AN ANALYSIS OF 15-15-15 TO BE APPLIED ONCE AT PLANTING AND ONCE DURING THE PERIOD OF ESTABLISHMENT AT A RATE OF 1/2 POUND PER 1000 SF.
B. HYDROMULCH SHALL COMPLY WITH TABLE1, BELOW.
C. TEMPORARY EROSION CONTROL SHALL BE ACCEPTABLE WHEN THE GRASS HAS GROWN AT LEAST 1½ INCHES HIGH WITH 95% COVERAGE, PROVIDED NO BARE SPOTS LARGER THAN 16 SQUARE FEET EXIST.
D. WHEN REQUIRED, NATIVE GRASS SEEDING SHALL COMPLY WITH REQUIREMENTS OF THE CITY OF AUSTIN ENVIRONMENTAL CRITERIA MANUAL.

PERMANENT VEGETATIVE STABILIZATION:

1. FROM SEPTEMBER 15 TO MARCH 1, SEEDING IS CONSIDERED TO BE TEMPORARY STABILIZATION ONLY. IF COOL SEASON COVER CROPS EXIST WHERE PERMANENT VEGETATIVE STABILIZATION IS DESIRED, THE GRASSES SHALL BE MOWED TO A HEIGHT OF LESS THAN ONE-HALF (½) INCH AND THE AREA SHALL BE RE-SEEDED IN ACCORDANCE WITH 2. BELOW.
2. FROM MARCH 2 TO SEPTEMBER 14, SEEDING SHALL BE WITH HULLED BERMUDA AT A RATE OF 1 POUND PER 1000 SF WITH A PURITY OF 95% WITH 85% GERMINATION. BERMUDA GRASS IS A WARM SEASON GRASS AND IS CONSIDERED PERMANENT EROSION CONTROL.

A. FERTILIZER SHALL BE A WATER SOLUBLE WITH AN ANALYSIS OF 15-15-15 TO BE APPLIED ONCE AT PLANTING AND ONCE DURING THE PERIOD OF ESTABLISHMENT AT A RATE OF ½ POUND PER 1000 SF.
B. HYDROMULCH SHALL COMPLY WITH TABLE 2, BELOW.
C. THE PLANTED AREA SHALL BE IRRIGATED OR SPRINKLED IN A MANNER THAT WILL NOT ERODE THE TOPSOIL, BUT WILL SUFFICIENTLY SOAK THE SOIL TO A DEPTH OF SIX INCHES. THE IRRIGATION SHALL OCCUR AT DAILY INTERVALS (MINIMUM) DURING THE FIRST TWO MONTHS. RAINFALL OCCURRENCES OF ½ INCH OR MORE SHALL POSTPONE THE WATERING SCHEDULE FOR ONE WEEK.
D. PERMANENT EROSION CONTROL SHALL BE ACCEPTABLE WHEN THE GRASS HAS GROWN AT LEAST 1½ INCHES HIGH WITH 95% COVERAGE, PROVIDED NO BARE SPOTS LARGER THAN 16 SQUARE FEET EXIST.

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EROSION AND SEDIMENTATION CONTROL PLAN DETAILS AND NOTES

RICHARDSON RESIDENCE
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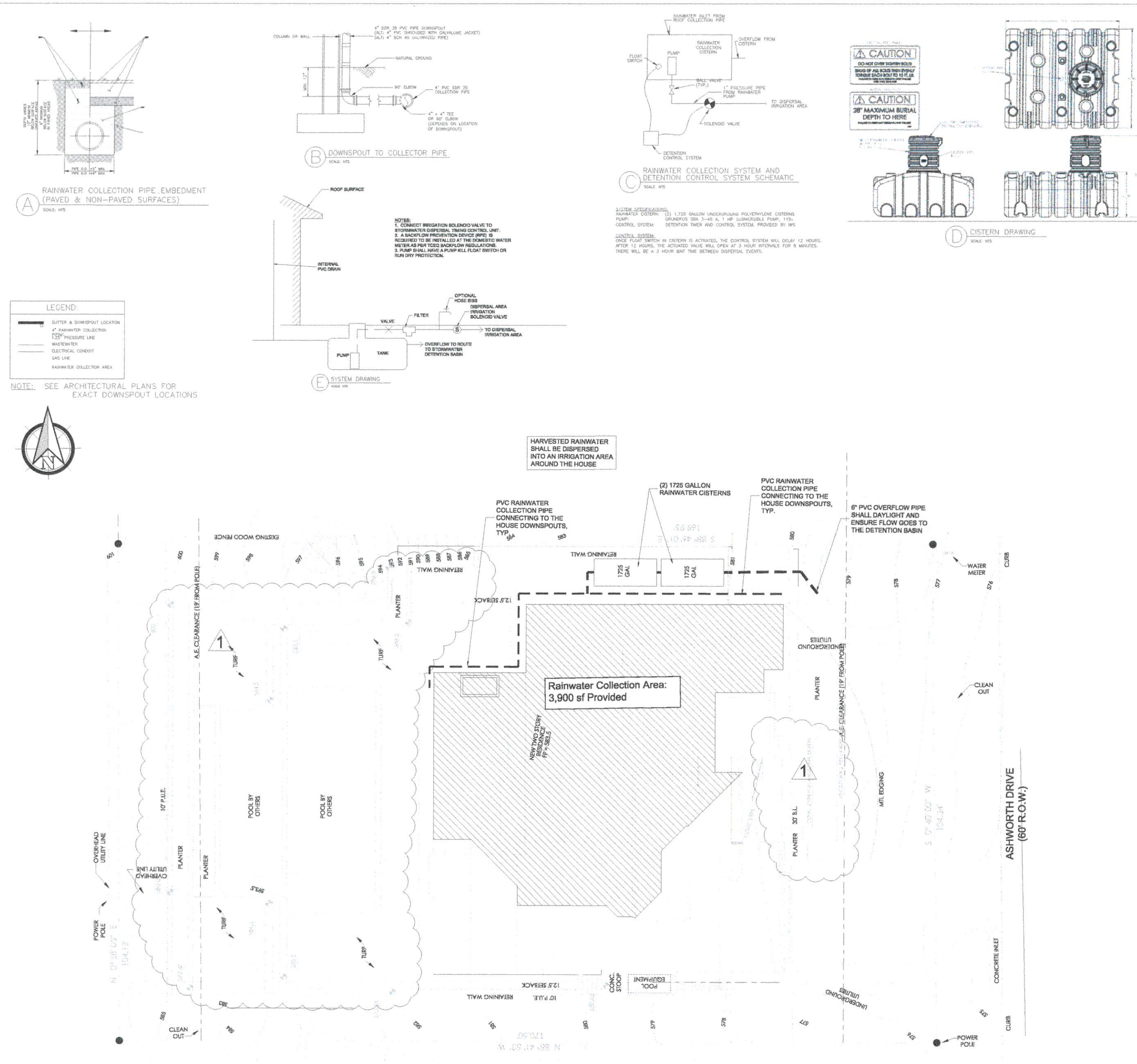


RAINWATER COLLECTION SYSTEM NOTES:

1. THIS PROPERTY DOES NOT REQUIRE A TCEQ EDWARDS AQUIFER WATER POLLUTION ABATEMENT PLAN (WPAP) SINCE THE EFFECTIVE IMPERVIOUS COVER IS BELOW 20%. THE EFFECTIVE IMPERVIOUS COVER WAS REDUCED TO 20% THROUGH THE IMPLEMENTATION OF A RAINWATER COLLECCTION SYSTEM. THE RAINWATER COLLECTION SYSTEM HAS BEEN DESIGNED TO CAPTURE RAINWATER FROM THE ROOF AREAS IN ORDER TO REDUCE THE TOTAL IMPERVIOUS COVER TO LESS THAN 20%. TCEQ DOES NOT INCLUDE ROOF AREAS IN THE CALCULATION OF IMPERVIOUS COVER IF THE ROOF AREAS ARE BEING COLLECTED INTO A RAINWATER COLLECTION SYSTEM. THE HARVESTED RAINWATER SHALL BE DOSED OUT OF THE TANK WITHIN 7 DAYS AS PER TCEQ CHAPTER 213. THE PROPERTY OWNER WILL EXECUTE A DEED AFFIDAVIT THAT WILL DOCUMENT THE PROPERTY'S EXEMPTION FROM EDWARDS AQUIFER WPAP AND REQUIRE THE PROPERTY OWNER TO MAINTAIN THE PROPER OPERATION OF THE RAINWATER COLLECTION SYSTEM.
2. RAINWATER COLLECTION SYSTEM SHALL COLLECT RAINWATER TO BE USED SOLELY FOR IRRIGATION PURPOSES ONLY AND BE RELEASED OUTDOORS. NO CONNECTION TO ANY INDOOR PLUMBING SHALL BE MADE.
3. THE RAINWATER COLLECTION PIPING AND OVERFLOW PIPING SHALL BE BURIED A MINIMUM OF 6".
4. OVERFLOW WATER FROM THE RAINWATER COLLECTION CISTERN SHALL BE ROUTED AS SHOWN ON PLANS TO FLOW AWAY FROM ANY STRUCTURE.
5. THE REQUIRED VOLUME OF RAINWATER MUST BE EMPTIED WITHIN 7 DAYS AFTER A RAIN EVENT ENDS.
6. DISPERSAL RATE. THE INFILTRATION RATE AT WHICH THE SOIL CAN ACCEPT THE IRRIGATED STORM WATER MUST BE ESTABLISHED USING THE STEPS OUTLINED IN SECTION 1.6.7.4. OTHER METHODS OF DEMONSTRATING SITE-SPECIFIC PERMEABILITY MAY BE APPROVED BY THE DIRECTOR. THE APPLICATION RATE MAY NOT EXCEED THE INFILTRATION RATE ON ANY PORTION OF THE DISPERSAL AREA.
7. DISPERSAL AREA. CALCULATIONS MUST BE PROVIDED WHICH DEMONSTRATE THAT ADEQUATE DISPERSAL AREA WILL BE PROVIDED BASED ON THE APPLICATION RATE, SOIL PERMEABILITY, WATER QUALITY VOLUME, AND THE ACTUAL IRRIGATION TIME. THE IRRIGATION AREA AND SYSTEM MUST BE INCLUDED WITHIN THE WATER QUALITY EASEMENT.
8. DISPERSAL AREA SLOPE. DISPERSAL MUST NOT OCCUR ON LAND WITH SLOPES GREATER THAN 10%.
9. ALL DISPERSAL SYSTEM DISTRIBUTION AND LATERAL PIPING MUST BE SCHEDULE 40 PURPLE PVC. ALL PIPES AND ELECTRICAL BUNDLES PASSING BENEATH DRIVEWAYS OR PAVED AREAS MUST BE SLEEVED WITH PVC CLASS 200 PIPE WITH SOLVENT WELDED JOINTS. SLEEVE DIAMETER MUST EQUAL TWICE THAT OF THE PIPE OR ELECTRICAL BUNDLE. BURIED PIPING MUST BE MARKED WITH DETECTABLE MARKING TAPE LABELED "CAUTION: BURIED NON-POTABLE WATER LINE BELOW".
10. VALVES. ALL VALVES MUST BE DESIGNED SPECIFICALLY FOR SEDIMENT BEARING WATER, AND BE OF APPROPRIATE DESIGN FOR THE INTENDED PURPOSE. ALL REMOTE CONTROL, GATE, AND QUICK COUPLING VALVES MUST BE LOCATED IN TEN-INCH OR LARGER PLASTIC VALVE BOXES WITH PURPLE CAPS. ALL PIPES AND VALVES MUST BE MARKED TO INDICATE THAT THEY CONTAIN NON-POTABLE WATER. ALL PIPING MUST BE BURIED TO PROTECT IT FROM WEATHER AND VANDALISM. THE DEPTH AND METHOD OF BURIAL MUST BE ADEQUATE TO PROTECT THE PIPE FROM VEHICULAR TRAFFIC SUCH AS MAINTENANCE EQUIPMENT. VELOCITIES IN ALL PIPELINES SHOULD BE SUFFICIENT TO PREVENT SETTLING OF SOLIDS. THE IRRIGATION DESIGN AND LAYOUT MUST BE INTEGRATED WITH THE TREE PROTECTION PLAN AND PRESENTED AS PART OF THE SITE PLAN OR SUBDIVISION CONSTRUCTION PLAN.
11. VEGETATION. THE IRRIGATION AREA MUST HAVE NATIVE VEGETATION OR BE RESTORED OR RE-ESTABLISHED WITH NATIVE VEGETATION, UNLESS APPROVED BY THE DIRECTOR. THESE AREAS MUST NOT RECEIVE ANY FERTILIZERS, PESTICIDES, OR HERBICIDES.
12. SOIL. A MINIMUM OF 12 INCHES OF SOIL, WITH THE IDENTIFIED PERMEABILITY RATES, MUST BE PRESENT IN THE DISPERSAL AREA. SOIL ENHANCEMENT IS ALLOWED TO ACHIEVE THIS REQUIREMENT.

TCEQ Edward's Aquifer WPAP Rainwater Harvesting System Design Calculations
208 Ashworth Drive, Rollingwood, TX

Area of lot (sf)		17,743
Impervious Cover (sf)	20%	3,549
Impervious Cover - Proposed (sf)		6709.52
Impervious Cover - Required capture (sf)		3,161
Required Rainwater Capture Depth (inches)		1.5
Water Quality Volume (gallons)		**2,955**
On-site soil		Cs
Soil Infiltration Rate (in/hr)		0.06
Drawdown Time (hours)		168
Required Irrigation Field Area (sf): WQV/(infil rate x drawdown)		470.371
Provided Irrigation Field Area (sf)		**470.4**

1

RAINWATER HARVESTING SYSTEM FOR TCEQ REQUIREMENTS

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX

PROJECT NO. 208 ASHWORTH
FILE NO: 208 ASHWORTH DRAINAGE-PLANNING
DATE: APRIL 2022
SCALE: 1"=10'

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

NO.	BY	DATE	REVISION
1	CMG	9/8/22	CHANGES TO LANDSCAPE DESIGN

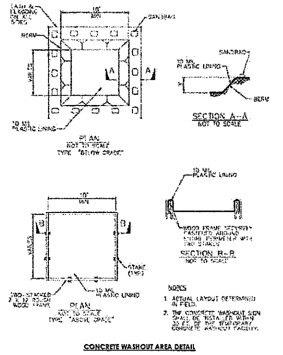
Innovative Water Solutions
RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING
P.O. Box 9963
Austin, Texas 78766
Phone: (512) 490-0932
http://www.watercache.com

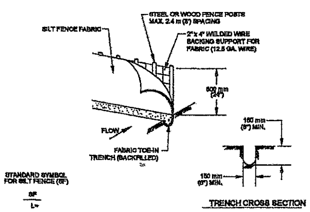
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY CHRIS MAXWELL-GAINES, P.E. 99248, ON APRIL 10, 2022. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Innovative Water Solutions
"Water Focused" Engineering & Planning
TX PE FIRM REG. #11414
501 W. POWELL LN., STE. 206
AUSTIN, TEXAS 78753
OFFICE: 512-490-0932 www.watercache.com

STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED PROFESSIONAL ENGINEER

EXHIBIT B



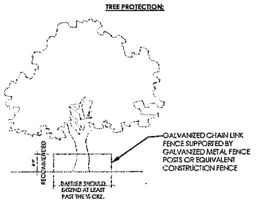


FLOOD CERTIFICATION

THIS AREA IS NOT DEPICTED AS BEING IN A SPECIAL FLOOD HAZARD AREA PER FEMA'S FLOOD INSURANCE RATE MAP 48453C0445K, DATED 01/22/2020. IT IS REPRESENTED AS IN ZONE "X". HOWEVER, AT THE PRESENT TIME NO ELEVATIONS, DRAINAGE, OR FLOOD STUDIES HAVE BEEN PERFORMED AND INFORMATION IS BASED SOLELY UPON SAID MAP. THE SURVEYOR DOES NOT ASSUME RESPONSIBILITY AS TO ANY INFORMATION PROVIDED BY SAID MAP AND DOES NOT IMPLY THAT THE PROPERTY AND/OR THE STRUCTURES THEREON WILL BE FREE OF FLOOD DAMAGE. FOR FURTHER INFORMATION CONTACT YOUR FLOOD PLAIN ADMINISTRATOR.

ROLLINGWOOD SITE PLAN NOTES

TREE PROTECTION:



IT IS THE ARCHITECT'S AND OWNER'S INTENT TO PROTECT ALL TREES IN PROXIMITY TO THE CONSTRUCTION AREA FROM DAMAGE OR INJURY DUE TO CONSTRUCTION. THE SUGGESTIONS FOR TREE PROTECTION PROVIDED IN THESE DRAWINGS ARE EXPLICITLY NOT GUARANTEED TO FULLY PROTECT THE TREES, IT IS HIGHLY RECOMMENDED THAT A TREE SPECIALIST BE HIRED AND THAT SUCH COST BE REVIEWED WITH OWNER FOR APPROVAL PRIOR TO PROCUREMENT OF TREE SPECIALIST SERVICES. IF CONTRACTOR DOES NOT REVIEW WITH OWNER HIS OR HER WILLINGNESS OR NON-WILLINGNESS TO HIRE SUCH SPECIALIST, THEN IT WILL BE CONSTRUED AS CONTRACTORS WILLINGNESS TO ACCEPT LIABILITY FOR PROTECTING THE TREES FROM ANY DAMAGE THROUGHOUT THE CONSTRUCTION PROCESS.

ROLLINGWOOD SITE PLAN NOTES

TREE LEGEND

½ CRITICAL ROOT ZONE (NO CUT/FILL)
½ CRITICAL ROOT ZONE (NO CUT/FILL > 4")
DRIP ZONE

ROLLINGWOOD CONSTRUCTION REQUIREMENTS

- CONSTRUCTION HOURS ARE FROM 7:00 A.M. TO 7:00 P.M. MONDAY THROUGH FRIDAY. CONSTRUCTION AND DEMOLITION ARE NOT PERMITTED DURING CITY HOLIDAYS OR ON WEEKENDS.
- QUIET INTERIOR CONSTRUCTION WORK IS PERMITTED BETWEEN THE HOURS OF 10:00AM AND 4:00PM ON SATURDAYS IF THE WORK MEETS THE FOLLOWING REQUIREMENTS:
  - TAKES PLACE WHOLLY WITHIN A DRIED-IN STRUCTURE;
  - DOES NOT REQUIRE LARGE EQUIPMENT SUCH AS CEMENT TRUCKS, DOZERS, CRANES OR DUMP TRUCKS;
  - DOES NOT CREATE A NUISANCE CONDITION RELATED TO NOISE, TRAFFIC, ODOR, DUST, OR OTHER CONDITIONS, AND IS NOT IN VIOLATION OF ANY OTHER CITY ORDINANCE.
- A SIGN NOTING THE CONSTRUCTION HOURS SHALL BE POSTED ON SITE AT OR PRIOR TO THE PRECONSTRUCTION MEETING, AND SHALL REMAIN FOR THE DURATION OF THE PROJECT.
- HEAVY CONSTRUCTION VEHICLES MUST COMPLY WITH DESIGNATED CONSTRUCTION ROUTES.
- SILT FENCES MUST BE IN PLACE BEFORE THE START OF CONSTRUCTION, AND REMAIN UNTIL LANDSCAPING IS COMPLETED.
- DIRT, FILL, GRAVEL, OR OTHER PERVIOUS MATERIALS MUST BE STORED WITHIN A SILT FENCE, OR SECURELY COVERED WITH A WATER-RESISTANT TARP.
- CONSTRUCTION SITES MUST BE KEPT CLEAN AT ALL TIMES, FREE OF TRASH AND DEBRIS. CONSTRUCTION SITES MUST HAVE A SOLID-SIDED TRASH CONTAINER, CANNOT BE OVER FILLED, AND MUST BE REGULARLY EMPTIED.
- THE LOCATION OF PORTABLE TOILETS, CONSTRUCTION CONTAINERS, AND MATERIALS STAGING NEEDS TO BE NOTED ON A SITE PLAN AND SUBMITTED AT OR BEFORE THE PRE-CONSTRUCTION MEETING.
- A SET OF STAMPED, OR OTHERWISE APPROVED PLANS BY THE OFFICE OF DEVELOPMENT SERVICES MUST BE KEPT ON SITE AT ALL TIMES. NO CHANGES TO THE PLANS SHALL BE MADE WITHOUT APPROVAL FROM THE OFFICE OF DEVELOPMENT SERVICES.
- A COPY OF THE BUILDING PERMIT ISSUED BY THE OFFICE OF DEVELOPMENT SERVICES SHALL BE KEPT ON SITE AT ALL TIMES, AND SHALL LIST ALL REQUIRED INSPECTIONS AS DETAILED IN THE PLAN REVIEW.

TO READ THE ENTIRE CODE AS IT RELATES TO THE MANNER OF CONDUCTING CONSTRUCTION, SEE SECTIONS 101-245 TO 101-254, OR VISIT:

HTTPS://LIBRARY.MUNICODE.COM/TX/ROLLINGWOOD/CODES/CODE_OF_ORDINANCES?NODEID=PTIILADECO_CH101BUCO_ARTVIMACOCORE

CITY OF ROLLINGWOOD CONSTRUCTION NOTES:

1. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(F)**, ALL FENCES SHALL BE MAINTAINED IN GOOD CONDITION.
2. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(D)**, IF A FENCE ALONG THE SIDE OR REAR OF A LOT OR PROPERTY IS ERECTED TO THE PROPERTY LINE, ADEQUATE ACCESS TO UTILITY LINES AND METERS SHALL BE PROVIDED.
3. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(B)(7)**, IF ONLY ONE SIDE OF THE FENCE IS STAINED WOOD OR OTHER FINISHED MATERIAL, THE FINISHED SIDE SHALL FACE AWAY FROM THE INTERIOR OF THE PROPERTY; IF SUPPORT COMPONENTS ARE PROVIDED ON ONLY ONE SIDE OF THE FENCE, SUCH SUPPORT COMPONENTS SHALL BE ON THE SIDE FACING THE INTERIOR OF THE PROPERTY.
4. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(B)(9)**, NO CHAIN LINK, BARBED WIRE, OR ELECTRIFIED FENCES SHALL BE INSTALLED OR MAINTAINED.
5. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-34(B)(10)**, NO FENCE, INCLUDING DECORATIVE OR ORNAMENTAL FENCE TOPS, SHALL BE DESIGNED TO INCLUDE OR BE CONSTRUCTED OF BARBED WIRE, BROKEN GLASS OR ANY EXPOSED SHARP OR POINTED MATERIALS THAT MAY PENETRATE OR IMPALE PERSONS OR ANIMALS.
6. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-35(G)**, OUTDOOR SWIMMING POOLS ERECTED, CONSTRUCTED OR SUBSTANTIALLY ALTERED AFTER MARCH 1, 1988, SHALL BE COMPLETELY ENCLOSED BY A FENCE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS ADOPTED BY THE CITY. IF THE POOL IS ABOVE GROUND BY THE REQUIRED HEIGHT, PLEASE SHOW HOW STAIRS WILL BE ENCLOSED TO PREVENT ACCESS TO THE POOL.
7. PER ROLLINGWOOD CITY ORDINANCE SECTION **107-35(F)**, OVERHEAD LIGHTING IN SWIMMING POOL AREAS IS PROHIBITED.
8. PER CITY OF ROLLINGWOOD CITY ORDINANCE SECTION **107-71**, EXCEPT AS MAY BE REQUIRED BY APPLICABLE CODES, NO CHIMNEY, ATTIC VENT, LIGHTNING ROD OR REQUIRED EQUIPMENT MAY EXTEND MORE THAN THREE FEET ABOVE THE HIGHEST POINT OF THE COPING OF A FLAT ROOF/DECK LINE OF A MANSARD ROOF/ THE GABLE OF A PITCHED OR HIPPED ROOF.
9. NO PORTION OF ANY BUILDING OR STRUCTURE MAY EXCEED 35 FEET IN HEIGHT, PER ROLLINGWOOD CITY ORDINANCE SECTION **107-71**. PLEASE PROVIDE THE GROUND ELEVATION USED FOR THE REFERENCE DATUM.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND INSPECTING, ON A REGULAR BASIS, ALL EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES INCLUDING THE SILT FENCES, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC., DURING CONSTRUCTION/DEMOLITION AND INCLUDING THE REMOVAL AND PROPER DISPOSAL OF ANY ACCUMULATED SILT AND DEBRIS.
11. (B) THE CONTRACTOR SHALL NOT BEGIN ANY WORK UNTIL TREE PROTECTION AND THE EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES SUCH AS SILT FENCE, CONSTRUCTION ENTRANCES, ROCK FILTER DAMS, ETC., HAVE BEEN INSTALLED.
12. (C) THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE STREETS FREE OF MUD, DIRT, DEBRIS AND MATERIAL AT ALL TIMES AND SHALL CLEAN/SWEEP THE STREETS ON A REGULAR BASIS AND AT THE DIRECTION OF THE CITY.
13. INCREASED STORMWATER PEAK FLOWS DURING CONSTRUCTION MUST BE MITIGATED WITH TEMPORARY BEST MANAGEMENT PRACTICES TO PREVENT HARM TO NEIGHBORING PROPERTIES.

TREE LIST

DEMO	TAG NO.	SIZE	SPECIES
REMOVE	T100	14.5"	MULTI-STEM MAGNOLIA
	T987	11.5"	OAK
	T988	14"	OAK
REMOVE	T989	8"	HACK
REMOVE	T990	13.25"	OAK
REMOVE	T991	12.5"	OAK
REMOVE	T992	8.25"	OAK
REMOVE	T993	27.5"	OAK
REMOVE	T994	11.25"	OAK
	T995	16"	OAK
REMOVE	T996	13"	OAK
REMOVE	T997	15"	OAK
	T998	8.5"	HACK
	T999	8.5"	HACK

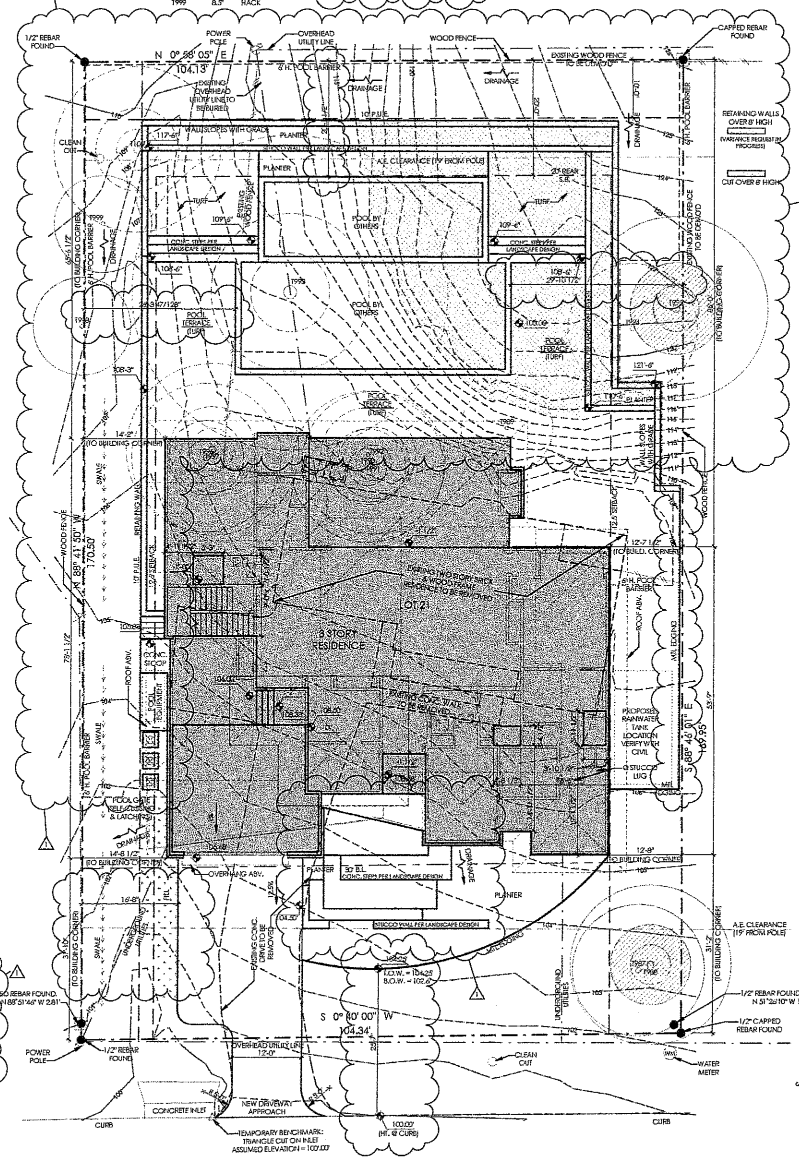
LEGAL DESCRIPTION

208 ASHWORTH DRIVE, LOT 21, ROLLINGWOOD PARK ESTATES SECTION 2, ROLLINGWOOD TX, 78746, TRAVIS COUNTY

BUILDING HEIGHT:
REFERENCE DATUM SELECTED: 112'
(102' + 10')

AUTOMATIC SPRINKLER SYSTEM

A FULL RESIDENTIAL SPRINKLER SYSTEM DESIGNED, INSTALLED AND TESTED IN ACCORDANCE WITH THE NFPA 13D OR THE 2021 IRC P2904 STANDARDS WILL BE INSTALLED IN THIS PROPERTY. THE PLANS FOR THE SPRINKLER SYSTEM MUST DESIGNED AND INSTALLED BY A TEXAS LICENSED SPRINKLER CONTRACTOR FOR NFPA 13D SYSTEMS OR A TEXAS LICENSED PLUMBER WITH THE IRC P2904 ENDORSEMENT ON THEIR LICENSE. THE SPRINKLER PLANS MUST BE SUBMITTED, REVIEWED, APPROVED, TESTED AND INSPECTED BY AFD PRIOR TO COVERING THE WALLS AND CEILINGS. A FLOW TEST OF THE MOST DEMANDING AREA WILL BE REQUIRED.



IMPERVIOUS COVER CALCULATIONS

TOTAL LOT AREA: 17,743.12 SF

AREA NAME	EXISTING	ADDED	TOTAL
RESIDENCE	1,662.21 SF	3,498.63 SF	5,160.84 SF
A/C PADS	0.00 SF	21.33 SF	21.33 SF
CONC. WALKWAY	76.27 SF	541.84 SF	618.11 SF
DRIVEWAY	1,448.92 SF	-789.49 SF	659.43 SF
POOL COPING	0.00 SF	192.08 SF	192.08 SF
POOL EQUIPMENT	0.00 SF	46.95 SF	46.95 SF
POOL STORAGE	0.00 SF	36.00 SF	36.00 SF
POOL TERRACE	0.00 SF	0.00 SF	0.00 SF
TOTAL IMPERVIOUS	3,187.40 SF	3,547.34 SF	6,734.74 SF

TOTAL PROJECT IMPERVIOUS COVERAGE @ 6,734.74 SF = 37.96%

CURRENT ADOPTED CODES

THESE PLANS AND SPECIFICATIONS HAVE BEEN DRAWN IN ACCORDANCE WITH THE FOLLOWING APPLICABLE ADOPTED CODES:

1. INTERNATIONAL BUILDING CODE - 2015 EDITION
2. INTERNATIONAL RESIDENTIAL CODE FOR ONE- AND TWO- FAMILY DWELLINGS - 2015 EDITION.
3. UNIFORM PLUMBING CODE - 2015 EDITION OR AS ADOPTED BY THE SERVICE PROVIDER.
4. INTERNATIONAL MECHANICAL CODE - 2015 EDITION.
5. NATIONAL ELECTRICAL CODE 2014 EDITION.
6. INTERNATIONAL ENERGY CONSERVATION CODE - 2015 EDITION.
7. INTERNATIONAL FIRE CODE - 2015 EDITION AS AMENDED BY TRAVIS COUNTY EMERGENCY SERVICE DISTRICT NO. 6.
8. INTERNATIONAL GAS CODE - 2015 EDITION.

SITE LEGEND

CONSTRUCTION FENCE
SILT FENCE
BENCHMARK
ELECTRIC TRANSFORMER
ELECTRIC BOX
ELECTRIC METER
DROP INLET
SEWER
CLEANOUT
GAS METER
GAS MARKER
WATER METER
TELEPHONE PEDESTAL
C.A.T.V. PEDESTAL
FIBER OPTICS
TELECOMMUNICATIONS
MANHOLE - WATER
MANHOLE - TELEPHONE
MANHOLE - ELECTRIC
MANHOLE - SEWER
UTILITY POLE
FIRE HYDRANT

POOL NOTES:

1. NEW RAILING TO BE IN ACCORDANCE WITH SECTIONS 305.2.1 THROUGH 305.7 IN 2015 INTERNATIONAL SWIMMING POOL AND SPA CODE.
2. ALL WINDOWS & DOORS WITH DIRECT ACCESS TO THE POOL / SPA TO HAVE AN ALARM THAT PRODUCES AUDIBLE WARNING WHEN OPENED IN ACCORDANCE WITH UL 2017.

GENERAL SITE NOTES

1. BUILDER TO RESCULPTURE TOPO/FINISH GRADE TO PROVIDE PROPER DRAINAGE OF SURFACE WATER AWAY FROM BUILDING AS REQ'D.
2. FINAL LOCATION OF PROPOSED RESIDENCE TO BE DETERMINED BY BUILDER.
3. EXPOSED FOUNDATION TO BE MINIMUM OF 8" AND A MAXIMUM OF 18" ABOVE FINISHED GRADE OR PER SUBDIVISION REQUIREMENTS. UNDERPIN ALL EXPOSED FOUNDATIONS.
4. THERE ARE NO STORM SEWER INLETS WITHIN THE LOT FRONTAGE OR 10'-0" BEYOND THE SIDE PROPERTY LINES.
5. UTILITY LINE LOCATIONS ARE APPROXIMATES- GENERAL CONTRACTOR TO FIELD VERIFY FOR EXACT LOCATIONS.
6. VERIFY METER AND UTILITY SERVICE LOCATIONS PRIOR TO INSTALLATION.
7. EROSION CONTROL BARRIERS TO BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
8. STABILIZED TEMPORARY CONSTRUCTION DRIVEWAY TO BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
9. CONFIRM ALL DRIVEWAY, WALKWAY AND PVC LAYOUTS/LOCATIONS PRIOR TO COMMENCING WORK.
10. PROVIDE CONTROL AND EXPANSION JOINTS AS REQUIRED ON CONCRETE DRIVES, WALKS AND PATIOS.
11. ALL EXTERIOR HVAC EQUIPMENT TO BE SCREENED PER CITY REQUIREMENTS, DEED RESTRICTIONS OF SUBDIVISION OR NEIGHBORHOOD ASSOCIATION.
12. GARBAGE RECEPTACLES TO BE STORED IN GARAGE OR SCREENED FROM VIEW AND ANIMAL ACCESS.
13. LOCATION OF MAILBOX AND EXTERIOR DRIVEWAY LIGHT(S) TO BE VERIFIED PRIOR TO INSTALLATION.
14. ALL CONSTRUCTION MATERIALS AND WASTE TO BE STORED ON SITE DURING CONSTRUCTION.
15. LANDSCAPE PLANS TO BE PROVIDED BY OTHERS AND PERMIT FOR SAME TO BE OBTAINED SEPARATELY FROM THESE PLANS.
16. NO EXISTING TREES TO BE REMOVED OR DISTURBED WITHOUT OWNER APPROVAL.
17. ALL STUMPS AND ROOTS SHALL BE REMOVED FROM THE SOIL TO A DEPTH OF 12" BELOW THE SURFACE OF THE GROUND IN THE AREA OF THE BUILDING.
18. CONTRACTOR SHALL CLEAN UP AREAS AFFECTED BY DAILY WORK AND REMOVE DEBRIS AND MATERIALS FROM THE SITE UPON COMPLETION OF THE WORK.

1 SITE PLAN
1" = 10'-0"

PERMIT SET: 2022-03-08

CORNERSTONEARCHITECTSLLC.COM

CORNERSTONE
ARCHITECTS
7000 BEE CAVES RD. SUITE 200 AUSTIN TX 78746 512.329.0007

A CUSTOM RESIDENCE FOR RICHARDSON FAMILY
208 ASHWORTH DR.
ROLLINGWOOD, TX 78746

REVISION:
1 8/31/2022 Permit/design update

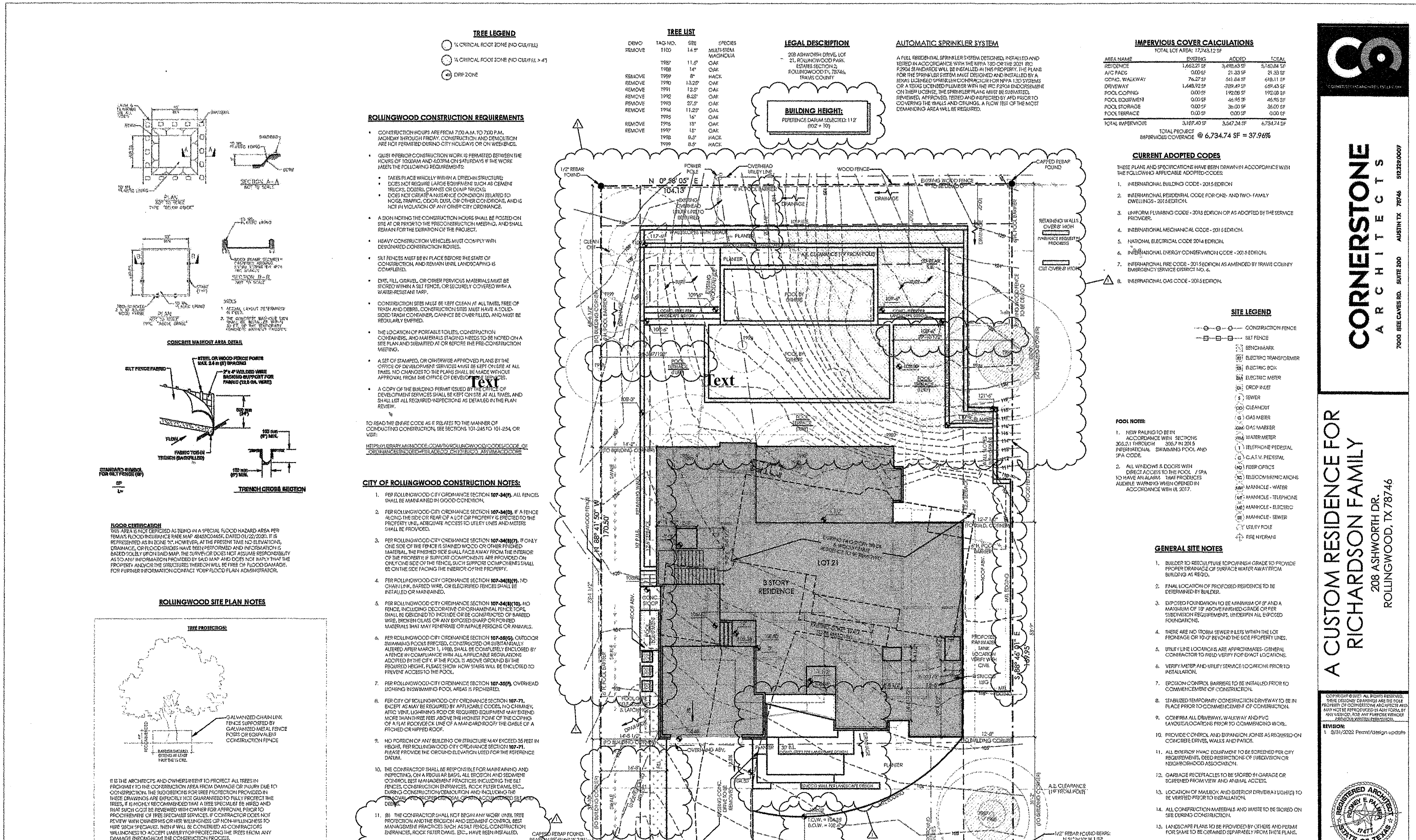
REGISTERED ARCHITECT RODNEY E. PALMER 17477 STATE OF TEXAS
CDs 09/07/2022

RICHARDSON CUSTOM

SHEET: A1
1 of 18

PROJECT NO: 21113
DRAWN BY: SN
DATE: 09/07/2022
CHECKED BY: XX
PROJECT MGR: SN

EXHIBIT C



TREE LEGEND
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REMOVE | T991 | 12.5" | OAK
REMOVE | T992 | 8.25" | OAK
REMOVE | T993 | 27.5" | OAK
REMOVE | T994 | 11.25" | OAK
T995 | 16" | OAK
REMOVE | T996 | 13" | OAK
REMOVE | T997 | 18" | OAK
T998 | 8.5" | HACK
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LEGAL DESCRIPTION
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REFERENCE DATUM SELECTED: 112' (102 + 10')
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7. INTERNATIONAL FIRE CODE - 2015 EDITION AS AMENDED BY TRAVIS COUNTY EMERGENCY SERVICE DISTRICT NO. 4.
8. INTERNATIONAL GAS CODE - 2015 EDITION.
SITE LEGEND
CONSTRUCTION FENCE
SILT FENCE
ROLLINGWOOD CONSTRUCTION REQUIREMENTS
CITY OF ROLLINGWOOD CONSTRUCTION NOTES:
ROLLINGWOOD SITE PLAN NOTES
TREE PROTECTION:
CONCRETE WASHOUT AREA DETAIL
TRENCH CROSS SECTION
FLOOD CERTIFICATION
POOL NOTES:
GENERAL SITE NOTES
N 0° 58' 05" E 104.13'
LOT 21
3 STORY RESIDENCE
CORNERSTONE ARCHITECTS
7000 BEE CAVES RD. SUITE 200 AUSTIN TX 78746 512.329.0007
A CUSTOM RESIDENCE FOR RICHARDSON FAMILY
208 ASHWORTH DR. ROLLINGWOOD, TX 78746
REVISION:
1 3/31/2022 Permit/design update

K · FRIESE
+ ASSOCIATES
PUBLIC PROJECT ENGINEERING

10001 Reunion Place, Suite 404
San Antonio, Texas 78216
P 210.491.2391 | kfriese.com
TBPE Firm No. 6535

November 14, 2022

Andy Richardson
Cornerstone Architects
700 Bee Cave Road #200
Austin, TX 78746

Sent Via: Email

RE: 208 Ashworth Drive – Request for Approval of Alternative Method

KFA has reviewed a third submittal of the plans associated with the request for permit for the construction of a swimming pool within the rear yard of the property located at 208 Ashworth Drive. The construction plans propose a maximum cut of approximately fourteen (14) feet of depth into the existing natural terrain of the property for the construction of the proposed pool.

Section 103-235(5) of the City's Code of Ordinances limits maximum allowable depths of cut to eight (8) vertical feet. Therefore, the submitted construction plans do not comply with the city's code and propose to exceed the maximum allowable cut by six (6) feet.

KFA understands that you are requesting relief from Section 103-235(5) above, per Section 103-206(b) of the City's Code of Ordinances, which states the following:

> Alternative methods *of design of drainage facilities may be considered where performance is demonstrated through sound engineering practices to meet the performance requirements of this article. If any condition requiring some additional measure of protection is identified as necessary to conform to the purpose identified in* section 103-199*, the applicant's engineer shall make provision therefor in the design of the development.*

KFA has further reviewed the request for relief from Section 103-235(5) per the Alternative Method of Design approval process and recommends denial for the following reasons:

1. Based on KFA's interpretation, the Alternative Method of Design provisions of the code are not applicable to this request. KFA interprets the alternative method of design process to apply to the design of drainage facilities only; not site design criteria in general, such as cut or fill.

2. Although the request demonstrates that the proposed cut would not negatively impact surrounding properties, the alternative method of design process simply does not apply in this case, because the applicant is not proposing one drainage facility design in-lieu of another. The applicant has merely demonstrated that exceeding a minimum dimensional standard of the code – in this case, maximum cut into existing grade – does not cause an adverse impact.

KFA Understands that per Section 103-208(a) you may appeal this rejection for alternative method of compliance, to the City of Rollingwood City Council. Should you wish to appeal, please contact City Staff at (512) 327-1838 for further assistance and coordination.

Should you have any additional questions pertaining to KFA's determination and this letter, please feel free to contact me directly.

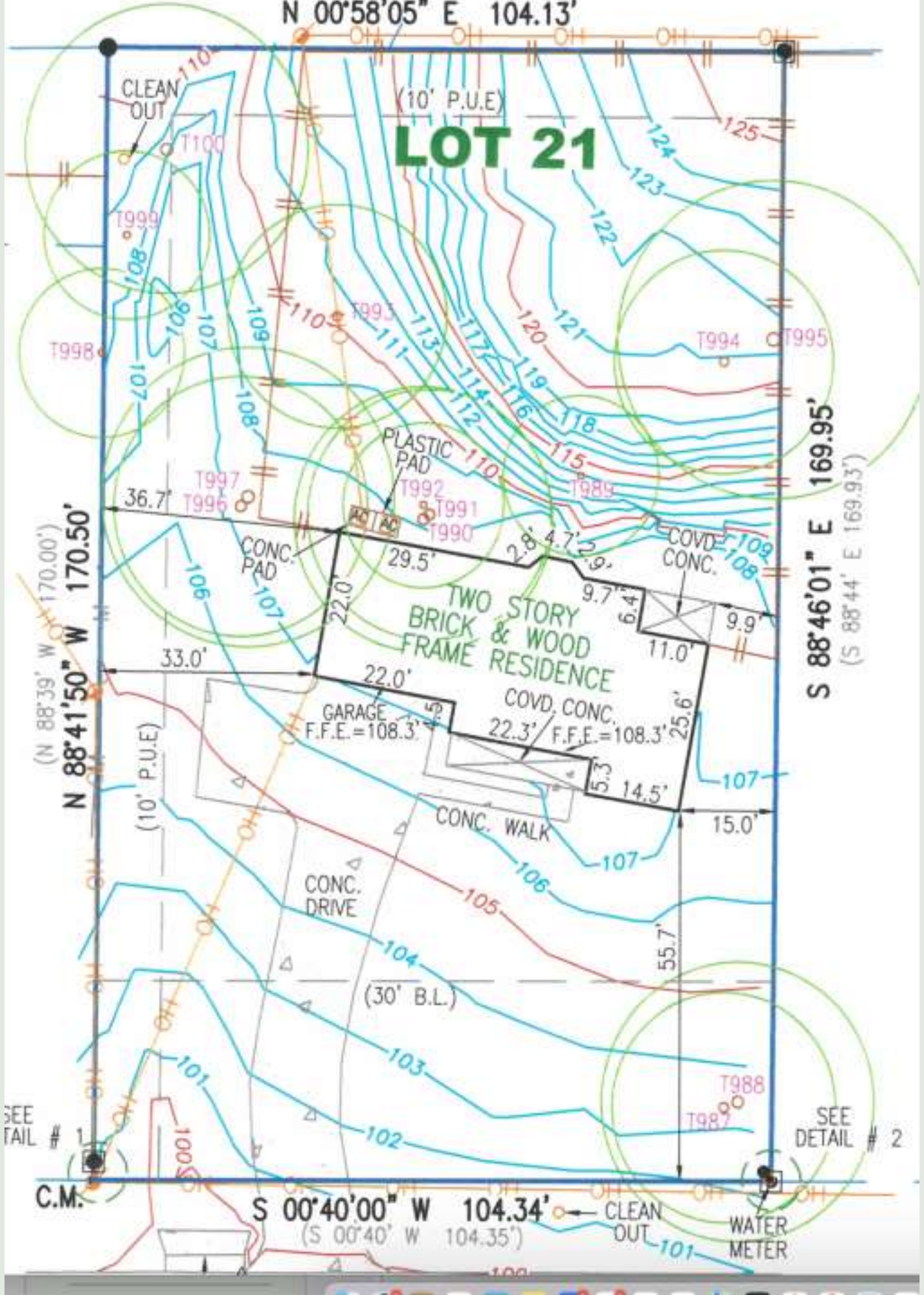
Respectfully,

Tyson Hasz, PE
Project Engineer

Appeal Request to Rollingwood City Council for Approval of Alternative Drainage Method

208 Ashworth Drive

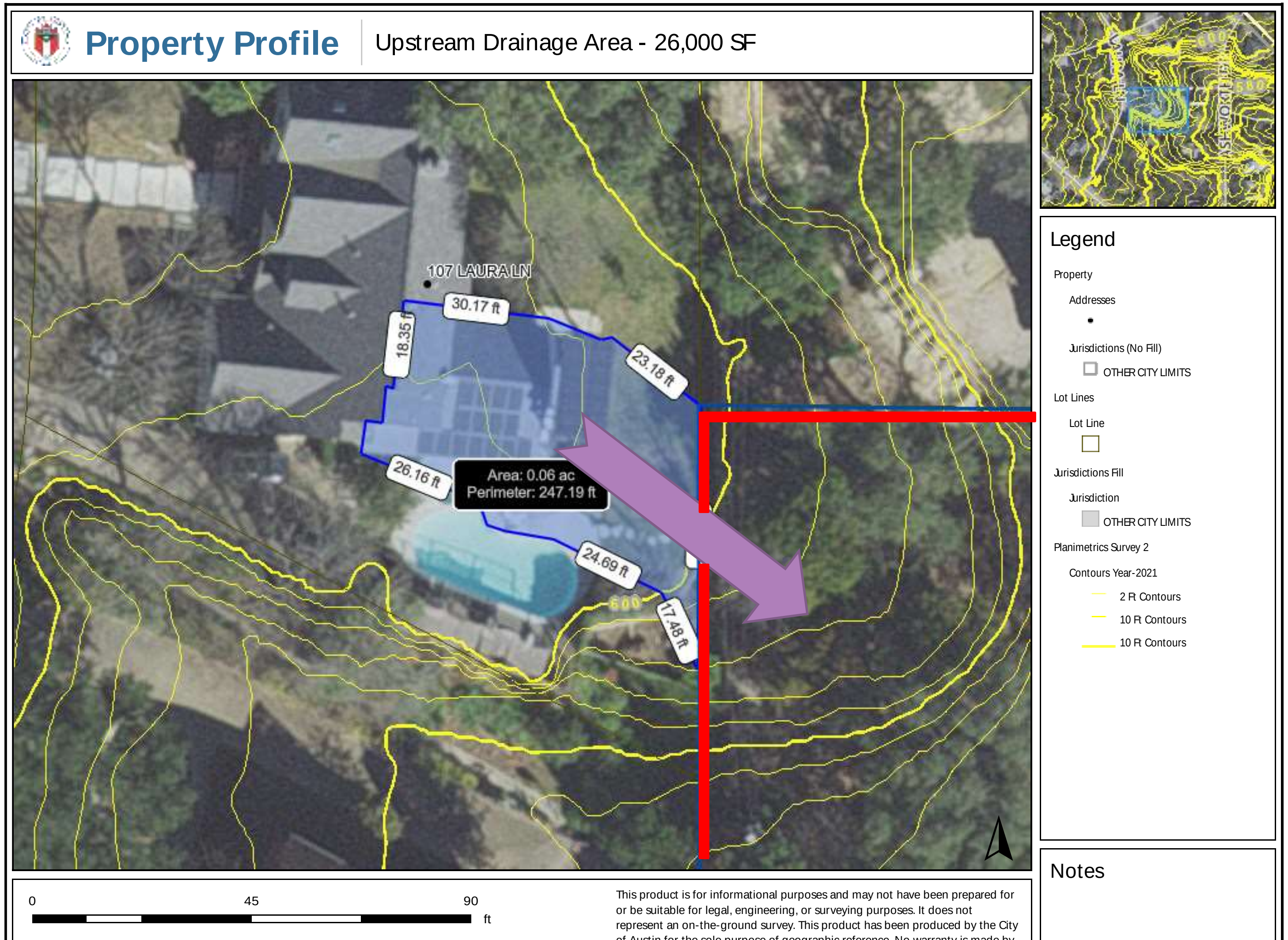
Site Topography



Street View

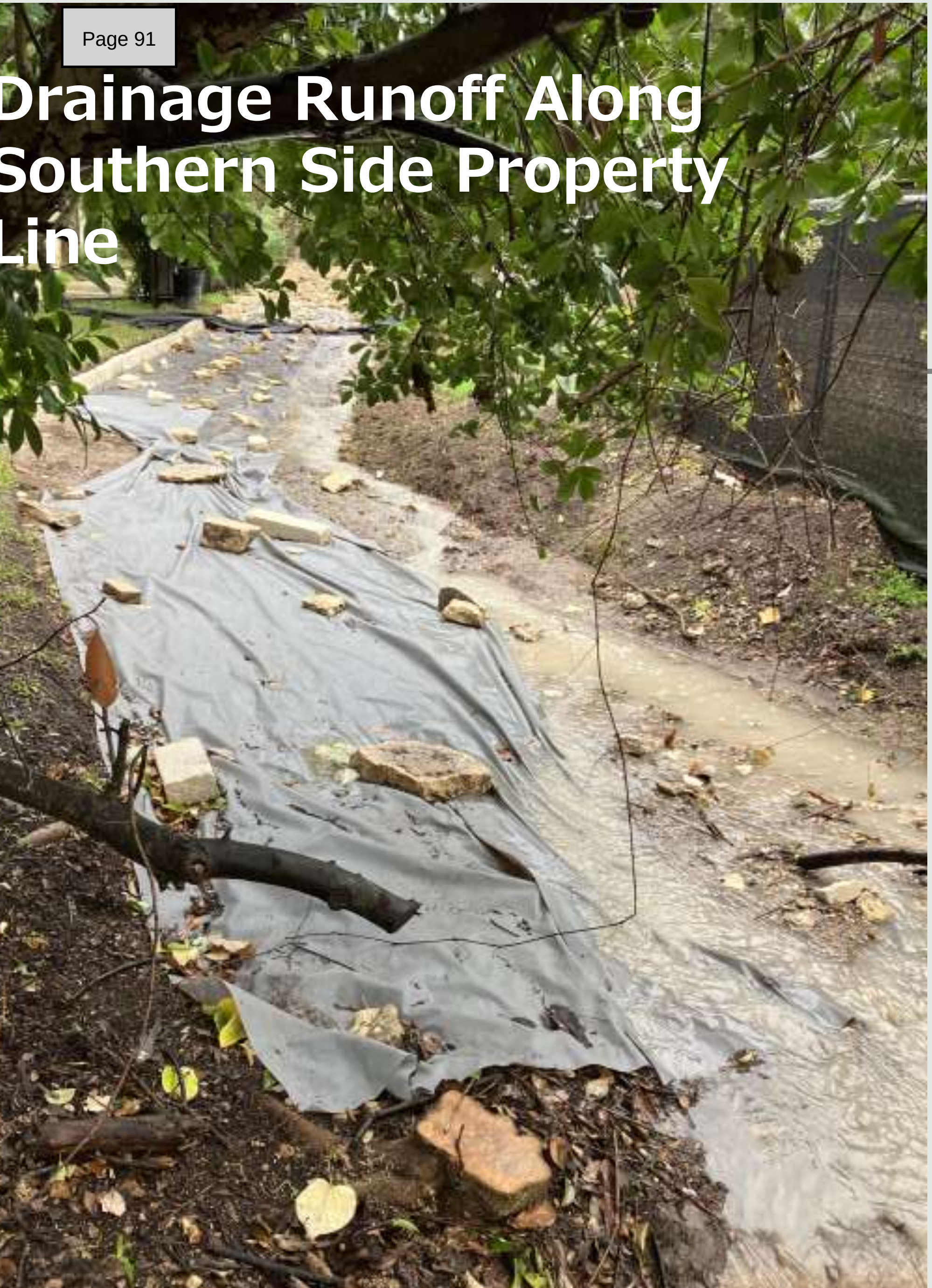
Side Yard View

Upstream Drainage Area is Approximately 30,000 SF

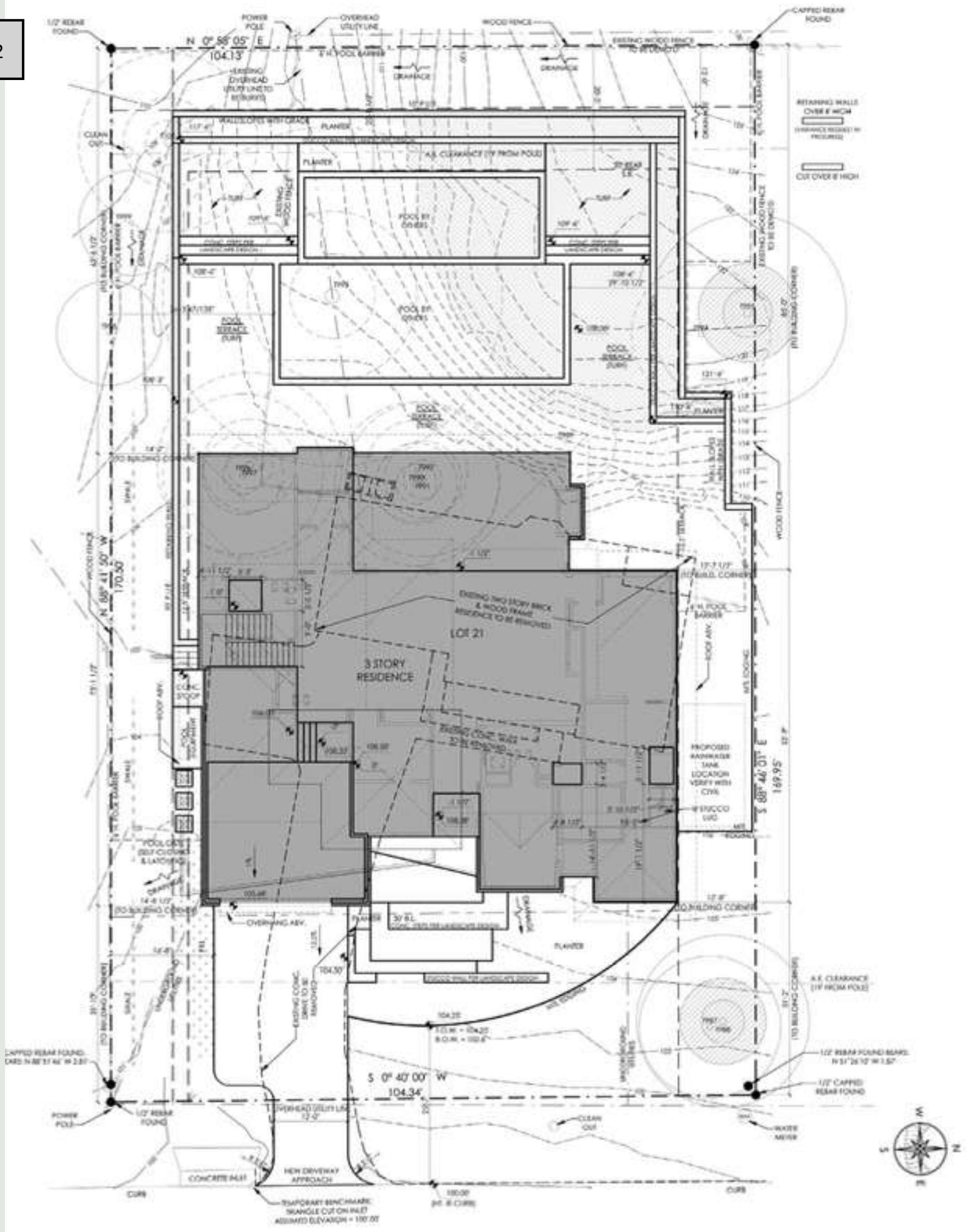


Significant Hillside Erosion is Evident

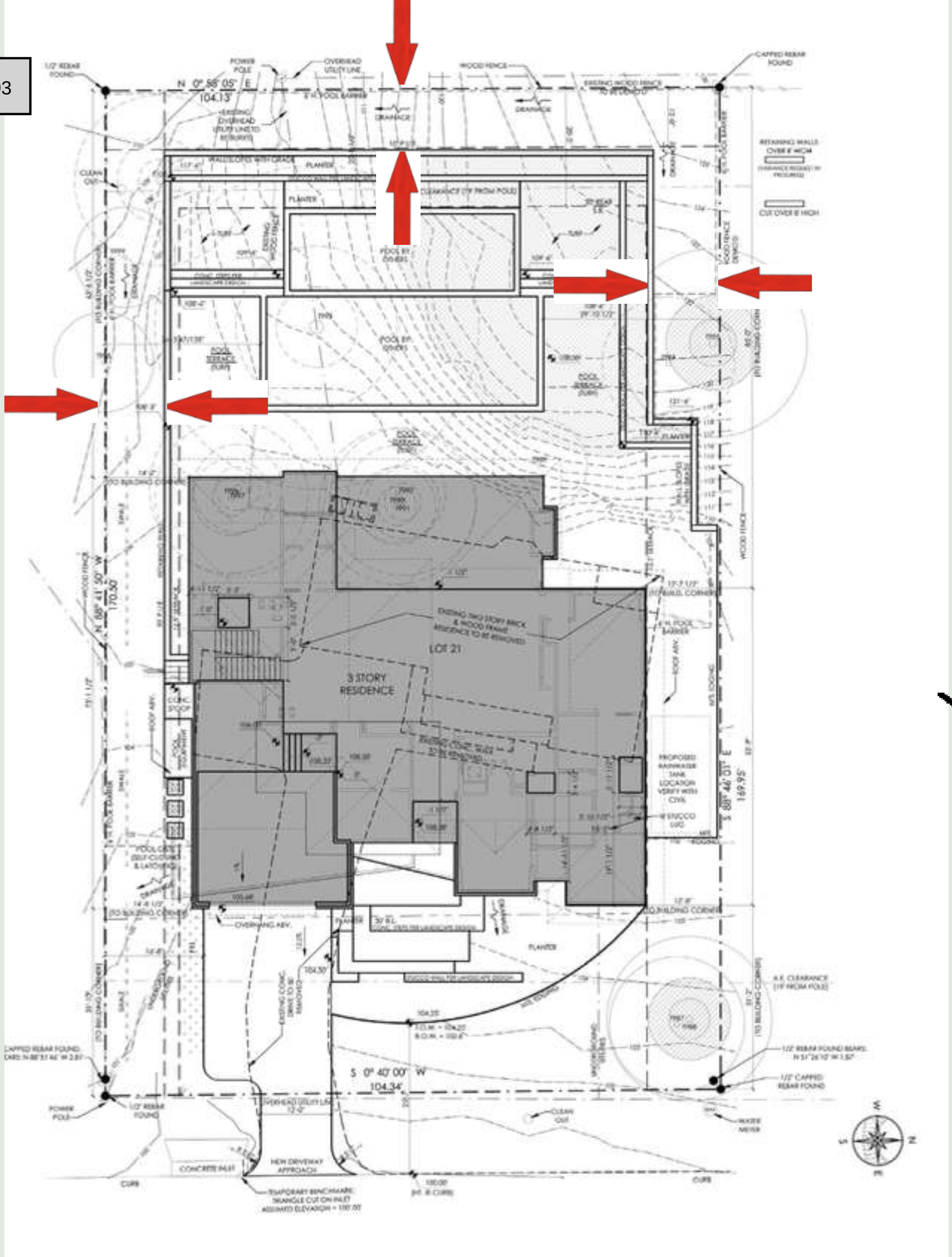
Drainage Runoff Along Southern Side Property Line



Drainage and Erosion Through Center of Site



Proposed Development Plan



Proposed Development Plan

No Regrading Within 10 Feet of Side or Rear Property Lines

Proposed Development Plan

Preserves All Existing Perimeter Trees

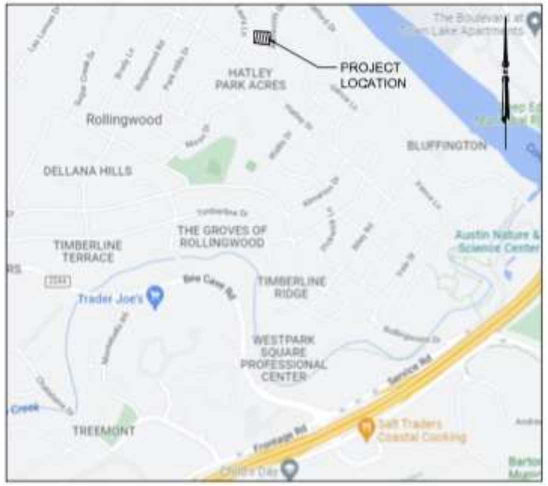
DRAINAGE PLANS FOR:
RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746
SUBMITTAL DATE: ARPIL 10, 2022

OWNER:	Andrew Richardson 208 Ashworth Drive Rollingwood, TX 78747
ARCHITECT:	Finn Nordfjord Cornerstone Architects 7000 Bee Caves Rd., Suite 200 Austin, TX 78746 (512) 329–0007
ENGINEER/: PERSON PREPARING PLAN	Chris Maxwell–Gaines, P.E. Innovative Water Solutions LLC 501 W. Powell Lane, Suite 206 Austin, TX 78753 (512) 490–0932

PROJECT ADDRESS:	208 ASHWORTH DRIVE ROLLINGWOOD, TX 78746
PARCEL ID:	110540
ACREAGE:	0.407 AC
LEGAL DESCRIPTION:	LOT 21 ROLLINGWOOD PARK ESTATES SEC 2
FLOODPLAIN:	THIS PROPERTY DOES NOT LIE WITHIN THE 100 YEAR FLOOD– PLAIN, AND HAS A ZONE "X" RATING AS SHOWN ON FEMA FIRM MAP 48453C0445K, DATED JANUARY 22, 2020.

GENERAL NOTES:

1. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAIN WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF ROLLINGWOOD MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
2. CONTRACTOR SHALL CALL THE ONE CALL SYSTEM (1–800–344–8377) FOR UTILITY LOCATIONS PRIOR TO ANY WORK IN CITY EASEMENTS OR STREET R.O.W.
3. FOR SLOPES OR TRENCHES GREATER THAN FIVE FEET IN DEPTH: ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE REGULATIONS OF THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA STANDARDS MAY BE PURCHASED FROM OSHA, 611 EAST 6TH STREET, AUSTIN, TEXAS.)
4. ALL SITE WORK MUST ALSO COMPLY WITH ENVIRONMENTAL REGULATIONS.
5. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TRAFFIC CONTROL PERMIT PRIOR TO CONSTRUCTION IN THE RIGHT–OF–WAY.



VICINITY MAP
N.T.S.

PROJECT DESCRIPTION:

DEMOLITION OF THE EXISTING TWO STORY HOUSE AND CONSTRUCTION OF A NEW TWO STORY HOUSE WITH POOL / PATIO, AND TERRACED BACKYARD.

NDEX OF SHEETS

APPROVED BY:

CITY OF ROLLINGWOOD DATE

REVISIONS/CORRECTIONS:

NO.	REVISION DESCRIPTION	REVIEWED BY	DATE

NO.	BY	DATE	REVISION
1	CMG	8/6/22	CHANGES TO LANDSCAPE DESIGN
2	CMG	10/3/22	DRAINAGE REVIEW CHANGES

PROJECT NO. 208 ASHWORTH
FILE NO: 208 ASHWORTH DRAINAGE–2203
DATE: APRIL 2022
SCALE: AS SHOWN

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: BW

Innovative Water Solutions

RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING

P.O. Box 9963
Austin, Texas 78766
Phone: (512) 490–0932
http://www.waterscape.com

COVER PAGE

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX 78746

STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED
PROFESSIONAL ENGINEER

4/10/2022

SHT 1 OF 5

1 EXISTING DRAINAGE AREA MAP
SCALE: 1" = 40'

Impervious Cover Report
208 Ashworth Drive, Rollingwood, TX

Area Description	Existing SF	Existing %	Proposed SF	Proposed %	WPAP Requirements SF	WPAP Requirements %
Lot	17740.12		17740.12		17740.12	
Residence	1,660.21	9.4%	5140.82	29.1%	1999	11.2%
Driveway	1,460.92	8.2%	658.43	3.7%	658.43	3.7%
Sidewalks/Porches	76.27	0.4%	692.89	3.9%	692.89	3.9%
Wood Deck (50%)	0	0.0%	0	0.0%	0	0.0%
Pool	0	0.0%	275.03	1.6%	275.03	1.6%
AC Pads	0	0.0%	21.35	0.1%	21.35	0.1%
Total	3197.4	18.0%	6789.52	37.8%	3643.68	20.0%

Net Increase in Impervious Cover: 3592.12 sf

Time of Concentration (T_c) Calculation

Area	L_{sheet} (feet)	[illegible] (feet)	n	s	T_c (min)	T_{lag} (min)
Ex	100	10.5	0.24	0.027	11.2	6.7
E1	100	76.0	0.24	0.128	6.2	3.7
E2	100	130.2	0.24	0.131	6.0	4.0
E3	11.87		0.011	0.001	0.1	0.1
E4	20.2		0.015	0.001	0.2	0.1
E5	86.5		0.015	0.06	0.6	0.5
P1	100	83.93	0.24	0.131	6.1	3.7
P2	100	150.5	0.24	0.03	7.4	4.4
P3	65.4		0.015	0.001	0.0	0.1
P4	17.5		0.015	0.001	0.2	0.1
P5	59.5		0.015	0.008	0.3	0.3

Note: For any T_{lag} below 5, the minimum used in HEC-HMS model is 3.0 minutes.

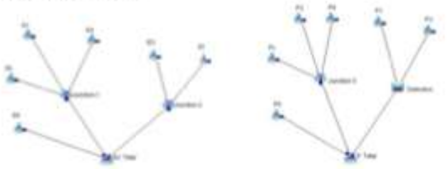
Hydrologic Calculations (SCS Method)
208 Ashworth Drive, Rollingwood, TX

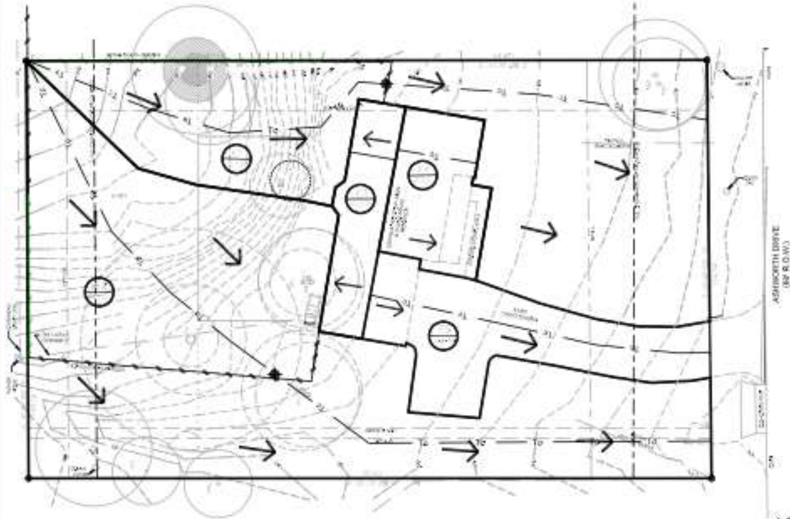
Hydrologic Element	Drainage Area (mi^2)	2-yr Peak discharge (cfs)	10-yr Peak discharge (cfs)	25-yr Peak discharge (cfs)	100-yr Peak discharge (cfs)
Existing					
Ex	[illegible]	0.1	0.6	0.8	1.2
E1	[illegible]	0.1	0.6	0.9	1.4
E2	[illegible]	0.4	0.8	1.3	1.8
E3	[illegible]	0.1	0.1	0.1	0.2
E4	[illegible]	0.1	0.1	0.1	0.1
E5	[illegible]	0.1	0.2	0.3	0.4
Ex. Total	[illegible]	1.0	2.0	3.0	3.4
Proposed					
Px	[illegible]	0.1	0.6	0.8	1.2
P1	[illegible]	0.4	0.8	1.1	1.6
P2	[illegible]	0.2	0.5	0.7	1.0
P3	[illegible]	0.1	0.4	0.6	0.8
P4	[illegible]	0.1	0.1	0.1	0.2
P5	[illegible]	0.1	0.2	0.4	0.5
Detention	[illegible]	0.2	0.4	0.6	0.8
P. Total	[illegible]	1.1	1.8	2.1	3.0

Impervious Cover

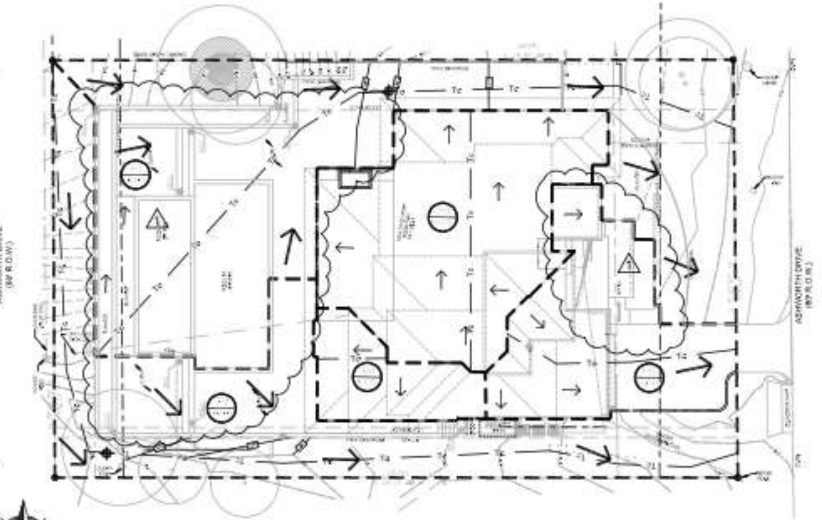
Hydrologic Element	Pervious SCS Number	Impervious SCS Number	Weighted SCS Number	Impervious Cover %
Ex	80	98	85.8	32.0%
E1	80	98	80.6	3.0%
E2	80	98	80.8	4.0%
E3	80	98	98.0	100.0%
E4	80	98	98.0	100.0%
E5	80	98	98.0	100.0%
P1	80	98	80.7	4.0%
P2	80	98	80.7	5.0%
P3	80	98	98.0	100.0%
P4	80	98	98.0	100.0%
P5	80	98	98.0	100.0%

HEC-HMS MODEL





2 EXISTING ON-SITE DRAINAGE MAP
SCALE: 1" = 15'



3 PROPOSED DRAINAGE AREA MAP
SCALE: 1" = 15'

DRAINAGE LEGEND

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY CHRIS MAXWELL-GAINES, P.E. 99248, ON APRIL 10, 2022.
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Innovative Water Solutions
"Water Focused" Engineering & Planning
TX PE FIRM REG. #11414
501 W. POWELL LN., STE. 206
AUSTIN, TEXAS 78753
OFFICE: 512-490-6972 www.watercache.com

NO.	BY	DATE	REVISION
1	CMG	8/8/22	CHANGE TO LANDSCAPE DESIGN
2	CMG	10/3/22	DRAINAGE REVIEW CHANGES

DESIGNED BY: CMG
DRAWN BY: CMG
CHECKED BY: DW
PROJECT NO. RICHARDSON RESIDENCE
FILE NO. 208 ASHWORTH DRIVE PLANNING
DATE: APRIL 2022
SCALE: AS SHOWN

Innovative Water Solutions
RAINWATER HARVESTING, GRAYWATER RECOVERY, & WATER CONSERVATION CONSULTING
P.O. Box 9963
Austin, Texas 78766
Phone: (512) 480-0832
http://www.watercache.com

DRAINAGE AREA MAPS AND CALCULATIONS

RICHARDSON RESIDENCE
208 ASHWORTH DRIVE
ROLLINGWOOD, TX

STATE OF TEXAS
CHRIS MAXWELL-GAINES
99248
LICENSED
PROFESSIONAL ENGINEER

SHT 2 OF 5

Letters of Support from all three Adjacent Neighbors

Letter of Support
Cut & Fill Variance Request
208 Ashworth Drive

Dear City of Rollingwood Board of Adjustment Members:

I wish to register my support for my neighbor's variance request to cut more than an eight foot depth in the rear yard of his property, in order to construct a new residence and swimming pool. Due to the unusual existing topography in our neighborhood, this variance request to cut up to approximately 14 feet will be necessary to create a usable back yard and to provide safe and efficient drainage flows, per the attached plan. I understand that no cuts are proposed within ten feet of the rear or side property lines, per City regulations.

Genie Nyer — Printed Name
Sep 8, 2022 — Date

Genie Nyer
Genie Nyer (Sep 8, 2022 13:42 CDT) — Signature
206 Ashworth Dr, Rollingwood, TX 78746 — Address

EXISTING PROPOSED

August 29, 2022

City of Rollingwood
403 Nixon Drive
Rollingwood, TX, 78746
Attention: Rollingwood Board of Adjustment Members

Re: Variance request by the owners of 208 Ashworth Drive to cut more than an eight (8) foot depth (up to fourteen (14) feet) in the rear yard of such property in order to construct a new residence and swimming pool (the "Variance Request")

Ladies and Gentlemen:

From a preliminary review of the Variance Request and accompanying general plans set forth on Exhibit A attached hereto, I do not oppose the aesthetics of such Variance Request; provided, however, this letter should not be deemed to (i) be an endorsement to any specific current or future plans related to such Variance Request as I have not reviewed any such plans (and I am not a structural engineer) or (ii) limit any of my future rights and/or remedies at law or otherwise that I may have as a result of any harms that the granting of such Variance Request and accompanying improvements may cause my property at 210 Ashworth Drive.

Sincerely,

Thomas D. Gianturco

Thomas Gianturco
210 Ashworth Drive
Rollingwood, TX, 78746

September 8, 2022

City of Rollingwood
403 Nixon Drive
Rollingwood, TX, 78746
Attention: Rollingwood Board of Adjustment Members

Re: Variance request by the owners of 208 Ashworth Drive to cut more than an eight (8) foot depth (up to fourteen (14) feet) in the rear yard of such property in order to construct a new residence and swimming pool (the "Variance Request")

Ladies and Gentlemen:

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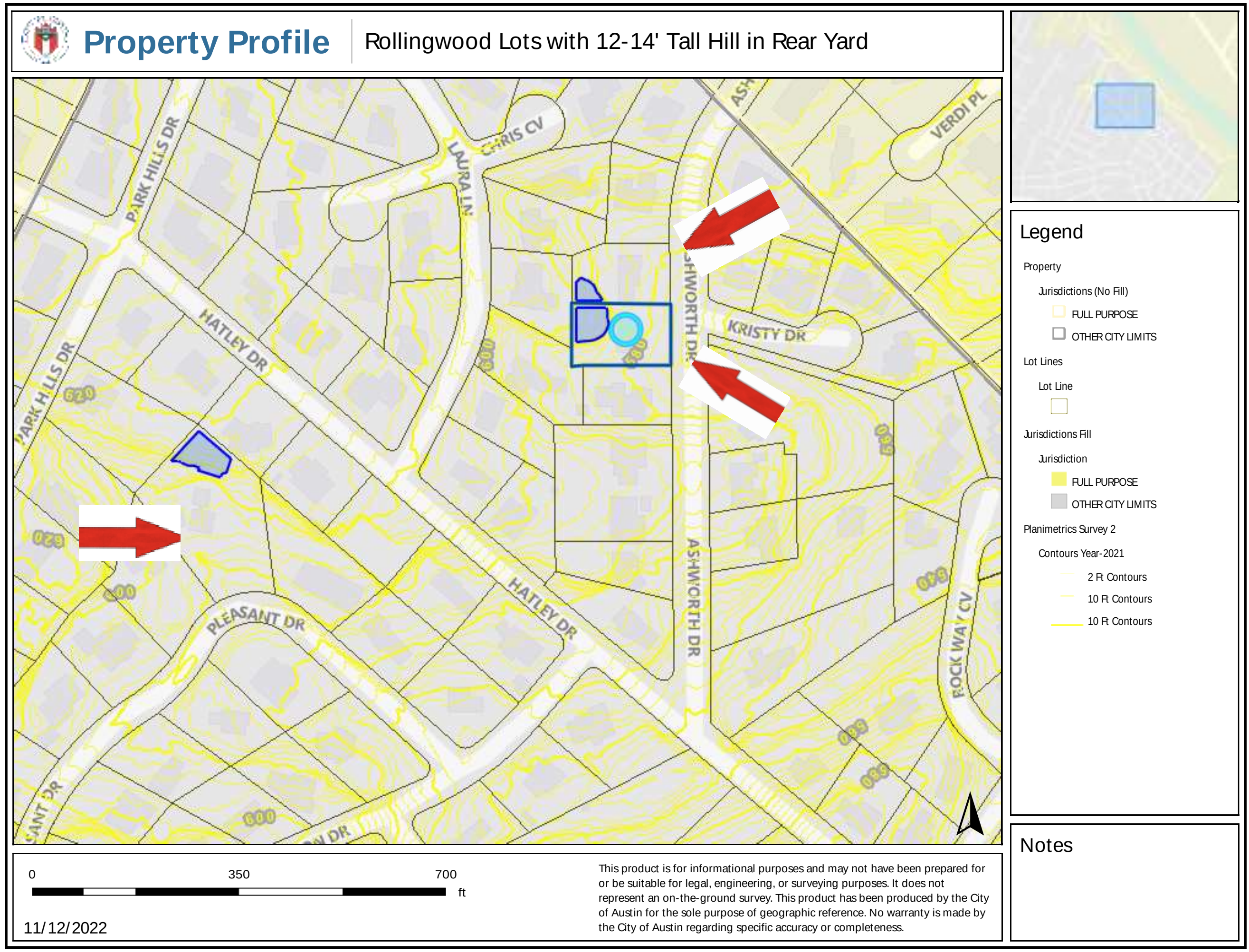
Sincerely,

Scott Burns
107 Laura Ln
Rollingwood, TX, 78746

In his original letter dated November 3, 2022, City consulting engineer Tyson Hanz stated:

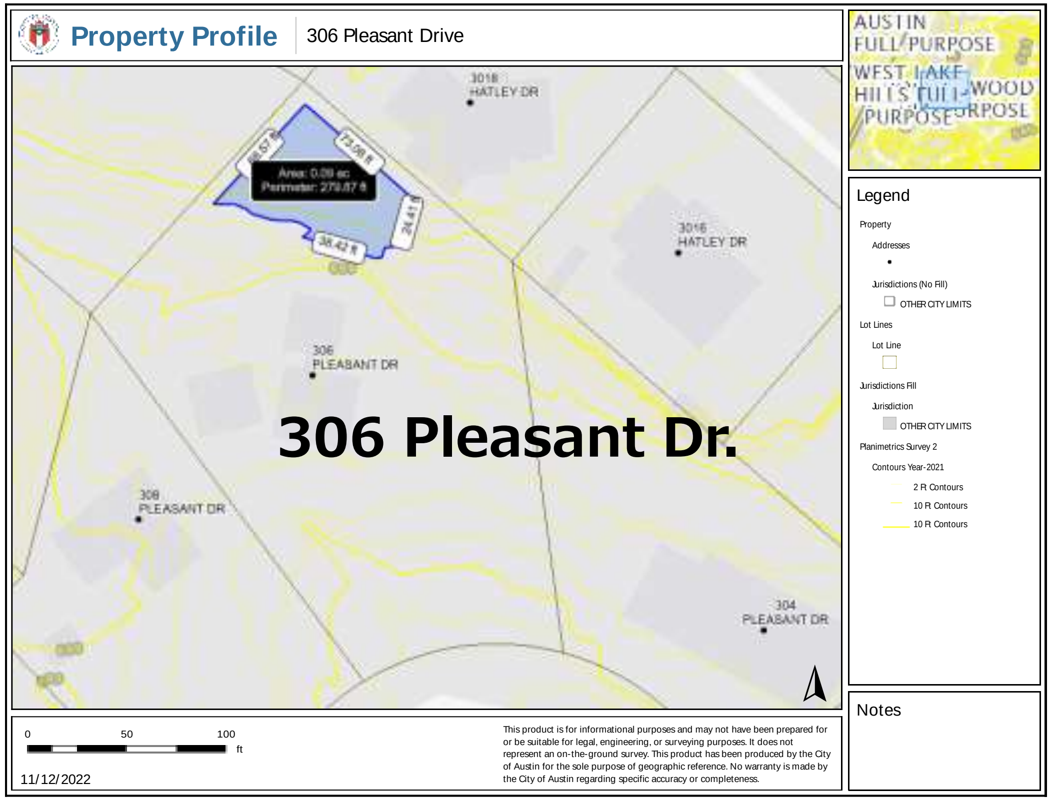
"While it has been demonstrated at a site-specific-level, that a cut of 14 feet of depth would have a negligible impact to surrounding properties; KFA believes that such cuts applied on multiple lots, or throughout the City, could result in adverse impacts at a cumulative level; such as unintended or unplanned alterations of neighborhood or area-wide flows patterns."

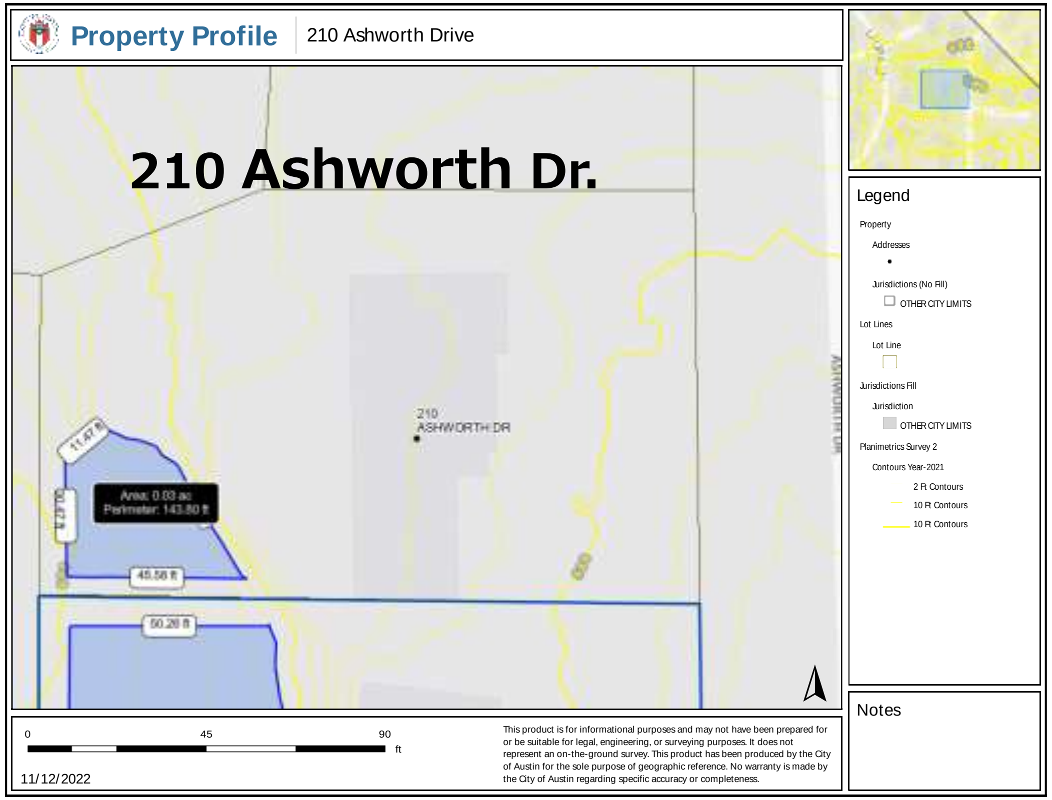
Residential Lots within the City of Rollingwood with a 12 to 17 Foot Tall Hill in the Rear Yard



There are Only **Three Residential Lots** in the <u>entire</u> City of Rollingwood with Hills in the Rear Yard which are Taller than 8 Feet

13.





PROPERTY COMPARISON

TRACT	TRACT SIZE	CUT AREA OVER 8 FT.	% OF TRACT
208 ASHWORTH	0.41 AC.	0.06 AC.	14.6%
210 ASHWORTH	0.39 AC.	0.03 AC.	7.7%
306 PLEASANT	0.96 AC.* *(2.3 X LARGER)	0.09 AC.	9.4%

The opinion letter from Rollingwood's Consulting Engineer Tyson Hanz states: *"It has **not been demonstrated** that the request for relief from Section 103-235b conforms to the purpose identified in Section 103-199."*

Rollingwood City Code Section 103-199

"The regulations provided in this article and the design criteria incorporated in this article establish stormwater drainage standards for **the protection of the public and of property** and to provide technical regulations for use in engineering **the solution of drainage problems and the proper conveyance and disposal of stormwater.**"

Our plan of development, including our proposed drainage plan, will protect the public (the next-door neighbors) and will protect property (the owners' proposed house). The City's consulting engineer agrees this plan will not result in any adverse downstream impact.

Section 103-206 (b) of the Rollingwood City Code states:

"**Alternative methods of design of drainage facilities may be considered** where performance is demonstrated through sound engineering practices to **meet the performance requirements of this article.**"

Our consulting engineer, Maxwell Gaines PE, with Innovative Water Solutions, has provided detailed drainage plans which **demonstrate compliance with all City regulations**, provided this Request for Approval of an Alternative Method is approved.

Reasons this proposed regrading request should be considered an innovative solution:

- It maintains existing drainage patterns
- It resolves a nuisance flooding issue for the adjacent neighbor
- It preserves the status quo for other surrounding neighbors
- It will prevent future flooding for the proposed residence on this lot.
- There is no adverse downstream impact

There is **no other solution** available under the current City drainage regulations that can accomplish these objectives.

Drainage Project Update
301 Nixon-303 Nixon-2910 Hatley Dr.

2022-11-16 City Council Meeting

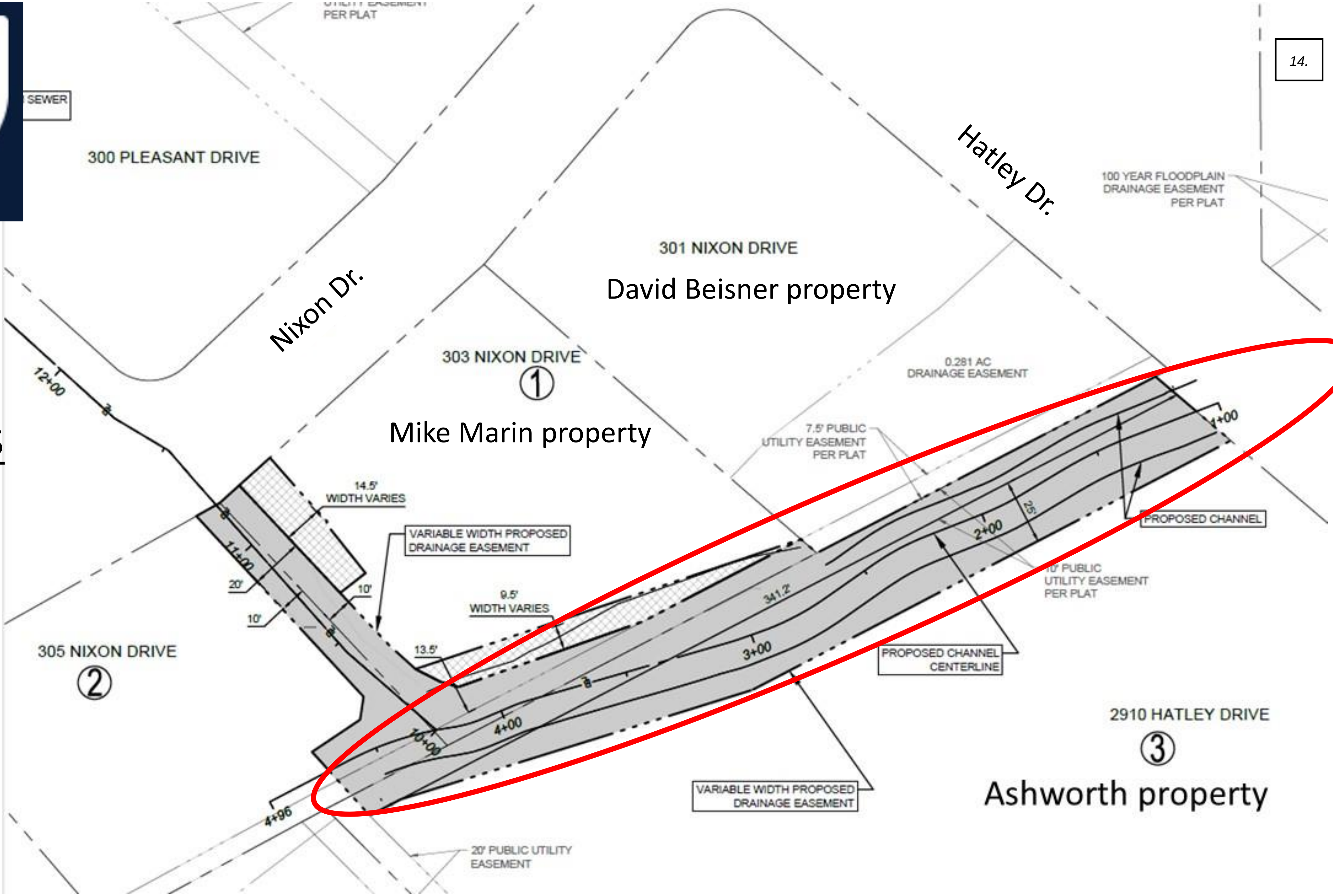
Duncan Ashworth

2910 Hatley Dr.

Rollingwood, TX

78746

Scope of this Presentation



Progress Report

- Completed
  - Mike Marin and Duncan Ashworth agreed on new ditch boundaries and marked them with stakes. Sara Hutson and Gavin Massingill attended. **October 13**
  - Met with Abe Salinas (K. Friese engineering) and walked the property to review the locations of the stakes. **October 20**
    - Attendees:
      - Gavin Massingill (City Mayor)
      - Mike Marin (303 Nixon)
      - Desiree Adair (City Secretary)
      - Kevin Schell (300 Pleasant Dr.)
      - Ashley Wayman (City Administrator)
      - Duncan Ashworth (2910 Hatley Dr.)
  - City of Rollingwood received Abe's initial desk review on **October 28**. The City reviewed his initial assessments **October 31** and Abe thinks there is an opportunity to move forward with the plan based on the input they received in the field.

Progress Report

- Yet To Go
  - The City of Rollingwood (per November 1 email) is going to approve Abe to go ahead and reschedule a field survey with him present.
    - END DATE????
  - Final plans from K. Friese.
    - END DATE????
  - K. Friese marks channel with spray paint.
    - END DATE????
  - Smooth tapering of concrete floor of Hatley Dr. culvert.
    - START DATE????
    - END DATE????
  - Excavation starts.
    - START DATE????
    - END DATE????
  - Rock walls placed.
    - START DATE????
    - END DATE????
  - Marginal plants planted (Mountain Laurel and Buckeye).
    - START DATE????
    - END DATE????
  - To provide guidance during construction, Duncan Ashworth has volunteered to be present during the re-survey, excavation, rock placements, and planting.

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Staff / Park Commission

Agenda Item:

Discussion and possible action on the process for appointing members of boards and commissions

Description:

At the October 3, 2022 Park Commission meeting, the Park Commission discussed the process by which the City Council makes appointments to boards and commissions.

Niccole Maurici moved to request the City Council revisit the procedure and the process to replace board and commission members when it works with their agenda. Melissa Morrow seconded the motion.

The motion carried with 7 in favor and 0 against.

Action Requested:

To take action on a recommendation from the Park Commission regarding the process for appointing members of boards and commissions.

Fiscal Impacts:

No significant fiscal impact anticipated at this time

Attachments:

- N/A

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: _September 19, 2022_______

Submitted By:

Niccole Maurici

Agenda Items:

Discussion and possible action to request City Council to revisit the procedure and process to replace Board and Commission members when one member resigns from their voluntary position. This agenda item is specific to the resignation and replacement of three Park Commission members from August 4, 2021-July 18, 2022. Prior to replacing the commission member, some considerations are: 1.) Inform Park Commission of any resignation(s), 2.) City of Rollingwood should inform all Rollingwood residents about the vacant spot and request applications, 3.) After posting the vacancy, City of Rollingwood should allow 30-days for candidates to submit an application, 4.) City Council should include the commission member replacement in their agenda no sooner than 60-days post resignation.

Description:

September 30, 2020 – Colin Harvey submits application for Park Commission.

August 4, 2021 – David Raymond submitted his resignation letter to City Council.

August 3, 2021 – Jennifer Meyer submits application for Park Commission.

August 24, 2021 – Melissa Morrow submits application for Park Commission.

August 25, 2021 – City Council appointed Melissa Morrow to Park Commission (Item 29).

September 7, 2021 – Melissa Morrow appointed and attends Park Commission meeting.

October 11, 2021 –Summary of Board and Commission Applications

November 13, 2021 – Phil McDuffee resignation from Park Commission.

November 17, 2021 – Summary of Board and Commission Applications

December 15, 2021 – Jennifer Meyer appointed to Park Commission (Item 22).

July 18, 2022 – Jennifer Meyer resignation from Park Commission.

August 12, 2022 – Summary of Board and Commission Applications

August 17, 2022 – Victoria Johnson appointed to Park Commission.

Action Requested:
Determine 1.) should action be taken, 2.) table this item to come back next meeting, or 3.) make a motion to table indefinitely.

Fiscal Impacts:

Attachments:

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Staff / Park Commission

Agenda Item:

Discussion and possible action on a recommendation from the Park Commission regarding the installation of artificial turf infield on Hatley Field 1 by Western Hills Little League

Description:

This item came before the Park Commission and City Council previously in June and the City Council moved to send it back to the Park Commission for further review.

At the September 19, 2022 Park Commission Meeting, the Park Commission discussed the installation of turf infield on Hatley Field 1 by Western Hills Little League.

Melissa Morrow moved to approve WHLL paying for installation of a turf infield and WHLL agreeing to pay for removing the infield at the end of the lease term should the City request it be removed and pay for quarterly maintenance to keep it within its warranty. Niccole Maurici seconded the motion. The motion passed with 3 in favor, 2 against and 1 abstention.

This item came before the City Council in October and was postponed to a time certain to the November City Council meeting to allow time to review research submitted by Park Commission member Victoria Johnson.

Action Requested:

Take action on the recommendation from the Park Commission regarding the installation of artificial turf infield on Hatley Field 1 by Western Hills Little League

Fiscal Impacts:

No significant fiscal impact anticipated at this time

Attachments:

- WHLL Request Letter
- Joseph & Hatley Field Pictures
- Infill Care Manual
- KMI Sports – Quote

Western Hills Little League

City of Rollingwood (via Hand Delivery)
403 Nixon Drive
Austin, TX 78746
Attn: Mayor

Dear Mayor Massingill,

In regards to the Rollingwood Municipal Park Athletic Fields Operation, Maintenance and Ground Lease Agreement dated effective 9/1/20 (the "Lease") by and between The City of Rollingwood, Texas (the "City"), Western Hills Little League, Inc. (the "Little League Corporation"), and the Western Hills Girls Softball Program, Inc. (the "Softball Corporation"), the Little League Corporation is requesting to make a major change or modification to the Athletic Fields under Section 8.1a of the Lease. Specifically, the Little League Corporation would like to install a turf infield at Field 1 of the Athletic Fields at the Little League Corporation's expense. The outfield would remain natural grass. Any change to the Park which costs more than $1,000 requires written approval of the City Council pursuant to such section 8.1a, which approval by the City Council shall not be unreasonably withheld, conditioned or delayed. Attached below are the plans detailing the requested changes to Field 1 of the Athletic Fields and a few pictures for your convenience of Joseph Field with the completed turf infield and the existing state of Hatley Field 1. The Little League Corporation has recently performed the same work to Joseph Field at the corner of Exposition and Enfield and it was very well received by everyone who uses it. The purpose for the change is to make the fields safer for the children, lessen the maintenance obligation on the City and the Little League Corporation, reduce the amount of rainouts, and make Field 1 more usable and attractive for all users of the Park.

Capitalized terms not defined herein shall have the meanings ascribed to them in the Lease. Please let us know your thoughts when you can. As you know, we have a limited amount of time during this summer before our Fall Season begins and a quick reply would be appreciated. The company doing the work has relayed that they will need 6 weeks to order the turf. Also, under the Notice Section of the Lease (Section 15.2), please change the address of Chad Smith for notices to 2606 Rollingwood Drive, West Lake Hills, TX 78746.

Sincerely,

Kam Praytor, President of Western Hills Little League

Cc: Charles E. Zech, 2500 W. William Cannon, Unit 609, Austin, Texas 78748 (via Certified Mail, Postage Prepaid)

Western Hills Girls Softball Program, Inc., 5410 Bee Caves Road, West Lake Hills, Texas 78746 (via Hand Delivery)

Joseph 1

Joseph 2

Hatley 1

SPORTURF™

Taking Care of Your Artificial Turf

INFILL

If you have further questions, contact

Sporturf

200 Howell Dr

Dalton, GA 30721

Telephone: 800-798-1056

www.sporturf.com

SPORTURF™

Please distribute this manual to those responsible for the day to day care of the turf field and see that they are thoroughly familiar with is contents. You should also review the warranty provided with the turf system for specific prohibitions and limitations contained therein.

How to Care for Your Artificial Turf

Introduction to Daily Use

THIS MANUAL OUTLINES SIMPLE DAY-TO-DAY CARE AND THOSE OCCASIONAL SPECIAL PROCEDURES NECESSARY FOR MINOR REPAIRS, SNOW REMOVAL AND UNUSUAL EVENTS OR USES. THE FOLLOWING ARE GENERAL KEYS TO PRESERVING YOUR TURF SYSTEM.

I. Daily Usage

1. Footwear should be restricted to ½” molded cleats
2. Stance areas for baseball/softball, Lacrosse and soccer goal mouths face abnormal wear patterns and must be monitored daily.(See section II)
3. Band Practices may cause abnormal wear and the field must be monitored for rubber loss in high traffic areas.
4. Pets or animals should not be allowed on artificial turf areas.
5. Non authorized vehicles should not be allowed on turf. Light machinery such as Gators, tractors and golf carts are permissible with turf tires only.
6. No food, chewing gum, sunflower seeds and/or tobacco products on playing surface.
7. Daily cleaning of surface should be hand-picked. Vacuums with dual motors and leaf blowers recommended.
8. Turf grooming and cleaning must be done by trained staff and authorized equipment
9. Steps must be taken to prevent dirt/debris from collecting onto surface from nearby trees and parking lot trash.

Table of Contents

I. CLEANING AND STAIN REMOVAL

GENERAL

Rain is your best cleanser. Rainfall gently cleans the turf fibers of dust, pollen and airborne pollutants in way that is difficult to duplicate in any other fashion. In areas where rainfall is scarce- or during prolonged periods of drought- an occasional water flush is beneficial to soak and thus cleanse the turf system this procedure is recommended for all turf systems.

HOWEVER, THE MOST OBVIOUS CLEANING NEEDED is the removal of litter deposited by users and spectators at events held on the field. Good housekeeping practices will minimize these problems:

- Keep trash and litter containers on site make sure there are enough containers to eliminate overflow.
- Route field traffic in such a way as to minimize mud and dirt tracking on to the field.
- Set up drinks for athletes during practice breaks off the field itself, if possible.
- Enforce a smoke-free environment, if possible, and discourage the use of tobacco products such as chewing tobacco.

LITTER REMOVAL

Paper, peanut shells, sunflower seeds, athletic tape, paper, etc., should and can be removed most easily with a lawn sweeper or a motorized vacuum sweeper immediately after any event.

When using these machines, several points should be observed so the machine does not damage the turf.

BRUSH SETTING

The sweeper should have synthetic fiber bristles such as nylon or polypropylene. **The brush must contain no metal or wire!** (Metal bristles or fibers can create a safety hazard in addition to damaging the turf in use.)

Proper cleaning should go against the grain along the seams and try not to cross over of the seams.

AD LIMITATIONS

Brushing and brush cleaning may require several trips over the field to finish the operation. Any sweeper that weighs more than 135 kg or 298 lbs. should have pneumatic tires with a maximum tire pressure of 35 pounds per square inch (psi) or 2.46 kilograms per square centimeter (kg/cm^2). Do not park vehicles on the turf, especially in the heat of the day, or leave vehicles on wet turf for long periods of time.

VEHICLE EXHAUST!!

Never leave a parked vehicle idling on the turf in order to prevent the possibility of burning or melting the turf due to exhaust or overheating. Make certain the hot engine exhaust is never discharged in the field when using any kind of vehicle.

OIL SPILLAGE

Care should be taken to prevent lubricating oil, grease, transmission fluids, etc., from dripping or spilling on your turf surface during sweepings. Such spills can discolor the turf. Proper maintenance procedures should be observed in this regard. Battery acid and other fluids should not be allowed on the turf. **Never change or add fluids to maintenance equipment while on the turf surface.**

FREQUENCY

The removal of loose rubbish and surface dust should be performed on an as need basis, generally about twice a month during heavy use periods.

Stain Removal

GENERAL

Polyethylene pile fibers are among the most stain resistant fibers. Most “stains” on Sporturf™ fields are not true “stains” but rather residues of foreign matter that must be promptly and thoroughly removed.

Such “stains” on wet fields can be removed with water or soap and water. The first rule is promptness. It is much easier to clean up a fresh spill before it has time to dry and harden. Remove any solid or putty-like deposit promptly using a dull knife or spatula-like tool. Blot up excess liquids with a stack of towels, cloth or paper. Dry absorbent clay based materials; such as kitty litter absorbers can be very useful and should be stored on site. Such dry absorbers can be swept or vacuumed up.

OCEDURE FOR REMOVING “STAINS” AND OTHER BLEMISHES

A. “Water Borne” Residues

Most “stains” commonly associated with playing fields can be classified as “water borne” stains. These stains are best removed using a warm, mild solution of granular household detergent (nonabrasive).

TYPICAL WATER BORNE “STAINS”

Acid	Alcohol	Alkali
Ice Cream	Latex Paint	Milk
Urine	Water Colors	Fruit Juice

1. Brush the residue with a stiff fiber brush.
2. Scrub the area with soap and water.
3. Rinse the area thoroughly with clear water to remove all traces of soap.
4. Dry with absorbent towel, if necessary.

A three percent solution of ammonia in water may be used in lieu of household detergent for more stubborn residues or stains.

B. Persistent or Oil Based Stains

Follow directions below:

- **PROBLEM:** Crayon, furniture stain, lipstick, metal polish, cooking oil, rubber cleat marks, shoe polish, suntan oil, ballpoint ink

  PROCEDURE: Sponge with perchloroethylene (dry cleaning solution). Blot with absorbent towels.

- **PROBLEM:** Oil paints

  PROCEDURE: Blot immediately. Sponge with turpentine or paint remover (apply sparingly). Blot with detergent and water. Re-sponge with cold water. To remove detergent. Scrape excess. Sponge with perchloroethylene (dry cleaning solvent). Repeat steps as necessary.

- **PROBLEM:** Nail Polish

  PROCEDURE: Sponge with acetone.

- **PROBLEM:** Paraffin Wax

  PROCEDURE: Scrape excess. Sponge with perchechlorethylene (dry cleaning solvent).

PROBLEM: Tar and Asphalt

PROCEDURE: Scrape excess. Sponge with perchechlorethylene (dry cleaning solvent).

Caution!!

Mineral spirits and other petroleum based solvents are highly flammable. Do not smoke or permit open flames near container or near solution when in use. Be sure the area is well ventilated.

C. Animal Waste

Neutralize with mixture of white distilled vinegar in an equal amount of water. Flush thoroughly with water after application. An enzyme type of cleaner is also effective.

D. Chewing Gum

Spray with Freon and scrape to remove residue (available in aerosol packs from carpet cleaning suppliers- or use dry ice).

E. Fungus, Mold Spots or Moss

Use **Game Plan 4 Turf**® at a rate of **1 gallon** of concentrate per **11 gallons** of water to cover 12,000 sq/ft. and spray thoroughly. Do not use high pressure water spray with stream force in excess of 2500 PSI as this can severely damage the turf. **Game Plan 4 Turf**® is an EPA registered disinfectant. Mr. Clean and Vital Oxide perform as needed but have not been EPA approved.

Protect Your Turf

1. Spread the load!

Remember that chairs and high heel shoes create high psi levels on the turf and put the system at risk. The basic precaution is to keep long term static loads below 2.46kg/cm^2 (35 lbs/in^2) by means of load spreaders. The best, most economical load spreader is outdoor plywood. Be sure to spread a polyethylene sheet under the plywood to protect the turf. Sheets of plywood are ideal and readily available. 19 mm thick plywood is recommended as long as the loads are not excessive (such as a concert stage or sound systems).If chairs are placed directly on the turf, inspect chair leg bottoms to be sure jagged or sharp ends cannot cut the turf. Metal chair legs should be protected with rubber tips. Wooden legs should be free of any projection sharp enough to cut the turf. Porta Four® by Sport Court® is an easy for use roll out product approved for Sporturf™.

2. Ban Open Flames!

No such acts should be allowed on the turf for obvious reasons.

3. Clean Up Immediately!

Animal waste should be removed and the area flushed thoroughly. The field should be inspected for damage so that small problems do not become major repair cases.

4. Ban Smoking!

Cigarettes cannot ignite the turf but they can damage the turf. If large crowds are expected, a cigarette ban should be enforced. However, in these cases, even if heavy loads will not be present on the turf, the turf should be covered.

SNOW AND ICE REMOVAL

SNOW AND ICE ARE NOT HARMFUL TO ARTIFICIAL TURF and generally should be left to melt system without assistance. At times, however, it is necessary to remove snow or ice to make the field playable for a scheduled event. The working principle for removing snow is to do so as near to game time as possible. This reduces the likelihood of new snow buildup and will reduce the risk of ice from cold winds whipping across a damp, newly cleared surface. Because ice removal is more difficult, the **prevention** of ice buildup is important.

Sweepers

- ✓ If the snow is dry and powdery, it can be swept from the field using a rotary brush. **Be careful that the machinery used is not set in such a way as to dig into the turf fabric.**

EVENT PREPARATION

Controlled Products Turf fields are designed to be multi-purpose and as such host numerous non-athletic events such as graduation exercises, assemblies, convocations, shows, concerts, circuses, etc.

Generally, two areas of concern should be recognized:

1. These events can create loads on the turf that exceed the surface load limit set forth in the warranty and in the load limits outlines in this manual.

2. Large crowds and act on the turf generally fall outside the “designated uses” for the system and damage of the turf can occur unless it is fully protected.

II. MAINTENANCE SCHEDULE

Daily: Check the field after each day's use for distribution and condition of the heavily played areas.

Weekly: Brush the surface of the field with a static (non-rotary) double brush including simultaneous vacuum devices to redistribute the infill, maintain vertical fibers, and a level playing "use" field.

Monthly: Check infill levels, seams, inlaid lines, etc., and report failures (if any) to the manufacturer. Also check for over compaction and de-compact as may be necessary. It is essential that the appropriate equipment is used in order to achieve the specified performance criteria.

Periodically: At least once a year a full grooming session should take place brushing (rotating unit), vacuuming, de-compacting, and grooming (static brush). Top dress with new infill may be required. Contact the manufacturer if any aspect of the maintenance process is causing a significant concern.

NOTE: These are minimum recommendations. Common sense and careful observation should prevail. If any serious doubt exists about the effectiveness of the maintenance regime or the condition of the field, contact with the manufacturer should be made.

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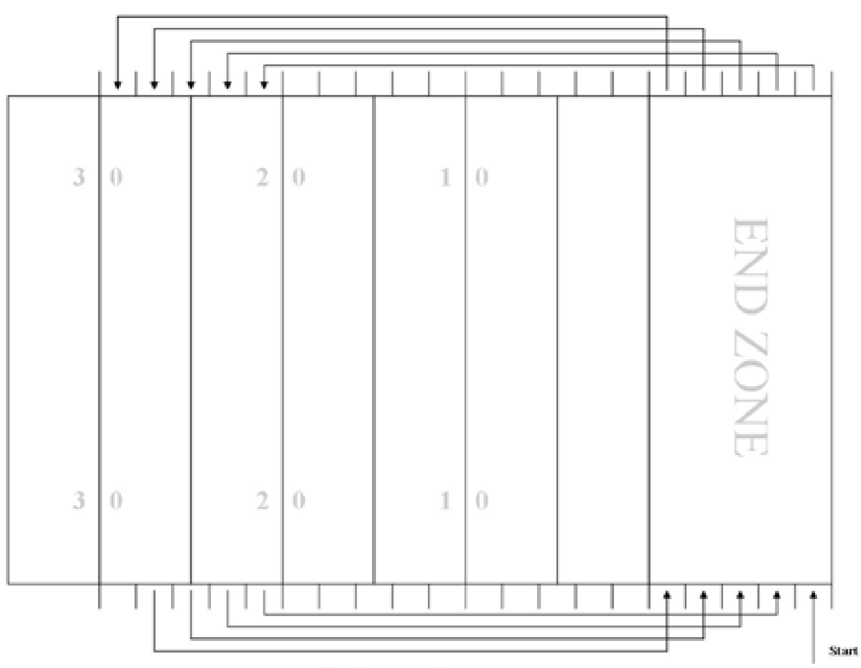
50 yard Grooming Pattern



GreensGroomer WORLDWIDE

Continue this pattern until you reach the 50 yard line. Repeat to complete the other half of the field. Rotate between clockwise and counterclockwise each time you groom.

VACUUMING AND BLOWER SWEEPING

A) Leaf Blower sweeping is an easy and quick way to blow all debris off the surface and into piles for easy hand picking. Commercial leaf blowers (pic below) are a great way to work debris to the side of the field.

B) Vacuuming helps keep the fibers to stand upright and maintains a fresh look by picking the debris off the field. Dual Motor vacuums or **Bill Goat/Bear Cat** type lawn vacs recommended.

SHING AND CLEANING

A) Washing/Spraying the field with a cleaning agent comprised of **Game Plan 4 Turf**® helps keep the fibers clean and the field looking fresh. DO NOT WATER TURF 3 HOURS BEFORE OR AFTER SPRAYING!

WATERING/COOLING THE SURFACE

Synthetic fibers are reflective in design to prolong exposure to sunlight. This design can cause heat patterns that can be overcome by watering the field. In many instances, coaches, players and trainers prefer to wet the turf down during use in order to lower the temperature/humidity index. This is a good idea and recommended because in periods of very hot weather. A wet field provides evaporation, which indeed lowers the temperature of the field rapidly.

The temperature of wet synthetic turf fields should match that of natural grass in the same area. Remember that evaporation can be very rapid (up to 1,200 gallons of water per hour on an average sized field) so with long uses of the turf, an additional sprinkling may become necessary. Try and distribute the water evenly over the field area to be used while avoiding sidelines etc.. **Never Use water from a polluted supply!**

SAMPLE PROGRAMS: Programs designed to saturate infill and keep heat levels down through the day.

(Note: Hot overcast days generally do not have as high of a heat buildup as a moderate clear sunny day.)

SAMPLE: 2 a day practice schedule (9:00 am and 4:00 PM)

8:00 Am: Water field for 10 minutes before practice
12:30 PM: Water field for 5 minutes
1:30 PM: Water field for 5 minutes
3:00 PM: Water field for 5 minutes

SAMPLE: 3:30 practice, sunny high near 95

10:00 Am: Water field for 15 minutes
12:30 PM: Water field for 10 minutes
2:45 PM: Water field for 10 minutes

Maintenance Log

MAINTENANCE LOG DESCRIPTION

- COLUMN 1 – DATE

  Put the date in which the maintenance was performed.

- COLUMN 2 – WORK PERFORMED BY

  Put the name of the person who performed the work on the field.

- COLUMN 3 – DESCRIPTION OF WORK PERFORMED

  In this column a brief description of the work completed will be needed. Some example would be: grooming, sweeping, seam maintenance, etc. If it is maintenance on a seam, then put a brief description of the seam. Seam length, width, etc.

- COLUMN 4 – LOCATION OF MAINTENANCE PERFORMED

  If the maintenance is grooming or sweeping, write whole field. If maintenance is maintenance on a seam, then write the location of the seam. Example: 30 yard line between the hash marks, down the third baseline thirty paces, etc.

DATE	WORK PERFORMED BY	DESCRIPTION OF WORK PERFORMED	LOCATION OF MAINTENANCE PERFORMED

DATE	WORK PERFORMED BY	DESCRIPTION OF WORK PERFORMED	LOCATION OF MAINTENANCE PERFORMED

III. MINOR REPAIRS

Because most Sporturf™ Fields are used heavily in the fall and winter months, good maintenance practice is to thoroughly inspect the field in the spring and make repairs to the surface in the spring and early summer. If a service visit must be scheduled, we ask that such a request be made as soon as possible in the spring so that the visit may coincide with a scheduled service trip to other fields in your area or in conjunction with the installation of a new field in your area.

All seams should be inspected carefully for looseness. All panels of turf should be inspected for damage, rips, tears, burns, etc. Make a sketch of the pitch and note on the sketch each area that needs attention.

Whether performed by the installer or by the Owner, all repairs must be made in warm, dry weather. Gluing seams and sanding the turf should not take place if the field is wet or even damp.

"MINOR" VS. "MAJOR" REPAIRS

Experience has taught us that most field repairs are minor in nature. However, minor problems can become major problems quickly if not corrected. Small loose spots on glued seams extending a few inches to a foot or two are to be expected with these systems and are not unusual or cause for great concern. They can generally be repaired by the owner's maintenance staff. Cuts, rips and tears in the surface that do not exceed six inches or so in length do not generally require a special trip by our service staff and can also be repaired by the Owner without much effort. These problems should be regarded as minor unless allowed to grow.

SEAM REPAIRS

These instructions refer to loose seams, typically from a ½" to ¾" in length along the seam.

If the seam openings over ¾" is considered severe, the user should contact Sporturf® for prompt assistance.

To repair minor seam openings or loose seam areas:

1. Vacuum the turf to be repaired.
2. Be sure fabrics to be glued are free from loose sand, dirt, old adhesive and other foreign matter, and are dry.
3. Clean the area to be repaired and wipe the opening with methyl-ethyl-key tone (MEK), toluene, or, if neither is available, with mineral spirits.
4. Position the fabric to check for satisfactory final placement.
5. Inject a small amount of adhesive (**PL Polyurethane caulk**) from the adhesive bottle on to the seaming tape. Avoid excessive adhesive to reduce the possibility of bleed through or bleed out. Spread the adhesive with a knife or spatula so that the entire fabric is coated lightly, but evenly.
6. Prop open the seam so that the adhesive is allowed to cure in the open air. (The adhesive is a brand of polyurethane adhesive and must be allowed to absorb moisture from the air to "kick" or activate.) Allot **at least 10 minutes of curing time before closing the turf and weighting it down.** This curing time recommendation is critical and is based on and ambient temperature of 75°F with 50% relative humidity. If the weather is colder or dryer, the open time should be extended until the adhesive spread on the fabric seems almost "dead" – i.e., only small strings ("angel hairs") of adhesive stick to your finger or a piece of turf when pressed into the bed of adhesive and removed.
7. Press the fabric into the adhesive bed uniformly.
8. Weigh down the area and allow curing for at least 24 hours.

Other Typical Repairs

CIGARETTE BURNS

A lit cigarette can damage any turf system. On rubber-infill pitches, the cigarette may scorch and blacken the turf. Use a metal brush (such as is used to remove paint) and brush the spot vigorously to separate the fibers. If brushing the turf does not remove the damage, take a razor knife and cut the fused area away.

If fabric seams or tears have gone beyond the scope outlined above, the installer should be contacted immediately for assistance, advice or to request a scheduled service visit. Any damage to the pad, de-lamination between the pad and turf, undue loss of sand, vandalized areas or dis-colorations should be reported to Sporturf™.

CONCLUSION

With the many advances in turf design, installation techniques and materials fields are even less maintenance intensive than ever before. Compared to natural grass fields, **Sporturf™ fields should be considered virtually "maintenance free" but no surface should be thought of as care free.** However, your field will perform, look and feel better for a longer period of time if the maintenance procedures outlined in this manual are followed closely. The manual attempts to encounter and answer the most frequently asked questions regarding your field. However, there are always new uses, new problems and unanticipated twists or needs. Do not hesitate to call us!

PROHIBITED ACTIVITIES

- Storage or materials such as drums, lumber, equipment, etc...
- Unnecessary vehicular traffic.
- Golfing, shot putting, javelin or discus throwing, and the use of long spike track shoes associated with cinder tracks.
- Open flames, fireworks, welding, etc...
- Use of wire brushes in any form.
- Heavy loads exceeding .21 kg/cm^2 (static) or 2.46 kg/cm^2 (dynamic).
- Use of cleaning equipment, methods or materials not authorized.
- High pressure water sprays exceeding 21 kg/cm^2
- Vehicles with non-pneumatic tires.

Key Points to Remember

- Keep the field clean. Sweep and hose the field as needed per this manual. Keep plenty of trash and litter containers on site for participants to use.
- Cross brush the turf surface often!
- Keep vehicular traffic off the field as much as possible.
- Post **NO SMOKING** signs around the turf.
- Don't abuse the turf by overloading it. Use plywood and fabrics to protect the turf especially if special events are scheduled on the field.
- Make minor repairs. Report major problems to Sporturf® right away.
- Follow exactly the recommendations and procedures incorporated in this manual.

APPROVED PRODUCTS

Adhesives/Paint:

PL Polyurethane (outdoor use in red/yellow label only) (800) 999-8920

Mapai 2 Part Seam Repair Kit

Pioneer Titan Paint (800) 748-9649

Cleaning Agents:

Game Plan 4 Turf® by Pioneer (800)748-9649

Vital Oxide®

Mr. Clean with Fabreeze (Multi-Surface Concentrate)

Maintenance Equipment:

Laymor® Ride On Sweepers (800) 323-0135

Wiedenmann USA Super 120 M (pull-behind) (912) 790-3004

Bear Cat by Echo or Billy Goat Vacuums

Force Blower by Billy Goat or other walk behind commercial blowers

Greens Gnome or Turf Cat

Greensgroomer

KMI Sports Construction

7070 Hwy 290 W
Dripping Springs, TX, 78620
512-962-3955
info@kmisportsconstruction.com
www.KMIconnect.com
Instagram: @KMITurf - Facebook: @KMIsports

Date	5/12/2022		**Quote# 2022-04051222**
Bill to Address:			**Remit to Address:**
Name	Chris Smith		7070 US HWY 290 W.
Address	1200 W. Cesar Chavez St, Austin TX 78703		Dripping Springs, TX, 78620
Email & Phone	512-922-5431 - chad.smith@streamrealty.com		info@kmisportsconstruction. com

Payment Terms: Deposit required to secure a spot on our schedule, remaining balance due at the time the job is completed

Item #	Materials	Quantity	UOM		
	Hatley Infield Turf Project				
1	KMI to excavate and remove all of the existing dirt and grass from the field, approx 10,849 sq ft	10849	Square Feet		
2	KMI to provide and install 2"x2" composite nailer boards around the perimeter of the infield, this nailer board is used to secure the turf down around the edges	400	Linear Feet		
3	KMI to provide and install a 4" performated drainage system throughout the infield, the pipe will exist the field at the lowest point and daylight drain	750	Linear Feet		
4	KMI to provide and install 6mil Plastic Barrier on the sub-base	10849	Square Feet		
5	KMI to provide #57 & #67 clean aggregate for the drainage ditches and the field final grade rock	23	Tons		
6	KMI to install, level and compact the #57 & #67 aggregate into the drainage ditches and on the field	170	Tons		
7	KMI to provide and install SBR rubber and sand mixture as the infill	32547	Lbs		
8	KMI to provide and install Power House 40oz Green and Terra-Cotta Power House 2" pile height White inlaid foul lines and batters boxes	10849	Square Feet		
9	One set of base anchors and bases, one home plate, one pitching rubber	1	Each		
10	Build a permanent artificial turf mound. If you would like a portable mound, I can provide you with our recommendations on which mound to purchase	1	Each		
11	Cleanup the site of all debris and garbage	1	Each		
Warranty	KMI provides warranty that covers seams, base work, perimeter edging and nailer boards for 3 years. The turf is covered for 8 years for the date of the install.			**Sub Total**	**$97,212.87**
Maintanace	Mainanance of Artificial turf is as simple as making sure there is enough infill in high traffic areas. Neglecting to maintain high traffic areas voids warranty of turf. Fill with sand when necessary.			**Deposit**	**$48,606.44**
15 day expiration	This quote expires in 15 days. After whcich, we will need to reacess costs, supplies, and material available.			**Due at Start of Construction**	**$11,665.54**
Financing	**KMI now offers financing for all commerical projects, ask us today for more details**			**Due at Completion**	**$36,940.89**
Customer Signature: ____				**Total Project Price**	**$97,212.87**

Desiree Adair

From: Victoria Johnson <lvpj@mac.com>
Sent: Tuesday, October 18, 2022 2:29 PM
To: Desiree Adair
Cc: Ashley Wayman
Subject: Letter for the Mayor and City Council
Attachments: Letter to Mayor & Council.docx; Environmental and Healt Impacts of Artificial Turf- A Review.pdf; Artificial turf systems for sport surfaces-current knowledge and research needs.pdf; AT and Global Warming.pdf; Artificial turf surfaces Perception of safety sporting feature satisfaction and preference of football users.pdf; Assessing differences in thermal stress of soccer players on natural turfgrass and artificial turf.pdf; Independent research.docx

Follow Up Flag: Follow up
Flag Status: Completed

Desiree,
Attached please find the letter for the Mayor and City Council. I have also included direct attachments to this email that I received from Texas A&M as well as a document including links to resources I found on my own. If you could forward all this along to them I would greatly appreciate it.
Thank you -
Victoria

October 18, 2022

Mr. Mayor and Members of the City Council,

On September 19, 2022 the Parks Commission voted to send the proposal to put artificial turf on Field 1 to the City Council for consideration. I voted for this measure. I feel it important however, for the council to have insight into the reasons for my vote and issues I have since found and believe are important for the Council to consider.

First, my understanding from the information provided to the Parks Commission is that Western Hills Little League is only willing to put money into artificial turf. Turf Grass is not something the league is willing to consider funding and the league did not do a cost analysis of installing turf grass.

Second, the maintenance of artificial turf according to Sean Kincaid with KMI Sports Construction, is low and doesn't require much water if any. In addition, maintenance is to be the responsibility of Western Hills Little League and drainage work during installation would allow the City to direct drainage in a way that will not contribute to the current drainage issues facing the City.

Third, the Commission was assured that Western Hills Little League did not want to propose artificial turf on any other fields and only on the infield of field 1.

These factors seemed to me to be a way to share maintenance of our fields with Western Hills Little League in a way that might afford the City a savings in water use and maintenance costs that would allow for more resources to be used to fix issues on the other park fields. This seemed important given the small budget the City has to maintain the park as a whole.

However, on Friday September 30th, an article was published that brought to the fore some questions regarding artificial turf. As I did more research, I realized I had not received enough information to justify the reasoning on which I based my vote.

To get more clear answers, I engaged Texas A&M's Turf Grass department. I am including attachments here that have been shared with me by this department thus far though, I am still awaiting information from the department on the costs of installing and maintaining the most economical turf grass vs artificial turf, as well as research on the effects of artificial turf on the soil underneath it and what it takes to restore soil to fertile conditions after artificial turf is removed. This would be important should the Council decide to put turf on the field and then later have it removed.

In addition, should the Council decide to put turf on Field 1, the research has shown there are ways to filter run off so that it has the least environmental impact. In my opinion, that would be an important factor to consider and to require.

Some of the articles attached address other environmental points regarding artificial turf. While these were not what initially started my query, I am including them because they are worthy of consideration.

Kind Regards,
Victoria Johnson

Environmental Science & Technology
Critical Review
pubs.acs.org/est

Environmental and Health Impacts of Artificial Turf: A Review

Hefa Cheng,*,† Yuanan Hu,† and Martin Reinhard‡

†State Key Laboratory of Organic Geochemistry Guangzhou Institute of Geochemistry, Chinese Academy of Sciences Guangzhou 510640, China

‡Department of Civil and Environmental Engineering Stanford University Stanford, California 94305, United States

Supporting Information

ABSTRACT: With significant water savings and low maintenance requirements, artificial turf is increasingly promoted as a replacement for natural grass on athletic fields and lawns. However, there remains the question of whether it is an environmentally friendly alternative to natural grass. The major concerns stem from the infill material that is typically derived from scrap tires. Tire rubber crumb contains a range of organic contaminants and heavy metals that can volatilize into the air and/or leach into the percolating rainwater, thereby posing a potential risk to the environment and human health. A limited number of studies have shown that the concentrations of volatile and semivolatile organic compounds in the air above artificial turf fields were typically not higher than the local background, while the concentrations of heavy metals and organic contaminants in the field drainages were generally below the respective regulatory limits. Health risk assessment studies suggested that users of artificial turf fields, even professional athletes, were not exposed to elevated risks. Preliminary life cycle assessment suggested that the environmental impacts of artificial turf fields were lower than equivalent grass fields. Areas that need further research to better understand and mitigate the potential negative environmental impacts of artificial turf are identified.

INTRODUCTION

Artificial turf (also referred to as synthetic turf) is a surfacing material engineered to mimic the appearance and sports performance (e.g., shock absorption, energy restitution, vertical deformation, slide and slip resistance, and wear resistance) of natural grass on athletic fields, golf courses, and lawns. The first generation artificial turf made of short-pile plastic fibers was introduced in the 1960s. The improved second generation products featuring sand infill between the fibers made artificial turf widely popular in the early 1980s. The third generation artificial turf introduced in the late 1990s is infilled with crumb rubber or a mixture of sand and crumb rubber to keep the plastic fibers upright and provide shock absorption similar to that of natural grass. The new generation of products have been accepted as providing improved safety, playability, appearance, durability, with lower annual operating costs and maintenance requirements, and have moved rapidly beyond athletic fields to residential lawns and landscaping.[1] Artificial turf is now widely considered as an ideal replacement for grass playing surface in cases where natural grass cannot grow, or where maintenance of natural grass is expensive or undesired. The advantages and limitations of artificial turf compared with natural grass are summarized in Table 1.

The third generation artificial turf system is typically composed of three primary layers (Figure 1a): (a) artificial grass fibers (polyethylene, nylon, or a blend of polyethylene and nylon); (b) infill (rubber made from one or more sources, or a mixture of sand and rubber); and (c) carpet backing (a blend of polypropylene, polyamide 6, polyolefins, and/or polyurethane). The rubber infill is produced predominantly by mechanical disintegration of scrap tires, and recycled athletic shoes in rare cases. Rubber manufactured specifically for infill purposes is also available, although crumb rubber produced from scrap tires is much cheaper compared to virgin rubber ($0.04−0.30 vs $1.00 or more per pound, price in early 2000s).[2] Significant amount of scrap tires can be recycled by artificial turf products: tire rubber crumb is applied at up to 6 lbs/ft^2 in most artificial turf fields (some "heavyweight" infill systems even contain 9.2 lbs/ft^2),[3] while 1−2 lbs/ft^2 of tire rubber crumb is often used in lawns. Sand is also used as an infill material in some artificial turf products to improve the hardness, and those with rubber/sand infill generally cost less and perform most like natural grass. Unlike grass lawns that can often become waterlogged during the rainy season, artificial turf fields are constructed with a built-in drainage system (Figure 1b) that allows water to drain quickly after the rain.

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Table 1. Comparison of the Benefits and Disadvantages of Natural Grass and Artificial Turf

	natural grass	artificial turf
cost	the installation cost of grass fields is low, but the annual maintenance cost is high.	the installation cost of artificial turf fields is quite high, while the annual maintenance cost is rather low; the increased practice and play time, as well as the flexibility of the artificial turf fields to be used for multiple events make the per use cost of artificial turf fields much lower than that of grass fields.[62]
visual appearance and smell	the visual appearance and smell of grass fields are pleasing, but proper maintenance is required; growth of natural grass is strongly influenced by drought and cold.	artificial turf is often virtually indistinguishable from natural grass when viewed from a distance; artificial turf stays green all year without requiring maintenance, although the color may fade over time; the tire rubber crumb in artificial turf can heat up and emit an unpleasant smell under direct sunlight.
durability	natural grass cannot sustain excessive wear and tear; grass fields need to "rest" after heavy uses for the grass to recover.	artificial turf stands up to heavy use without compromising the quality of play caused by damage of the surface from over use; artificial turf fields always stay uniform and consistent; artificial turf fields can be utilized with virtually no "rest" required.
installation conditions	natural grass cannot grow well in desert areas and extremely cold climates; due to lack of sunlight, growing natural grass in indoor sports stadiums and arenas is challenging and expensive.	artificial turf can be installed in virtually any environment.
field availability	the playable time allowed by grass fields is typically no more than 20 h/week, or 680 h/year for three seasons.	artificial turf is well suited for multipurpose fields and can host a range of sporting activities including football, soccer, lacrosse, baseball, and softball, which means more practice and game time; one artificial turf field can typically accommodate the play of 3−4 natural grass fields, and the playability (hours of use) of artificial turf fields can be up to 7.7 times of that of natural grass fields.[6] artificial turf fields allow up to approximately 3000 h of playing time annually.[1,6,62]
drainage	grass fields frequently become water logged during the rainy season, which exacerbates damage to the surfaces and limits play thereon.	artificial turf fields have excellent drainage property because of their totally porous nature and the built-in drainage system, and can be used immediately after rainfalls.
irrigation requirement	natural grass requires large amount of irrigation water. A full-size grass sports field in the U.S. generally consumes 0.5 to 1 million gallons of water each year.[5,6]	artificial turf essentially requires no irrigation; artificial turf fields may need to be irrigated to cool and clean the playing surface on hot summer days.
maintenance	natural grass fields require frequent maintenance, including watering, mowing, fertilizing, and periodic reseeding; fossil fuels, chemicals, fertilizers, and herbicides, which produce greenhouse gas (GHG) emissions when manufactured, are required for growing and maintaining turf grass; the requirement of equipments, fertilizers, chemicals, and water makes the additional cost of maintenance quite high.	artificial turf fields need little maintenance: only occasional sanitation, raking, cleaning, and vacuuming are required; artificial turf fields eliminate the use of chemicals, which can cause soil and groundwater contamination.
player safety	natural grass athletic fields have been used successfully for many years; the presence of holes or mounds made by moles, gophers, or other animals, and slippery mud areas can increase the chance of player injuries.	artificial turf is generally regarded as being as safe to play on as typical grass surfaces;[99,100] studies consistently indicated that the incidence and severity of athlete injuries on the third generation artificial turf are similar to, or better than those on natural grass;[99,101−103] artificial turf fields are free of gopher holes, bumps, or muddy patches inherent in grass fields.
environmental functions	natural grass reduces surface temperatures, lowers noise levels, traps and biodegrades airborne pollutants, supports worms and insects that are fed on by birds and other animals;[104] due to natural grasses' ability to store atmospheric CO_2 in the soil as organic carbon, grass fields have a net negative carbon footprint, although the constant maintenance activity on sports fields can expose the organic carbon to air, which offsets the actual carbon sequestration of grass fields;[105] natural grasses emit photochemically reactive VOCs, especially during and after mowing, which is related to plant growth, maintenance, and wound defense mechanisms.[106,107]	artificial turf may cause environmental damage, including consumption of raw materials and energy, and emissions to air, water, and land; due to the lack of transpiration and heat trapping in the plasticand rubber materials, the surface temperature of artificial turf is elevated (20 °C or even more above that of natural grass) under direct sunlight;[47,48] production and transportation of artificial turf release large amounts of GHGs; artificial turf needs to be disposed of in landfills at the end of its functional life as most of the components cannot be recycled.

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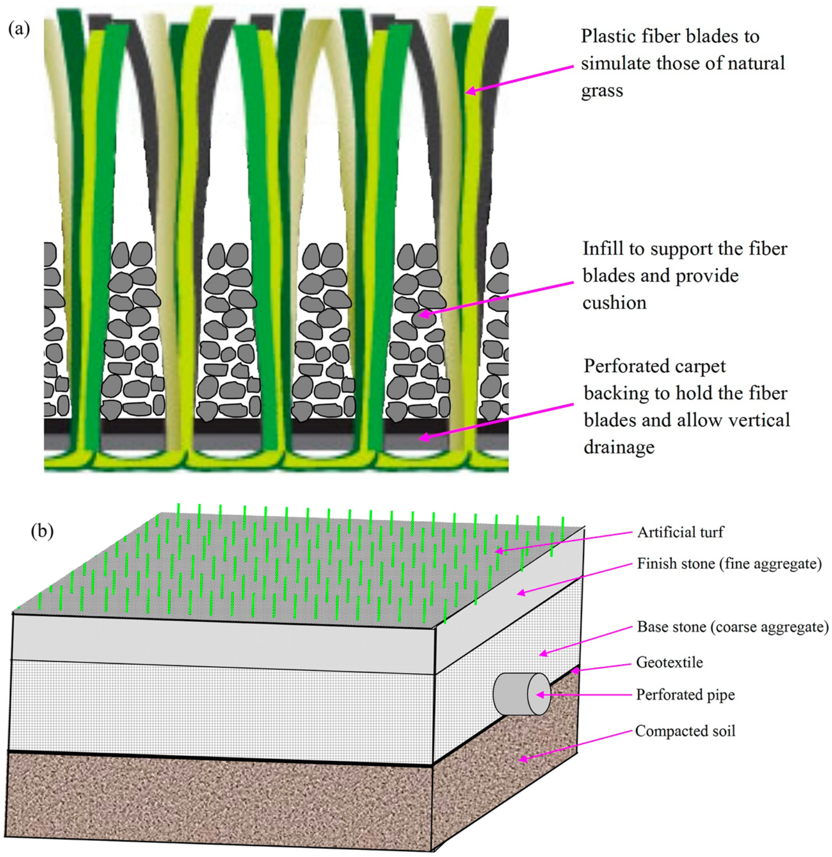

Figure 1. Schematic illustrations of the makeup of a typical artificial turf field: (a) the major components of artificial turf, and (b) the built-in drainage system.

Manufacturers typically emphasize that artificial turf is environmentally friendly with the use of recycled tire rubber. Because of their large production volume and durability, the disposal of scrap tires is a major challenge for waste management, and a truly environmentally friendly disposal method remains to be found (Supporting Information, SI). Artificial turf can reuse large amounts of scrap tires: an average soccer pitch/field of artificial turf contains approximately 100 tonnes of tire rubber crumb. It has been estimated that 26.2% of the scrap tires generated in the U.S. were recycled into tire rubber crumb, with about 0.18 million tonnes used in sports surfacing in 2009.[4]

Today artificial turf is being widely promoted as a cost-efficient, environmentally- and user-friendly product that can replace natural grass on sports fields and residential lawns. The markets for artificial turf in the U.S. and Europe are both over one billion dollars, and continue to grow, while manufacturers of artificial turf have also begun to pay more attention to the emerging markets, such as China. Depending on the region in the U.S., a full-size artificial turf sports field can result in an annual savings of 0.5 to 1 million gallons of water.[5,6] Recognizing the significant water conservation potential, many cities and water conservation institutions in the dry regions of the U.S. have begun to offer financial incentives for the replacement of residential lawns with artificial turf. It has been claimed that the use of artificial turf conserved about 5 billion gallons of water in the U.S. in 2011.[5]

In spite of the obvious environmental benefits, such as saving water, requiring no fertilizer or pesticide, and reusing rubber from scrap tires, artificial turf can pose potential risk to human health and the environment, primarily from the contaminants released by the tire rubber crumb infill. These emissions and their potential impacts have not received much attention until recently.[7−10] The key question that needs to be answered is whether artificial turf is a truly "green" alternative to natural grass. This review summarizes the benefits of artificial turf, assesses its major environmental and health impacts, and identifies research that is needed to ascertain and mitigate the environmental impacts of artificial turf. Available data were compiled from published journal articles, conference proceedings, books, and gray literature. The latter includes technical reports published by governmental agencies, academic institutions, trade publications, and information gathered from Web sites of manufacturers and other groups, which are typically not subjected to peer-review and might thus contain data that were collected to represent biased viewpoints. Although some cited reports came directly or indirectly from industries with a financial interest in promoting artificial turf, data were cross-checked with other sources to ensure the validity of the conclusions as much as possible.

■ ASSESSING THE ENVIRONMENTAL IMPACTS OF ARTIFICIAL TURF

The use of recycled tire rubber significantly reduces the cost of artificial turf, although this practice is afflicted with potential downsides, as tire rubber contains a range of chemical vulcanizers, oil-based plasticizers, antioxidants, antiozonants, and fillers in the blend of natural and synthetic rubber,[11−16] which are summarized in the SI. Despite the common assumption that tire rubber is extremely resistant to environ-

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mental breakdown, organic compounds and heavy metals in the rubber matrix can be slowly released through volatilization and/or leaching under natural conditions. Shredded tires in various conditions from tire chips to finely ground rubber crumb have been used in a range of civil engineering applications, such as lightweight fill for embankments and retaining walls, insulation blocks, drainage aggregates, surface materials for playgrounds and racetracks, soil amendments, and surface mulches.[37] A large number of studies have characterized the environmental impacts associated with such direct reuse of scrap tire materials, which provide important insights on the potential environmental impacts associated with artificial turf.

Volatilization of Organic Contaminants. The odor of tires is characteristic of amines and sulfur-containing organic compounds (with very low odor thresholds) that are used in the compounding of tire rubber.[11,16] Despite the unpleasant smell, car and truck tires do not release significant amounts of volatile organic compounds (VOCs) or semivolatile organic compounds (SVOCs) under ambient conditions and are not commonly considered as a source of air pollution. In contrast, hundreds of VOCs and SVOCs have been identified in the off-gases of rubber vulcanization and pyrolysis.[15,17,18] The levels of total VOCs in the air of two tire shredding facilities located in central Taiwan ranged from 1.4 to 2.2 ppm, which were not significantly different from the local background level (~1.4 ppm).[19] Chemical analysis indicated the presence of various groups of air pollutants, such as aliphatics (e.g., octane, decane, and undecane), aromatics (e.g., benzene, toluene, ethylbenzene, and xylenes), polycyclic aromatic hydrocarbons (PAHs), methyl isobutyl ketone, styrene, and benzothiazole.[19] These contaminants probably resulted from the decomposition of rubber polymers, vulcanization accelerators, and plasticizers during tire shredding and grinding. It has been reported that benzothiazole was the most abundant volatile compound in the vapor phase over tire rubber crumb, and that the concentrations of VOCs leveled off significantly within 2 weeks under natural weathering conditions and became relatively constant thereafter.[8]

Leaching of Heavy Metals and Organic Contaminants. Whole tires and laminated tires have long been used as dock bumpers and fenders against heavy rubbing and pushing forces of vessels with few concerns raised about their impact on water quality. However, the much smaller tire chips and rubber crumb may release heavy metals and organic contaminants more readily, and thus present a risk to aquatic environment. Results of toxicity characterization leaching procedure (TCLP) analyses (SI Table S1) showed that the regulated metals (As, Ag, Ba, Cd, Cr, Hg, Pb, and Se) and organic contaminants were typically below their respective regulatory limits in the leachate of tire rubber in various shapes.[20−23] A wide range of organic contaminants (SI Table S2) have been detected at very low concentrations in the leachate of tire shreds and chips, which resulted from the breakdown of natural and synthetic rubber polymers, compounds associated with the carbon black, and various additives such as plasticizers and accelerators.[13,15,24−30] Tire rubber leachate typically also contained elevated levels of Zn, while other heavy metals, such as Cd, Cr, Cu, Fe, Mg, and Mn were often present at relatively low concentrations.[7,8,15,21,24,25,28−35] These metals originated primarily from the metal oxides and residual steel belt wires of the tire shreds and chips (SI Tables S3 and S4). Laboratory studies found that acidic and alkaline conditions favored the leaching of metals and organic compounds from tire rubber crumb, respectively, and the leaching rates increased with decreasing particle size.[23,31] A number of field studies have been conducted to investigate the impact of tire shreds and chips used in civil engineering applications on the quality of surface water and groundwater through sampling of existing sites and field trials with follow-up monitoring of up to 2 years.[21,27,29−31,36,37] In general, Fe, Mn, Zn, and Al appeared to be the major contaminants of concern even though their concentrations did not exceed the respective maximum contaminant levels (MCLs) for drinking water in most cases, while the organic contaminants (e.g., amines, aniline, quinoline, amides, and benzothiazole) occurred only at trace levels. These results suggest that scrap tire materials may affect surface water and/or groundwater, and warrant further field study with controls.

The ecotoxicity of tire rubber leachate has long been recognized, although determination of the specific hazardous substances responsible for the toxic effects was difficult. Lethal and sublethal effects on aquatic biota as well as genotoxicity have been documented for tire leachate and solvent extracts of tire rubber.[12−15,19,25,26,38−43] Leachate from used tires was also found to be more toxic than that from the new ones,[14] which could be explained by the easier release of hazardous substances from the matrix of worn rubber. In general, the major toxic constituent in tire leachate is zinc, with minor contributions from organic compounds. Even though leachate from tire chips and tire rubber crumb can be toxic to some aquatic life, dilution (i.e., by infiltrating rainwater and groundwater) in natural systems is expected to reduce its toxicity and lower the associated ecological risk.

Contaminants Contributed by the Nonrubber Components of Artificial Turf. Besides tire rubber crumb, plastic fibers of artificial turf are also a potential source of heavy metals, particularly lead. Some manufacturers produced plastic fibers with encapsulated lead chromate pigment in the early years of artificial turf product development. Excessive levels (several mg/g) of lead had been found in some artificial turf fibers made of nylon or polyethylene/nylon blends, while fibers made of polyethylene commonly contained very low or undetectable levels of lead.[10,44,45] Even though the leaded pigment particles are not expected to leach from intact nylon fibers, deterioration of these fibers over time can result in the formation of lead-containing dust. In addition, artificial turf fields with exotic colors could also contain elevated levels of lead, probably due to the use of specialty pigments.[45] A scoping-level field monitoring study found that the lead contents in the fibers of six artificial turf fields ranged from 0.002 to 0.39 mg/g, which were below the standard set by the U.S. Environmental Protection Agency (USEPA) for lead in soils (0.40 mg/g).[46] Only fibers from the repaired area of one field had a high level of lead (0.70 mg/g), while the lead contents of tire rubber crumb in these fields only ranged from 0.01 to 0.05 mg/g.[46]

A comprehensive laboratory investigation found that the fibers from two artificial turf manufacturers had relatively high levels of Al (1.2−2.1 mg/g) and Fe (2.7−4.0 mg/g), while the contents of Cr, Cu, Mg, Mn, Ni, Sn, and Ti were in the range of 0.01−1 mg/g and those of Ba, Co, Mo, Pb, and Sr were below 0.01 mg/g.[35] The fibers from a third manufacturer contained even higher levels of Fe (14.3 mg/g) and Zn (7.6 mg/g), and relatively high levels of Ti, Sn, Cu, Co, and Ni (0.1−1 mg/g) as well.[35] The relatively high levels of heavy metals probably came from the coloring pigments and UV inhibitors (for photoresistance) in the polymers. The heavy metal contents of the carpet backing materials from these artificial turf products were

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Table 2. Concentration Ranges of Heavy Metals and Organic Contaminants Detected in the Drainage from Artificial Turf Fields

study and contaminants measured	sampling site and sampling method	concentration	water quality standard
Moretto (2007)[52]			
zinc	A newly installed artificial turf football pitch (with tire rubber crumb infill) located in the Lyon region of France was sampled. Field drainage was collected using a lysimetric system made from a stainless steel sheet buried under the field. The monitoring period was 11 months.	0.074–0.488 mg/L	5 mg/L[a]
arsenic		0.001–0.0147 mg/L	10 μg/L[b]; 10 μg/L[c]
copper		0–0.011 mg/L	1.3 mg/L[b]; 1.0 mg/L[a]; 2 mg/L[c]
lead		0–0.014 mg/L	0.015 mg/L[b]; 10 μg/L[c]
sum of benzo(k)fluoranthene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene.		0.016–0.091 μg/L	
Bristol and McDermott (2008)[50]			
zinc	Three artificial turf fields (with tire rubber crumb infill) located in the state of Connecticut in the U.S. were sampled. One of these fields was installed in the year of sampling, while the others were constructed in the previous year. Grab samples of the drainage were obtained from the discharge pipes of these fields.	<0.002–0.036 mg/L	5 mg/L[a]
lead		<0.001 mg/L	0.015 mg/L[b]; 10 μg/L[c]
selenium		<0.002 mg/L	50 μg/L[b]; 40 μg/L[c]
cadmium		<0.001 mg/L	5 μg/L[b]; 3 μg/L[c]
Hofstra (2008)[68,72]			
zinc	A total of five artificial turf fields (with tire rubber infill) from 5 to 6 years old in Sittard, Netherlands were sampled. Drainage from these fields was collected.	mean: 0.016 mg/L	5 mg/L[a]
Lim and Walker (2009)[47]			
antimony	A one-year old artificial turf field in New York city of the U.S. was sampled. Only surface runoff was collected, while the volume of runoff from the drainage collection pipes was insufficient.	<2.3 μg/L	6 μg/L[b]; 20 μg/L[c]
arsenic		<1.8 μg/L	10 μg/L[b]; 10 μg/L[c]
beryllium		<0.096 μg/L	4 μg/L[b]
cadmium		<0.35 μg/L	5 μg/L[b]; 3 μg/L[c]
chromium		2.2 μg/L	100 μg/L[b]
copper		5.4 μg/L	1.3 mg/L[b]; 1.0 mg/L[a]; 2 mg/L[c]
lead		1.7 μg/L	0.015 mg/L[b]; 10 μg/L[c]
mercury		<0.13 μg/L	2 μg/L[b]; 6 μg/L[c]
nickel		8.8 μg/L	30 μg/L[c]; 7 μg/L[c]
selenium		<1.9 μg/L	50 μg/L[b]; 40 μg/L[c]
silver		<0.54 μg/L	0.1 mg/L[a]
thallium		<1.9 μg/L	2 μg/L[b]
zinc		59.5 μg/L	5 mg/L[a]
30 VOCs		<1 μg/L each	
56 SVOCs		<5–10 μg/L each	

Table 2. continued

study and contaminants measured	sampling site and sampling method	concentration	water quality standard
Cheng and Reinhard (2010)[35]			
zinc	A one-year old artificial turf field (with tire rubber infill) in northern California of the U.S. was sampled. Drainage was collected using lysimetric systems made from plastic funnels buried under the field. The monitoring period was 1 month.	0.129−0.473 mg/L	5 mg/L[a]
nickel		<0.001−0.009 mg/L	30 μg/L[c]; 7 μg/L[c]
manganese		0.007−0.011 mg/L	0.05 mg/L[a]
iron		0.003−0.114 mg/L	0.3 mg/L[a]
copper		0.001−0.034 mg/L	1.3 mg/L[b]; 1.0 mg/L[a]; 2 mg/L[c]
cobalt		0.002−0.007 mg/L	
barium		0.010−0.043 mg/L	2.0 mg/L[b]; 0.7 mg/L[c]
naphthalene		<0.002 μg/L	
acenaphthylene		<0.002−0.314 μg/L	
acenaphthene		0.009−0.023 μg/L	
fluorene		<0.002 μg/L	
phenanthrene		0.071−0.292 μg/L	
anthracene		0.028−0.390 μg/L	
fluoranthene		0.029−0.180 μg/L	
pyrene		<0.002−0.02 μg/L	
benzo[a]anthracene		<0.002−0.212 μg/L	
chrysene		<0.002−0.034 μg/L	
benzo[b]fluoranthene		<0.002−0.040 μg/L	
benzo[k]fluoranthene		<0.002−0.014 μg/L	
benzo[a]pyrene		<0.002 μg/L	0.2 μg/L[b]; 0.7 μg/L[c]
indeno[1,2,3-cd]pyrene		<0.002 μg/L	
dibenz[a,h]anthracene		<0.002 μg/L	
benzo[g,h,i]perylene		<0.002 μg/L	
sum of 16 EPA priority PAHs		0.12−0.95 μg/L	

[a]National Secondary Drinking Water Regulations of USEPA. [b]National Primary Drinking Water Standards of USEPA. [c]Current guideline value of the World Health Organization.

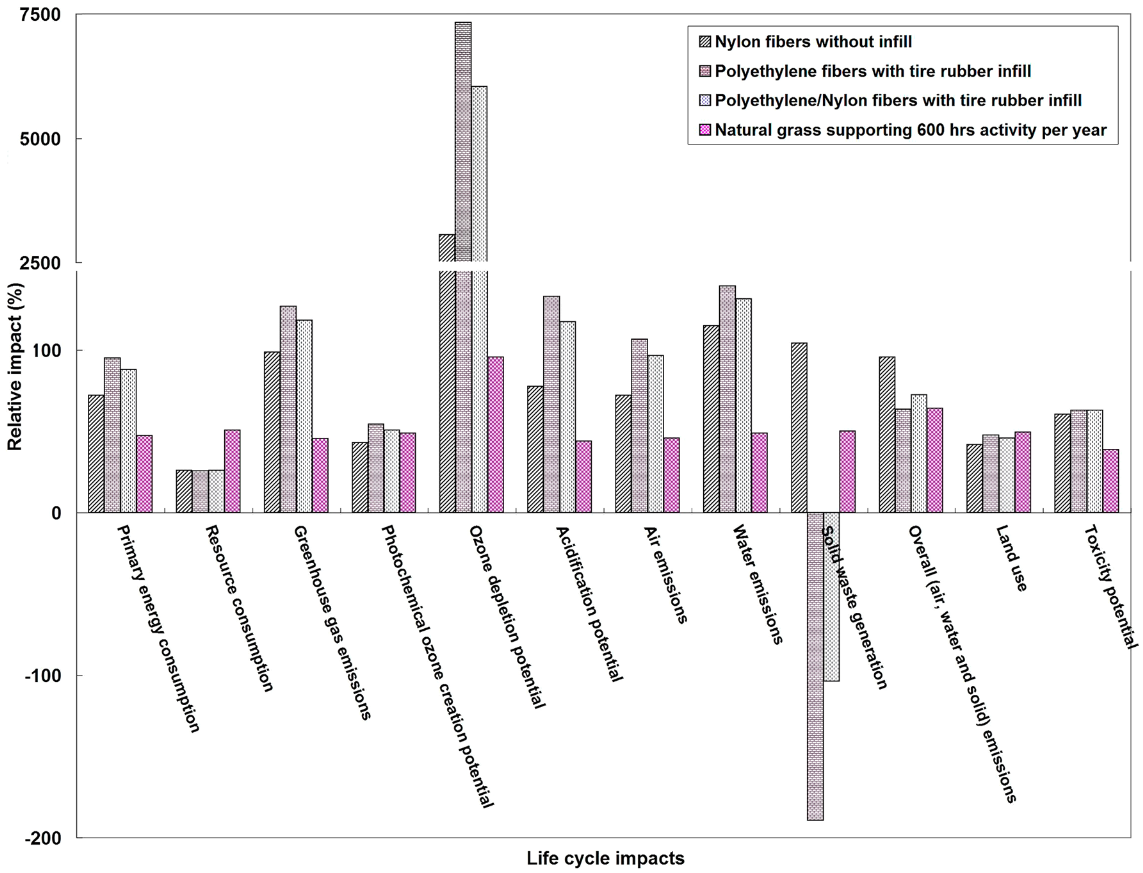

Figure 2. Life cycle environmental impacts of three representative artificial turf fields and an equivalent grass field (75 000 ft^2) that supports 600 h of activity per year, using a grass field of the same size but with an annual availability of 300 h as the basis of comparison (data from ref 62). One artificial turf had nylon fibers without infill, while the others had tire rubber crumb infill but with fibers made of polyethylene and 70% polyethylene/30% nylon, respectively. Although artificial turf fields could support up to 3000 h of activity per year, they were assumed to have annual availability of 600 h in this comparison. For natural grass fields, 300 h event activity per year is the typical annual playing capacity, while 600 h activity/year is the upper limit.

generally comparable to or less than those in the fibers.[35] Lead contents in the fibers and carpet backing materials were quite low (close or below 0.001 mg/g), indicating it was not a common additive used in the production of current generation of artificial turf. The fibers and carpet backing of artificial turf are made from the same polymers used in the manufacturing of a wide range of consumer products, and are not expected to have significant adverse environmental impacts. Nonetheless, the use of encapsulated lead chromate in some old fields and specialty colorants in fields with exotic colors makes it necessary to assess the fibers of artificial turf fields on a case-by-case basis.

Observations from Artificial Turf Fields. The tire chips or rubber crumb used in various civil engineering applications can be buried in soils, above or below the groundwater table, or stay at the surface. In contrast, the tire rubber crumb is applied as a relatively thin layer on the surface of artificial turf fields, and the sizes are typically much finer than the scrap tire materials used in civil engineering applications. Therefore, field observations are essential for understanding the actual release of hazardous substances from artificial turf and the potential impacts on the environment and human health.

The impact of artificial turf on the air quality of sports fields has been closely monitored in a number of studies. In general, the levels of VOCs, SVOCs, PAHs, heavy metals, and particulates ($PM_{2.5}$ and PM_{10}) in the air above outdoor artificial turf fields were found to be comparable to those of local background, and were within the regulatory limits,[9,46−51] although the results might only be applicable to the specific fields and conditions measured. One study found that the levels of PM_{10} and metals at the high play activity sites of artificial turf fields, although elevated compared to the background concentrations, were below the corresponding air quality standards.[46] The VOCs and SVOCs in the air above outdoor artificial turf fields resulted from volatilization from the fields and local traffic emissions, both of which were subject to air dispersion and dilution. In contrast, the concentrations of VOCs and PAHs measured in indoor sports halls with artificial turf were slightly elevated,[52−54] while the levels of particulates were similar to those in other urban indoor settings.[53,55]

With the porous structure of artificial turf, precipitation can easily percolate through the infill layer and potentially leach heavy metals and organic contaminants out of the tire rubber crumb. Several studies have characterized the contaminants in the drainage of artificial turf fields (Table 2). Overall, the concentrations of heavy metals and organic contaminants in the drainage were low with the exception of Zn, which occurred at concentrations up to near 0.5 mg/L. Many studies have demonstrated the removal of various heavy metals (such as Cu, Cd, Pb, and Hg) and organic contaminants (e.g., xylenes, toluene, naphthalene, and trichloroethylene) from wastewaters by tire rubber crumb,[56−59] while some of them also observed that zinc concentrations became elevated despite the removal of other heavy metal ions.[56,59] Relative to rainwater, the tire rubber crumb in artificial turf is expected to function as a net source of heavy metals and organic contaminants instead of a sink.

Ecotoxicity can be expected for the drainage from artificial turf fields with elevated levels of Zn, which adversely affects the growth, survival, and reproduction of aquatic plants, protozoans, sponges, molluscs, crustaceans, echinoderms, fish, and amphibians at concentrations as low as 10−25 μg/L.[60] The drainage from four pilot setups (with tire rubber crumb and specialty synthetic rubber infills) with controlled atmosphere and supervised human intervention treated with simulated rain showed very slight toxicity to *Daphnia magna* and *Pseudokirchneriella subcapitata*, while the drainage from an artificial turf football pitch (with tire rubber crumb infill) showed essentially no toxicity.[52] One field sample did show a low impact on the aquatic species, but chemical analysis results suggested that it was probably due to pollution external to the field.[52] Another study also found that the drainage from an artificial turf field with tire rubber crumb infill exhibited no toxicity to *Daphnia pulex*.[50]

Although air and water quality monitoring had been conducted on artificial turf fields of various ages (from newly constructed to 6 years old or more), the numbers of fields sampled and samples collected at each site were rather limited. Thus the results may not necessarily represent the potentially large variations in the design, manufacturing material, geographical location, use pattern, age, and other conditions of artificial turf fields, which can affect the release of contaminants. In addition, these field investigations were often constrained by available resources (e.g., personnel, equipment, and budget) and accessibility of field sites. Even though the existing field studies indicate artificial turf fields have limited impacts on air quality and aquatic environment, more comprehensive field monitoring data are needed to verify these findings.

Results from Preliminary Life Cycle Assessment (LCA) Studies. Both artificial turf and natural grass can have a range of environmental impacts, including consumption of raw materials and energy, and emissions to air, water, and land. Therefore, determination of which type of product has a lower overall environmental burden is not straightforward. To this end, LCA provides an efficient tool for systematically comparing the environmental impacts of artificial turf and natural grass through all stages of their life cycles (i.e., from “cradle to grave”).

Constructed mostly from synthetic materials, artificial turf fields have a much larger carbon footprint compared to grass fields. It has been estimated that the total greenhouse gas (GHG) emissions from manufacturing, transporting, installing, maintaining, and disposing of a 9000 m^2 artificial turf field in Toronto, Canada over a 10 year period is 55.6 tonnes CO_{2e}, while that from construction and maintenance of a grass field of the same size is −16.9 tonnes CO_{2e}.[61] Through absorbing large quantity of CO_2 during growth, natural grass serves as a carbon sink. On the other hand, the GHG emissions from the artificial turf field would be nearly doubled if the components were not recycled at the end of life.[61] It is worth pointing out that these results are site specific (SI) and the differences in playable time of the two types of fields are not accounted for in the comparison.

Figure 2 compares the life cycle environmental impacts of three representative artificial turf products with those of natural grass on a multipurpose recreational sports field (75 000 ft^2) over a 20-year time frame. Field availability, durability of the artificial turf fields, and maintenance requirement of the grass fields were based on the average data in the U.S.[62] The results indicate that artificial turf performed better or comparable to natural grass in the major environmental categories, including energy and resource consumption, emissions (air, water, and solid waste), toxicity potential, and land uses over the production, use, and disposal phases. Although the ozone depletion potential of the artificial turf fields, which stemmed predominantly from production and transportation, was much higher than that of grass fields, its contribution to the overall environmental impacts was less than 1% over their life cycles.[62]

The actual environmental impacts of natural grass and artificial turf fields are strongly dependent on their availability. For the grass field, its environmental impacts could almost all (excluding the ozone depletion potential) be reduced by a half with the doubling of field availability (Figure 2). Artificial turf fields have much higher playability compared to grass turf fields because of the lower maintenance requirement, superior durability, and availability in all weather conditions.[51] To have the same hours of use (e.g., 2400 h), additional grass fields (which are still not playable during the rainy season) have to be built to match the availability of an artificial turf field, which would involve significant environmental impacts from the construction and maintenance activities.[6] Therefore, the environmental impacts of artificial turf fields relative to grass fields can be significantly reduced when they are used toward the maximum availability (i.e., by substituting multiple grass fields).

It should be noted that the results of LCA are model-based representations of the real environmental impacts for the specific turf fields, and are only valid under the specific assumptions made on their production, installation, use, maintenance, and disposal (SI). The environmental and health impacts of a product can be significantly influenced by the material and energy inputs and outputs considered for each stage of its life cycle, as well as limitations in data and knowledge of specific environmental impacts.[63,64] The LCA studies conducted to date have limited scopes and are far from comprehensive or representative of all types of artificial turf and natural grass fields in all geographical conditions. Cooperation and participation of the artificial turf industry by sharing relevant data, and monitoring data on the emissions of organic contaminants and heavy metals to air, water, and land during the functional lifetimes of artificial turf fields, which were not included in previous studies, will be crucial in more accurately tracking their life cycle environmental impacts in the future.

■ HUMAN HEALTH IMPACT OF ARTIFICIAL TURF FIELDS

Because tire rubber crumb contains a wide range of toxic and even carcinogenic chemicals that can be released into the surrounding environment, the potential health risk for field users has been a major concern. Players can be exposed to the rubber particles and their hazardous constituents through several routes, including ingestion, dermal uptake, and inhalation, as illustrated in Figure 3. Many risk assessment studies have been conducted to characterize the health risk of tire rubber crumb in artificial turf fields via these exposure routes, with the results consistently showing that no significant health risk was associated with being on or playing on such fields.

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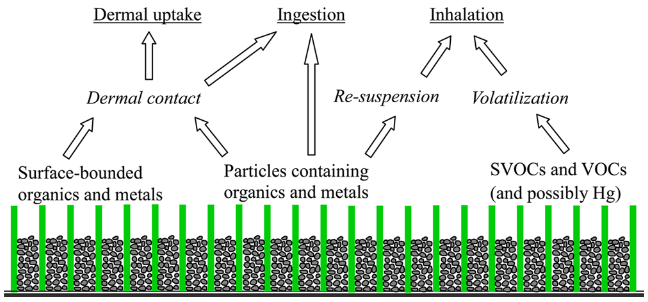

Figure 3. Major exposure pathways for athletes and occasional users to the hazardous substances in artificial turf fields. Tire rubber crumb can be intentionally or incidentally ingested by the field users, particularly children. SVOCs and VOCs volatilized from the tire rubber crumb and the fine particulates resuspended from the field can be inhaled. The organic contaminants and heavy metals on the exterior surfaces of the fiber blades and rubber infill, as well as the fine rubber granules, can stick to the skin and clothes upon contact. As a result, the users can also be exposed to these substances through dermal uptake and incidental ingestion (e.g., via hand-to-mouth activity).

Although intentional or incidental oral ingestion of tire rubber crumb on artificial turf fields is not a major exposure pathway for typical users, this may happen for young children. The potential risk of direct ingestion had been assessed in many studies, and no significant acute, cancer, or chronic adverse health effects were found at exposure levels ranging from acute to chronic scenarios.[43,54,65−69] Oral exposure can also occur through hand-to-mouth activity following contact with artificial turf surfaces, and such risk is typically associated with high degree of variability and uncertainty as the exposure is influenced by many factors, including the frequencies of field use, hand-to-playground contact, and hand-to-mouth activity, as well as the transfer efficiencies of chemicals from hand to mouth.[55] Nonetheless, there is no indication that the exposure to hazardous substances (PAHs and Pb) in tire rubber crumb via hand-to-mouth contact could cause adverse health effects.[65,70,71] Overall, studies evaluating end points in both children and adults consistently found that the tire rubber crumb in playgrounds and artificial turf fields poses low risk to human health through oral exposure.

Players can be exposed to the chemicals leached from the components of artificial turf and the tire rubber crumb through skin absorption. However, with the natural protection offered by human skin and the typically short contacting time with tire rubber crumb, dermal uptake of chemicals is unlikely to cause systemic toxicity.[55] In fact, risk assessment studies have shown that the doses of toxic chemicals exposed through dermal absorption were too low to cause any adverse health effects, including allergic response or indicated sensitization, for children and adults playing on artificial turf fields.[54,65,67] Biological monitoring also revealed that the level of a biomarker (1-hydroxypyrene) for PAH exposure in the urines of adult football players did not increase after intensive skin contact with rubber crumb on artificial turf fields, suggesting the uptake of PAHs via dermal pathway (and other exposure pathways as well) was negligible.[68,72]

Inhalation of VOCs, SVOCs, and particulates/dusts released from the tire rubber crumb of artificial turf fields is another important exposure pathway, particularly given the accelerated inhalation rates of the players.[48] Field monitoring showed that the levels of PAHs and VOCs detected in the air above outdoor artificial turf fields were not high enough to threaten human health,[47,48,73] and that the health risk from indoor artificial turf was also below the level of concern with adequate facility ventilation.[52−54] One study found that the PAH emissions from artificial turf fields could result in an excess lifetime cancer risk of 1×10^{-6} for professional athletes with 30 years of intense activity (5 h/day, 5 days/week, all year round) from inhalation, but no risk for discontinuous or amateur users.[9] No elevated

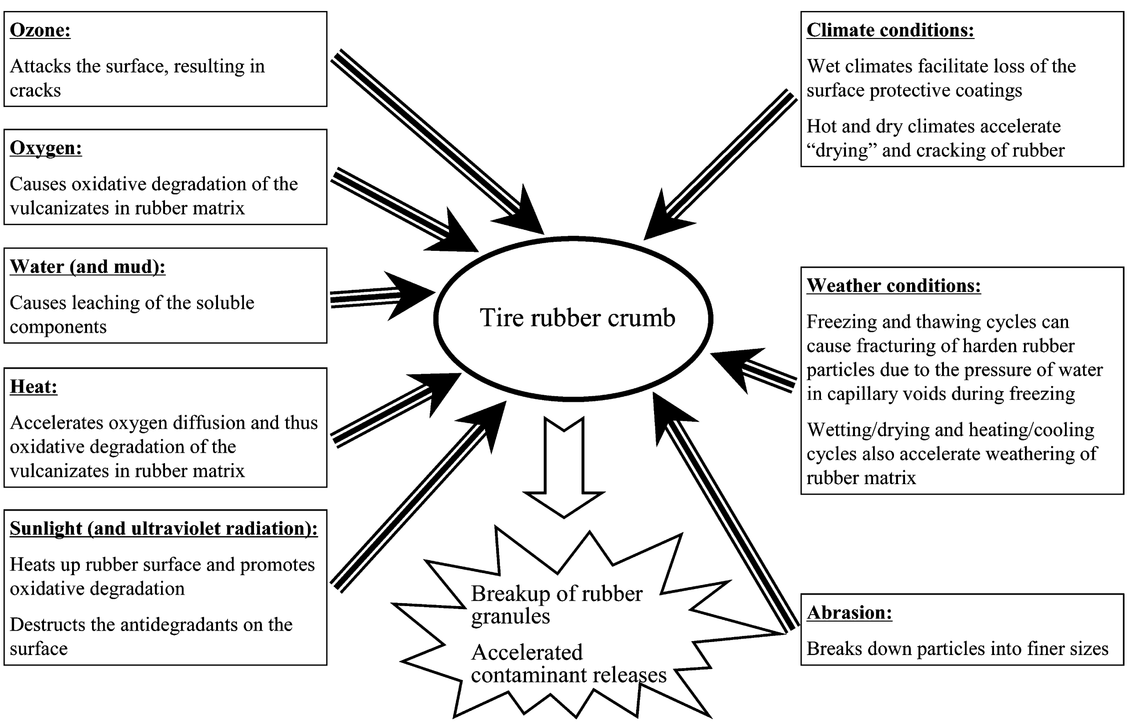

Figure 4. Influence of the major environmental factors on degradation of tire rubber crumb in artificial turf fields.

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risk was found with the exposure to respirable particulates (PM_{10} and $PM_{2.5}$) at artificial turf fields in both outdoor and indoor settings, either.[52−55] Taken together, it appears that the health risk posed by tire rubber crumb used in both outdoor and indoor artificial turf fields to professional athletes and occasional users through inhalation is insignificant. Health risk evaluation results indicated that elevated health risk from inhalation exposure could occur only for workers installing artificial turf in small and poorly ventilated facilities with a long exposure history (>5 years).[52]

AREAS OF FURTHER RESEARCH

Although a number of studies have investigated the environmental release of potentially hazardous substances from artificial turf and its components, and exposure evaluations failed to demonstrate significant environmental and human health risks for typical field installations, several questions pertaining to the environmental impacts of artificial turf fields over their life cycle and their mitifation remain. Addressing these issues should help resolve uncertainties that still hamper the adoption of artificial turf at some sites.

Degradation of Tire Rubber Crumb under Field Conditions. Characterization of the environmental breakdown of tire rubber crumb is crucial for understanding the environmental impacts of artificial turf as this process is accompanied with release of the hazardous additives in the rubber matrix and the degradation products of rubber polymers. Although it is known that the cross-linked polymer matrix of tire rubber can degrade slowly under natural conditions,[74] factors that influence the aging of rubber crumb are poorly understood. As illustrated in Figure 4, exposure to oxygen, ozone, heat, sunlight, and liquids can all cause changes in the physical and chemical properties of tire rubber crumb, and correspondingly release of contaminants from the degraded rubber matrix. A range of additives and stabilizers are used in tire manufacturing to inhibit undesired/unwanted chemical reactions within the rubber components and to sustain their structural integrity and desired properties over an extended period of time. Oxygen in air permeates into tire rubber and causes oxidative degradation of the vulcanizates, while the much more reactive ozone almost exclusively attacks the surface causing cracks perpendicular to the direction of applied stress in the rubber.[75] Heat accelerates oxygen diffusion in rubber stock and thus the oxidative degradation.[76] Ultraviolet radiation and sunlight promote oxidative degradation and destruct the antidegradants on the rubber surface.[77] Water and mud cause leaching of the soluble components from the rubber surface. Climate and weather conditions also contribute to tire rubber degradation as a composite result of the actions of sunlight, temperature, and water. Overall, the interactions with all these environmental factors lead to aging of tire rubber (i.e., cracking, splitting, oxidizing, and overall deterioration).[75,78]

A range of antidegradants are used by tire manufacturers to inhibit the attacks of oxygen and ozone (and flex cracking as well): antioxidants to limit oxidative degradation of the vulcanizates, antiozonants to retard the occurrence or growth of cracks caused by ozone attack, and flex-crack inhibitors to limit the initiation or growth of cracks resulting from cyclic deformation (i.e., flexing) of tires.[11,16] In addition, waxes are used to provide ozone protection through formation of a chemically inert surface barrier. Because they can migrate freely in the rubber stock, waxes are squeezed out onto the surface as the tire rolls, which also helps bring fresh antiozonants to the outside surface. As the antidegradants are gradually lost or used up through the life of tires, aged tires have drastically reduced resistance to weathering and initiation and propagation of cracks compared to new ones.[79] Due to the loss of antidegradants, rubber crumb produced from scrap tires are subject to much more significant attacks from oxygen, ozone, and sunlight compared to virgin rubber. The specific surface areas of tire rubber crumb are much higher than those of scrap tires, and most of the surface area is newly created by grinding or other mechanical processes. As a result, the volatilization of organic contaminants into air, and the leaching of heavy metals and organic contaminants into the percolating water from tire rubber crumb are expected to be significantly increased compared to the bulky scrap tires. The small particle sizes of the tire rubber crumb also facilitate the aging process.[76−78] With their high surface-to-volume ratios, granules of tire rubber are subject to significant ozone attack, which occurs predominantly on the surface.[78] Oxidative degradation is also accelerated due to easier diffusion of oxygen into the rubber stock.[75] Under natural conditions, the protection effect of antidegradants left in the tire rubber crumb is also lost more easily from the granules of smaller sizes.[77] Furthermore, the diurnal cycle of heating and cooling, and the freezing and thawing, as well as the wetting and drying cycles associated with weather patterns, along with the abrasion of the granules during playing time all can enhance the degradation of tire rubber crumb. The breakup of tire rubber crumb further accelerates the degradation process, and concomitantly, the release of hazardous substances into the environment.

Tire rubber is extremely resistant to biodegradation because of its complex composition and the additives within its matrix.[74,80] Nonetheless, recent research showed that the activity of both aerobic and anaerobic microorganisms could devulcanize tire rubber polymers.[74,81] *Thiobacillus ferrooxidans* and *Nocardia* could cause microbial desulfurization of tire rubber granules,[81−84] and the degradation rate generally increased with decreasing particle size when the cell attachment efficiency was not a limiting factor.[84,85] Nonetheless, degradation of tire rubber granules caused by microbial attack is much less significant compared to the attack by atmospheric oxygen.[86] Given the highly variable physical conditions (e.g., moisture and temperature) in artificial turf fields, biodegradation of tire rubber crumb is not expected to be important compared to the abiotic degradation processes discussed above. Because of the complex actions of oxygen, ozone, sunlight, and water on rubber degradation, and the significantly variable conditions of artificial turf fields, it is necessary to study the degradation of tire rubber crumb under relevant conditions over their functional lifetimes.

Leaching Dynamics of Hazardous Substances. The impacts of artificial turf fields on the environment are expected to be localized but last throughout their functional lifetimes. To predict the long-term impacts of artificial turf fields and help designing appropriate environmental safeguards, it is necessary to understand the environmental release of toxic metals (e.g., Zn, Pb, and Cd) and organic contaminants (e.g., PAHs) on a fundamental basis. Heavy metals are nondegradable in comparison with organic contaminants, and hence persist in the recipient environment. Thus the accumulation of heavy metals released from artificial turf fields over long-term is of particular concern. The high contents of ZnO, and to a lesser degree, PbO and CdO, in the tire rubber crumb present a significant point source of these hazardous substances. A typical soccer pitch/field can contain a total of 1.2 tonnes of zinc (assuming the rubber crumb has an average ZnO content of 1.5%). It has been estimated that under natural conditions 10–40% of the Zn could be released from the fine tire debris (<100 μm) mixed in soils within one year.[87] If 10% of the ZnO in the tire rubber crumb of an artificial turf field were released over its functional lifetime (10–20 years), it would contaminate 24 000 m^3 of water to the secondary drinking water standard (5 mg/L), or 1 million m^3 of water to the USEPA's criteria maximum concentration (CMC, 120 μg/L) for the protection of freshwater aquatic life. Similarly, the potential leaching of Cd and Pb, which have much lower MCL and CMC values than Zn, also poses significant environmental concerns. Because of its negative environmental effect and high cost, the tire industry has attempted to reduce the use of ZnO in tires and substitute it with alternative vulcanization activators, but with limited success so far.[88,89] Therefore, the risk associated with Zn leaching from tire rubber crumb would remain for artificial turf fields in the foreseeable future.

Tire rubber also contains significant levels of PAHs, which originate from the highly aromatic (HA) oils added as extender oils and the carbon black added as a reinforcement filler during production (SI). Due to concerns on the harmful effects of PAHs on human health and the environment, tire manufacturers had begun to substitute HA oils with alternative extender oils since the 2000s.[90] Extender oils that contain more than 1 mg/kg of benzo[a]pyrene or 10 mg/kg of the EU-8 priority PAHs have been banned in tires manufactured in or imported into the European Union (EU) countries since 2010.[91] As a result, major tire manufacturers have been implementing the changes at their plants worldwide. Meanwhile, carbon black is still used as a reinforcement filler of choice in tire manufacturing, thus its contribution to PAHs in tire rubber is becoming relatively more important.[92] Overall, with the phase-out of HA oils in tire production, the contents of PAHs in tire rubber crumb are expected to decline significantly over this decade.

The risk on human health and the environment posed by heavy metals and organic contaminants occurring in artificial turf depends on the rates at which they are released and transported into the target organisms.[93] The hydrophobic PAHs in tire rubber crumb are not expected to desorb readily. It has been observed that the PAHs on commercial carbon black materials were not leached by artificial lung fluid,[94] and that the PAHs on carbon black incorporated in cured rubber formulations were scarcely available to various aqueous media.[95] Similarly, the rubber stock also has high affinity for HA oils and PAHs, and these organic contaminants are not expected to leach out easily. Therefore, characterizing the release of contaminants and their subsequent fate and transport under field conditions is critical to assess their actual risk. Many factors, such as the composition of the infill, and its particle size and age, the acidity of rainwater, and the ambient temperature are expected to affect the leaching rates of heavy metals and organic contaminants from tire rubber crumb, while the subsequent transport behaviors of the contaminants released are affected by their interactions with the underlying rock materials and pH of the drainage.[35,49] The long-term evolution of the contaminant release rates is difficult to predict: they can decrease over time due to the depletion of contaminants on the surface of the rubber granules, while the accelerated weathering of rubber granules exposed to sunlight, oxygen, ozone, and water/moisture can result in formation of cracks and possibly breakup of the rubber particles, which are expected to enhance their release.

Large-scale monitoring campaigns based on systematic random sampling of all artificial turf field sites can be cost- and resource-prohibitive. Thus carefully coordinated laboratory and field investigations are invaluable for characterizing the release of heavy metals and organic contaminants from artificial turf under relevant environmental conditions, as well as their transport behaviors along with the field drainage. It is particularly worthwhile to study the contaminant release under conditions representative of "worst case" scenarios (e.g., high temperatures and frequent rainfalls) to estimate the upper bound of impacts.

Management of Storm Drainage from Artificial Turf Fields. To mitigate the release of potentially hazardous substances from artificial turf fields into the aquatic environment, optimized treatment systems and management strategies are needed to remove the contaminants before the drainage is discharged into the receiving body. The gravel layers beneath the artificial turf serve as a reservoir for the rainwater fallen on the fields. The crushed rock used as a base material in the construction of artificial turf field (Figure 1b) has a neutralization effect on precipitation (e.g., acidic rainwater),[49] and can effectively retain Zn through sorption/coprecipitation.[35] Its presence in artificial turf fields help immobilize some of the heavy metals released from the tire rubber crumb, although the drainage of artificial turf fields still contained heavy metals at appreciable levels.[35,50,68] Given the relatively large areas of artificial turf fields, significant quantity of drainage can be collected for beneficial uses after proper treatment, such as field cleaning and irrigation of adjacent grass lawns.

Even though many of the contaminants that can be present in the drainage from artificial turf fields do not have relevant regulatory standards, it is prudent to treat the drainage to prevent potential synergistic impacts of the contaminants at low concentrations. The drainage is produced only intermittently and often has complex chemical composition with significant variations in the concentrations of the contaminants, thus conventional biological, physical, and chemical processes developed for removing organic contaminants and heavy metals from industrial and municipal wastewaters may not be effective. Besides the technical capability, the treatment process should also meet the criteria of being robust, low-cost, and easy to maintain. The hydrophobic organic contaminants (such as PAHs) can be adsorbed from aqueous solutions onto activated carbon, while heavy metals can be removed by mineral sorbents through sorption and coprecipitation. Therefore, mixed sorbents (e.g., activated carbon and mineral sorbents) packed in the configuration of a filtration bed or a permeable reactive barrier can be employed to remove the contaminants leached from tire rubber crumb. Such treatment system can be installed conveniently under the artificial turf fields to help mitigate the potential impact of field drainage on aquatic environment.

Disposal and Recycling of Artificial Turf Components. Typical artificial turf fields have functional lifetimes of 10–20 years. Rubber crumb and other components of artificial turf degrade upon exposure to sunlight, air, and water, and eventually must be disposed of. Landfilling is the default disposal option for scrap tires that are not recycled or reused. However, tires in any shape or form have been banned from landfills in the EU countries since 2006,[96] while landfilling of cut or shredded tires is currently allowed in only 36 states of the U.S.[4] Given the large mass of tire rubber crumb used in

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Table 3. Comparison of the Advantages and Limitations of the Major Types of Infill Material for Artificial Turf

type	advantages	limitations	cost	recyclability	field performance
silica sand	a natural mineral mined from gravel pits; durable; does not get very hot from absorbing the heat from the sun.	the playing surface is very hard and abrasive; weights more than the other infill products; compaction can occur; can generate dust.	least expensive	can be recycled or disposed of with little restriction.	widely used in the second generation artificial turf
tire rubber crumb	provides excellent stability, uniformity, and resiliency; proven durability and performance; made from postconsumer recycled materials; does not harden or change composition, allowing the surface to stay consistent over time.	small rubber particles easily stick onto clothes and skin; retains heat from the sun and can get very hot; may release volatile and semivolatile organic contaminants into the air; may leach heavy metals and organic contaminants into water.	more expensive than silica sand	can be recycled or disposed of in landfills	has been field tested and proven for performance over many years
silica sand and tire rubber crumb mixture	provides a firmer playing surface than rubber only infill; mixed infill helps ensure optimal field safety and playability.	segregation of the rubber and sand particles can occur and the mixed infill needs to be loosened periodically.	costs less than rubber only infill	tire rubber crumb can be separated from sand, and subsequently recycled or disposed of in landfills	has been field tested and proven for performance over many years
thermoplastic elastomers	made from virgin materials that do not contain hazardous additives; less heat absorption when exposed to the sun compared to rubber infill.	subject to wide manufacturing variations; may harden over time; some products do not provide enough flexibility and crush resistance; some products do not contain ultraviolet stabilizers and undergo degradation relatively.	very expensive	recyclable	the durability and performance remain to be proven
EPDM rubber	made from virgin material that does not contain hazardous additives; durable and more environmentally friendly than tire rubber; available in a variety of colors; less heat absorption when exposed to the sun compared to rubber infill.	chemicals used in the rubber manufacturing can leach into the contacting water	very expensive	recyclable	has been used in european countries, yet the durability and performance remain to be proven
organic infill	derived from natural plant fibers and cork; nontoxic and truly environmentally friendly; less heat absorption when exposed to the sun compared to rubber infill; resists wear and ultraviolet rays.	requires antimicrobial treatment to prevent degradation; may break down; may be infected by insects; compaction can occur over time.	relatively inexpensive	can be recycled into other products	new to the market, and has no track record for durability
rubber coated sand	does not contain hazardous additives; eliminates the compaction and dust issues of sand; less heat absorption when exposed to the sun compared to rubber infill.	a softer filler material need to be added to the acrylic material; coating may break down over time.	more expensive than sand infill	can be recycled	new to the market, and has no track record for durability

artificial turf fields, effective treatment or recycling schemes must be developed to minimize the environmental impacts upon disposal. A potential solution is to use the spent tire rubber crumb as tire-derived fuel to supplement traditional fuels (SI), although attention should be paid to control the potential emissions of heavy metals contained in the rubber and toxic organic contaminants, such as PAHs, and dioxins and furans (due to the presence of chlorine in tires) during burning.[97] The plastic fibers and carpet backing of artificial turf used to be landfilled at the end of the field's functional lifetime. A few companies have started to offer the alternative of full field recycling for artificial turf since 2010. After thorough separation of the infill materials, the plastics are shredded, repalletized, and converted into useable materials for new artificial turf applications or other extruded plastic products.

Development of Alternative Infill Materials. The human health and environmental risk of artificial turf can be eliminated or reduced by substituting the tire rubber crumb with alternative infill materials containing less hazardous substances. Several alternative infill materials have been developed by artificial turf and rubber manufacturers.[6,48] Table 3 summarizes the advantages and limitations of the six major types of infill materials available on the market. Even though the alternative infill materials contain much less hazardous substances than tire rubber crumb, they are often considerably more expensive. Besides the criterion of containing minimum hazardous substances, the safety, durability, and cost of the infill materials are also important considerations. Sand and tire rubber crumb have been field tested and proven for several decades, while the performance and environmental friendliness of the newly emerged infill materials, including thermoplastic elastomers, ethylene propylene diene monomer (EPDM) rubber, organic infill, and rubber coated sand remain to be field proven.[6] Furthermore, some of the alternative infill materials also release organic contaminants and have environmental impacts similar to those of tire rubber crumb.[7,52,70,98] It may take years to develop environmentally friendly alternative infill materials that can match the durability and performance of tire rubber crumb. It should be noted that raw materials and energy are required for the production of most of these alternatives, in addition to the lost benefits of reusing scrap tires. Thus the life cycle environmental impacts should also be considered when developing substitutes for tire rubber crumb in artificial turf.

PERSPECTIVE ON THE TURF WAR

Recycling and reuse of tire rubber in artificial turf contribute to sustainable development by reducing the dependence on new materials, waste generation, and energy consumption. The limited number of studies conducted to date appear to indicate that the concentrations of hazardous substances in the drainage from artificial turf fields and in the air above them are relatively low and of no significant concern. Nonetheless, the release of organic contaminants and heavy metals into the air, water, and soil in the surrounding environment occurs continuously, and their cumulative masses can be significant over the fields' functional lifetimes. There remains a significant knowledge gap that must be urgently addressed with the fast expansion of the artificial turf market. Given the wide range of designs, ages, and conditions of artificial turf fields, it is likely that the contaminant release and the environmental impacts are variable from site to site. It is also important to assess more systematically the risk posed by the tire rubber crumb on the environment and human health. The contents of some hazardous substances, such PAHs, in tire rubber are expected to decrease over time as the industry becomes more environmentally conscious, which is going to reduce the associated risk in artificial turf. Meanwhile, the development of alternative infill materials for replacing the tire rubber crumb, which may significantly increase the cost of artificial turf, will help eliminate some of the major environmental concerns. Overall, manufacturers are expected to produce more environmentally friendly artificial turf as the general public become increasingly concerned with its negative environmental impacts.

It is worth pointing out that the turf grass industry has also been making significant progress in developing new types of grass to meet the water challenges and the increasing environmental concerns associated with fertilizer and pesticide applications. Improved turf grasses can be extremely drought-tolerant, tough, and fast-growing, while having lower requirement for fertilizers and maintenance. Organic fertilizers that can eliminate most of the environmental issues associated with chemical fertilizers are also available. These advances have greatly reduced the necessity of artificial turf in warm climates. On the other hand, artificial turf appears to be the most viable playing surface currently available in indoor sports facilities, in the cold climates where the prime growing season of turf grass is rather short, and in the dry climates and other zones with scarce water resources.

Natural grass and artificial turf each have their advantages and limitations (Table 1). Despite the existence of methods for estimating their life cycle costs and environmental impacts, a generally applicable methodology to compare objectively and quantitatively the benefits and impacts of natural grass and artificial turf is difficult because some of these attributes are unrelated (belong to different categories) and site specific, and depend on how users value them.

ASSOCIATED CONTENT

Supporting Information

Additional information on disposal of scrap tires, composition of tire rubber and production of tire rubber crumb, ZnO and PAHs in tire rubber, assumptions in the LCA studies, conditions and major findings of selected TCLP studies on ground tire rubber and tire chips, potential organic contaminants that can be leached from tire rubber, composition of passenger and truck tires, composition of tire rubber ash, and scrap tire management in the U.S. (2005−2009) is available. This material is available free of charge via the Internet at http://pubs.acs.org.

AUTHOR INFORMATION

Corresponding Author

*Phone: (+86) 20 8529-0175; fax: (+86) 20 8529-0706; e-mail: hefac@umich.edu.

Notes

The authors declare no competing financial interest.

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Artificial turf systems for sport surfaces: current knowledge and research needs

P Fleming

Civil and Building Engineering Department, Loughborough University, Loughborough, Leics LE11 3TU, UK.
email: p.r.fleming@lboro.ac.uk.

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Abstract: Artificial sport surfaces, for team outdoor sports, are growing in number in many sports including soccer (association football), rugby, hockey, and football (American and Australian). The science of their behaviour has, it is argued, been under-researched in comparison to the development of artificial turf products and also the development of many of the sports with respect to athleticism and advances in equipment such as footwear. This paper reviews artificial turf design requirements and behavioural aspects to develop the science, and draws from a range of up-to-date literature to identify the key principles of behaviour and gaps in knowledge. The relationship between the material types used in the substrate support and surface system (comprising some form of shockpad and turf, the turf infilled or unfilled) behaviour is demonstrated in regard to the key performance factors of player–surface interaction – for both impact and traction. The data demonstrate the relatively complex behaviour of surface systems, and highlight the pitfalls of current simple mechanical tests in relation to human loading. Degradation and the role of maintenance to sustain long-term performance are issues also highlighted and discussed. Surface safety is discussed through a short review of studies related to injury risk, albeit most were associated with the contrast between natural turf and artificial turf; however, there is clearly more research required in injury surveillance to include aspects of objective surface measurement. This paper additionally provides the reader with a state-of-the-knowledge review of where current thinking is now, and where future research is considered to be of merit, in developing sport surface science.

Keywords: sport surfaces, artificial, injury, impact, traction, testing, measurement, durability, materials, maintenance, biomechanics, player loading, safety

1 INTRODUCTION

The general topic of sport surfaces is large, covering both indoor and outdoor surfaces for which aspects of design, materials, construction, testing, performance, and durability are all important. Indoor sports hall floors [**1**] often comprise sprung systems, and are referred to as ‘area elastic’ – for which the application of a point load causes deflection over a relatively large area around the point of application of the force. Outdoor surfaces are referred to as ‘point’ elastic with deflection local to a smaller area/or point loading. Outdoor surfaces are used for many sports, include running track, though this review paper is restricted to surfaces for the popular team sports, soccer, rugby, and hockey that rely on a rectangular ‘pitch’ of large dimensions for training and/or competition and have come to rely on ‘artificial turf’ - comprising synthetic fibres (green usually) which exhibit a look similar to natural grass. However, many behaviour principles and test methods covered here are applicable across the range of sports that also utilize artificial turf such as tennis, cricket, and rugby league.

The roles of a sport surface are essentially to provide safe provision of player interaction and/or ball interaction to an appropriate level of performance (over its design life) and be cost-effective and manageable. The importance of one particular role or the order of priorities usually depends largely upon the key stakeholder such as the funder, the owner/operator, sports governing body, or end user(s). In terms of cost and management, many facilities are of course for hire and can generate significant income revenue.

Artificial surfaces increasingly represent an effective alternative to natural turf, and permit relatively higher usage (greater durability) but require relatively higher initial capital spend [**2**]. However, their 'all weather' capability usually offers real benefit in terms of high intensity use, often suggested as up to 50 h per week, usually coupled with floodlights to extend playing hours and income. Outdoor artificial sport surfaces represent significant assets, and to ensure good value for money need to be carefully selected to suit the users, constructed to exacting standards, and then well maintained. Artificial turf was originally marketed as 'low maintenance', and poor aftercare has, in the author's opinion, affected the legacy of provision in the UK and elsewhere. The introduction of 'performance standards' specific to each sport that discriminates between competition levels has slowly educated many stakeholders into a more business-like attitude in recent years, in the author's opinion.

Notwithstanding the improvement in product guidance and specifications from policy makers (see section 2.2), there have been many significant developments in the technology applied to the manufacture and construction of surfaces, and research on the effects on human (and ball) interaction has largely lagged behind. This imbalance is, it seems, slowly changing but currently the emphasis is on elite sport performance with little aimed at the community level.

In the UK, for example, the number of artificial turf facilities has been steadily increasing, largely due to the development of products more suited to football (soccer), funding streams to promote widening participation, and the health agenda, and also the potential income benefits for community/school facilities clubs operating artificial turf facilities relative to natural turf. In addition, lower professional clubs are increasingly installing artificial turf products, primarily for business reasons.

However, from a more international perspective, the introduction of artificial turf facilities in countries with high summer temperatures, such as Australia for Aussie rules football at community level [**3**], require careful consideration. The environmental issues such as drought/water shortage provide great impetus for non-turf installations, but in contrast there is concern that artificial turf can experience elevated surface temperatures in comparison to natural turf.

Artificial turf is, it appears, under much scrutiny for aspects of its health-related implications such as player injury risk, but also its play performance to ensure that it is acceptable at all levels of sport. The current market for more artificial turf facilities and healthy industry competition has spawned a very large range of proprietary surface systems. It was estimated in 2008–9 that around 25 000 000 square metres of artificial turf carpet was produced in Europe by the main artificial carpet manufacturers, against a reported stock comprising of 15 000 soccer, more than 1000 hockey, and more than 5000 tennis facilities in Europe [**4**]. Currently, worldwide market figures are not available.

This paper presents a state-of-the-art review of both the research literature and industry perspectives describing both the types of, and behaviour of, (outdoor) artificial turf surface systems, and pertinent aspects of the regulatory framework (for soccer, rugby, and hockey) within which surfaces should/must comply. The scientific focus of the paper is intended to be international, whereas the practical aspects of design, construction, and maintenance are predominantly drawn from direct experience of UK practice and to an extent European practice.

2 ARTIFICIAL SURFACES – TYPES AND REQUIREMENTS

To those outside of the surfaces industry, including researchers, the vast range of products marketed and the large array of terms used (often incorrectly applied in the author's opinion) can be confusing. In addition, several terms are used interchangeably to mean artificial turf, such as: synthetic turf; synthetic fibres; synthetic carpet; artificial grass; plastic grass; and football turf, in marketing literature and the popular press.

The artificial grass carpet is made from yarn which may be either woven (produced on a loom similar to cloth) or tufted (injected and looped into a backing material using a machine that is like a large sewing machine and cut so that each loop forms two strands). Once woven or tufted the individual strands of yarn are then termed fibres, and also referred to collectively as the carpet 'pile'. Usually some form of adhesive is used to reduce the problem of fibres being pulled out of the carpet backing. Another different form of producing an artificial turf carpet is termed ‘needle punching’, in which the yarn is punched into a centre fabric to produce a more felt-like mix of fibres with more random vertical, horizontal, and angled orientations.

Furthermore, the terms relating to the ‘generation’ of artificial turf products is also confusing – and is further clarified below.

2.1 Surface systems and classification

There exist many documents that describe artificial turf systems in relation to specific sport provision including a range of specifications and standards. In the UK, the term ‘synthetic turf pitches’ was and still is common in British Standards [**5**] and industry guidance [**6**], though recent guidance from Sport England [**7**] on selecting surfaces uses the term ‘artificial grass pitch’. However, ‘artificial surface’ was also used in the early British Standards and the latest European Standard [**8**] uses the term ‘synthetic turf surface’ to mean a sports surface comprised a carpet of tufted, knitted, or woven construction whose pile is designed to replicate the appearance of natural grass. FIFA’s documentation [**9**] now refers to artificial turf as ‘football turf’.

The artificial turf market has changed considerably since the early days of the first installation for American Football in the Astrodome, Houston, Texas, in the 1960s. The products have been developed largely by manufacturers with sufficient resources and vision such that, despite the very negative publicity surrounding its introduction into English professional football in the 1980s, today, sports such as hockey, rugby, soccer, tennis, and cricket utilize artificial grass for training and/or competition – up to international level.

The first generation of products was developed in the 1960s and comprised a dense artificial turf carpet, usually with nylon fibres (good for durability) and was unfilled (also termed non-filled). These systems were relatively hard in terms of impact absorption, and were abrasive to skin contact from sliding. Carpets typically comprised 10–12 mm length fibres, woven or tufted into the carpet, and anecdotally these systems were observed to develop very high traction. The earlier systems used no shockpad underneath the carpet and a high ball bounce in football was one consequence, though an integral shockpad (part of the carpet backing) was common in later developments. Water was added to the surface by hockey to help reduce ball speed and skin abrasion effects (note: in 1974 this system was used for hockey for the first time at the Olympics). Hockey still uses a form of this simple system today, though currently with more shockpad and softer fibres. It was a general finding, unsurprisingly, that these hard abrasive early surfaces carried a greater risk of injury relative to today’s available systems [**10**].

The second generation of products were developed and introduced in the 1970s, and is often termed sand-filled carpets. Typically, it comprised 20–25 mm length fibres of either monofilament or fibrillated polyethylene, a softer yarn than nylon, with wider spaced tufts of fibres saving costs and used to accommodate the sand infill. This system is in wide use today, and is very popular at clubs for community multi-use facilities. Denser tuft spacing with a smaller quantity of sand has been subsequently developed and termed ‘sand-dressed’. The sand infill provides weight and stability to the lighter (less dense) carpet, and it also helps control play performance aspects such as underfoot traction and ball bounce. Sand-filled systems proliferated throughout Europe, and are used for hockey (it is a cheaper than denser non-filled watered systems) and also for tennis. The ‘astro-turf boot’, as it was often termed, was introduced for these surfaces specifically comprising multiple short dimples on the base to provide better shoe–surface interaction. The term astro-turf™ was a trade name and is sometimes incorrectly used today to mean many forms of artificial carpet.

The third generation (3G) of products were developed in the late 1990s, and were specifically aimed at better simulation of natural turf and to permit the use of normal studded (cleated) soccer boots. FieldTurf, now FieldTurf Tarkett, a division of Tarkett Inc., based in Calhoun, Georgia, USA is the company credited with inventing this product. The 3G systems typically comprise a relatively long fibre in the carpet, 40–65 mm is a typical range, using monofilament or fibrillated fibres with a relatively low tuft density (large space between tufts). They are termed ‘filled’ surfaces [**8**], and relatively large quantities of infill are required in comparison to first or second generation products, with usually a sand layer at the base (for stability) and crumbed rubber/elastomeric particles (can be a recycled tyre source) to aid the play performance and comfort. The infill is installed to a depth of typically two-thirds of the pile height, and may comprise some 120 tonnes of recycled rubber for a full-sized soccer pitch. The free-standing length of fibre showing above the infill (sometimes referred to as ‘pole’ length) is important for aspects of surface friction such as ball roll. These 3G surfaces have proliferated in association football (soccer) and more recently also in rugby union. There exist detailed performance standards from the IRB [**11**] and FIFA [**9**] following their own research and monitoring programmes into play performance, testing, and injury, discussed further in sections 2.2 and 3, respectively.

The term fourth generation is also now in use in the industry, though its meaning is less well defined and may be used inconsistently as there is little precedence from implemented systems. Some would suggest that this new generation describes a surface system with a reduced need for infill (and its associated maintenance) and that the carpet may comprise fibres that both maintain their resilience performance but are also durable, a difficult behaviour to achieve with thermoplastics. The products currently being marketed as fourth generation usually include a mix of fibre types in the carpet that are shaped during extrusion (into fibres with a stiffened profile or are composite fibres) and may then also be textured (curled) to improve resilience. A mix of fibre lengths and relatively close tuft spacing also seem to be a feature.

Recent technological developments in artificial surface systems include innovations to the three key components that make up the surface 'system': the shockpad; carpet; and infill. Shockpads have been developed and improved with regard to *in situ* products mixed and laid on site (also known as wetpour), prefabricated products including tiles (interlocking like a jigsaw) or rolls, and in some cases are designed into the aggregate base beneath the surface system. In some cases the shockpad may be excluded if the design of carpet/infill together with the underlying base provides enough shock absorption. Carpets, and specifically developments in the fibres that are woven or, more commonly today are tufted into a carpet product, have been developed to meet different sport's requirements and many advances have focused on the compromise between friction properties, and durability, softer fibres are favoured by the players but they wear out quickly or flatten. Carpets with a range of fibre lengths, number of fibres per tuft, shape, texture, and tuft spacing are available. Fibres that absorb and radiate less heat to users are also being developed into carpets for hotter climates. Infill developments have tended toward alternatives to recycled rubber crumb (shredding truck/car tyres) with other types of 'waste' products or bespoke new products from virgin material emerging on the market. This includes coloured infills used for aesthetic purposes, and also to overcome some limitations of (black) recycled rubber such as their odour and high heat absorption. Many claims are made in marketing information regarding infill qualities but little published research is currently available on their behaviour or assessment in any detail [**12**].

A typical cross-section of an artificial pitch design is shown in Fig. 1. This shows the sub-layers that form the pitch foundation, with concomitant requirements for stability, load bearing (relatively light from the users but the designer must consider maintenance plant and other applications such as for emergency vehicles or other uses of the facility such as public events), frost resistance, planarity, and through drainage (in most cases the surface systems are designed as porous). The requirements for the thickness of the sub-base is based upon the strength of the subgrade (natural soil), and for the asphalt is based on required planarity usually with a minimum buildable thickness of 40 mm. The design life of the foundation should be at least 25 years. The expected life of the surface system is expected to depend on intensity of use, and to some extent the maintenance regime, but is typically 5–10 years for a 3G system and perhaps 15 years for a second generation system – though no authoritative data exists. The shockpad (when separate) should be designed to last two carpet lifetimes. Product quality and installation quality are also expected to affect longevity.

In the UK a recent publication by Sport England about surface selection, aimed at educating clubs [**7**], has attempted to establish a set of clearer guidelines for discriminating between water-type (water-based) systems aimed at high level hockey; sand type (sand-filled and sand-dressed) aimed at hockey primarily; and rubber crumb type: long-pile 3G 65 mm (with shockpad) aimed at rugby; 55–60 mm (with or without shockpad) aimed at football; and short pile <40 mm (also considered acceptable for some levels of hockey). This publication, produced in conjunction with the national sports governing bodies, was in response to increasing confusion of users/clubs/schools on how to select an appropriate surface for their needs. The issue as to whether hockey can be played to an appropriate skill level on short-pile 3G systems in the UK, installed for soccer as the primary sport but that have passed FIH performance testing, has raised the very real problem of player feedback not seeming to agree with the suite of compliance testing specified in the relevant sport's performance standards (see section 4.3).

In spite of the increasing number of documents available it is a challenging task to objectively compare between the many surface systems available, or contrast cost versus product 'value'. It is only since 2006, in the UK, that audits of the stock of sport facilities has been made public by the database

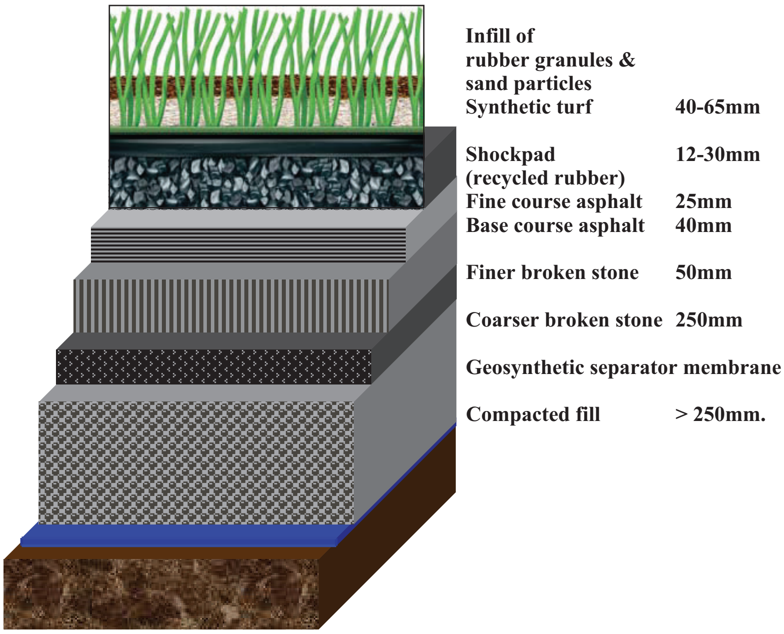

Fig. 1 Cross-section of typical construction profile for a typical long-pile infilled (3G) pitch designed for soccer and/or rugby, showing layers and typical thickness

'Active Places' [**13**]. However, enhanced sport standards [**9**, **11**] and codes of practice for construction [**6**] and aftercare, and dissemination of research into practice [**14**] has, in the author's opinion, led to improvements in the quality of sports surface provision in the last 10 years, in the UK at least.

2.2 Performance requirements

The sports governing bodies set out their own methodologies for performance compliance of newly installed artificial turf pitches (ATPs). These in general follow a similar framework, however, comprising the following steps for approval for high level competition play performance.

Step 1: accreditation of manufacturer's products for use in the specific sport. This is based on the complete 'system', from a series of laboratory tests (most are to BSEN standards) with set limits for compliance stated in the performance standard for the sport. This allows the product vendor to show that a system has been approved by that sport for a specific level of competition, or for multi-use.

Step 2: accreditation of a constructed pitch. This is based upon a series of field tests (many are to BSEN standards) required to meet the compliance targets. This shows field compliance with the system approved in the laboratory in step 1 and acceptable quality of installation (e.g. for FIFA 1 or 2 star approval in their 'quality concept' [**9**]).

Step 3: Long-term performance. This requires pitch retesting at intervals, testing as per step 2, to demonstrate ongoing quality at the specific level for which it was originally designed. The frequency of retesting is dictated by the play level 'rating' of the pitch.

Note: all accredited testing has to be carried out by certified and approved testing laboratories.

The development of performance-related standards and specification for test methods in the UK dates back to the introduction of the British Standard 7044 'Artificial Sport Surfaces' [**5**], which superseded previous Sports Council guidance, and has been updated and superseded by the European harmonization of many standards in 2007. Multi-use facilities, also termed multi-use games areas.

Offer a cost-effective solution for schools and other facilities with a wide range of sporting demands. While a multi-sports area is often seen as a 'safe option', it should be recognized that there will almost always be a need for compromise, primarily in terms of the performance of the playing surface, as no one surface is suitable for all types of sport [**8**].

Furthermore, compromises on the player–surface interactions are considered more difficult if players are to be protected from an increased risk of injury. For example, reducing the shock absorption level to increase the ball rebound for tennis might result in a greater number of injuries to football players who will fall onto the surface more frequently than

Table 1 Summary table of performance specifications for soccer, rugby union, hockey, and multi-use

Player-surface tests	Sport and level of competition				
	Units	FIFA 1 Star	FIFA 2 Star	FIH (Global)	IRB
Force reduction[1]	%	55–70	60–70	40–65	60–75
Multi-use		55–80		35–54	61–80
Vertical deformation[2]	mm	4–9	4–8	N/A	4–10
HIC-critical drop height[3]	m	—	—	N/A	>1.0 (>1.3)
Rotational resistance[4]	Nm	25–50	30–45	N/A	30–50
Multi-use		25–50			25–50
Slip resistance[5] (pendulum test)		—	—	0.6–1.0	0.6–1.0
Linear friction- stud deceleration value (modified pendulum test with studs)	g	3.0–6.0	3.0–5.5		
Ball–surface tests					
Ball rebound resilience (from set drop height)	m	0.6–1.0	0.6–0.85	0.1–0.4	0.6–1.0
Multi-use		0.61–1.14		0–0.5	0.61–1.14
Ball roll (simple ramp)	m	4–10	4–8	9–15	—
Multi-use		5–10		5–15	
Angled ball behaviour (change in velocity)	%	45–70 dry 45–80 wet	45–60 dry 45–80 wet	N/A	50–70

Note that space does not permit full explanations of the test methods or test philosophy. In general all the sports have used test results from 'high quality' natural turf as the gold standard to help set the acceptability test limits (with the exception of hockey). Key points (1–5) made about the tests in Table 1 can be found within the text.

tennis players. It is suggested that, as a general rule [**8**], the characteristics of the surface should be designed to satisfy the priority sport of a facility.

The test techniques previously referred to in the 'approval' process steps are largely aimed at 'performance' in relation to player–surface and ball–surface behaviour, and Table 1 summarizes the required target values for several tests used for soccer [**9**], rugby [**11**], hockey [**15**], and also multi-use [**8**] to provide a comparison. In addition to those shown, a number of test methods exist for durability of systems in relation to environmental factors and also resistance to mechanical wear – which require climate cabinets and simulated footfall machines. In addition, in brief, physical assessment of artificial turf carpets includes measurement of: mass per unit area; tufts per unit area; pile weight; tuft withdrawal force; pile length above backing; fibre Identification, to show product compliance. Tests also exist for shockpads such as: mass/area; thickness; compressibility; and tensile strength. Infill-related tests for sand include: shape; size range; and bulk density; and for rubber infill the size range.

1. The per cent force reduction (also often termed shock absorbency) represents the test result peak vertical impact force when compared between the sport surface and concrete, a larger percentage meaning 'softer' underfoot (see section 4.1 for further details).
2. Vertical deformation is measured from a similar impact test to that used in the per cent force reduction, but which measures the maximum surface deformation under the impact loading.
3. HIC is the 'head injury criterion', also interpreted as 'critical drop height' – interpreted from analysis of an accelerometer attached to a (5.5 kg) metal hemispherical missile dropped from increasing height. It aims to help provide protection against concussions and serious head injury. Rugby guidance stipulates a shockpad to pass this test.
4. Rotational traction – a simple studded disc is rotated on the surface until the maximum resistance torque is measured. Too low a torque is said to represent too slippery, and too high represents the possibility of 'foot lock' and ankle injuries (see section 4.2 for more details)
5. The pendulum test measures the energy lost through surface friction from contact of the test foot swung from a set height. It was developed from skid resistance testing of road surfaces. For infilled 3G surfaces a studded foot is used and the peak deceleration on contact is also recorded. The mass of the swinging arm and studded test foot is specified as 2 kg in mass.

There are many potential challenges for approximating a human athlete's surface interaction with simple mechanical tests such as these, discussed further in section 4.

2.3 Durability

The long-term degradation/wear and resulting performance behaviour of artificial turf has not been well documented to date. A few studies have collected data in the UK that demonstrate the changes

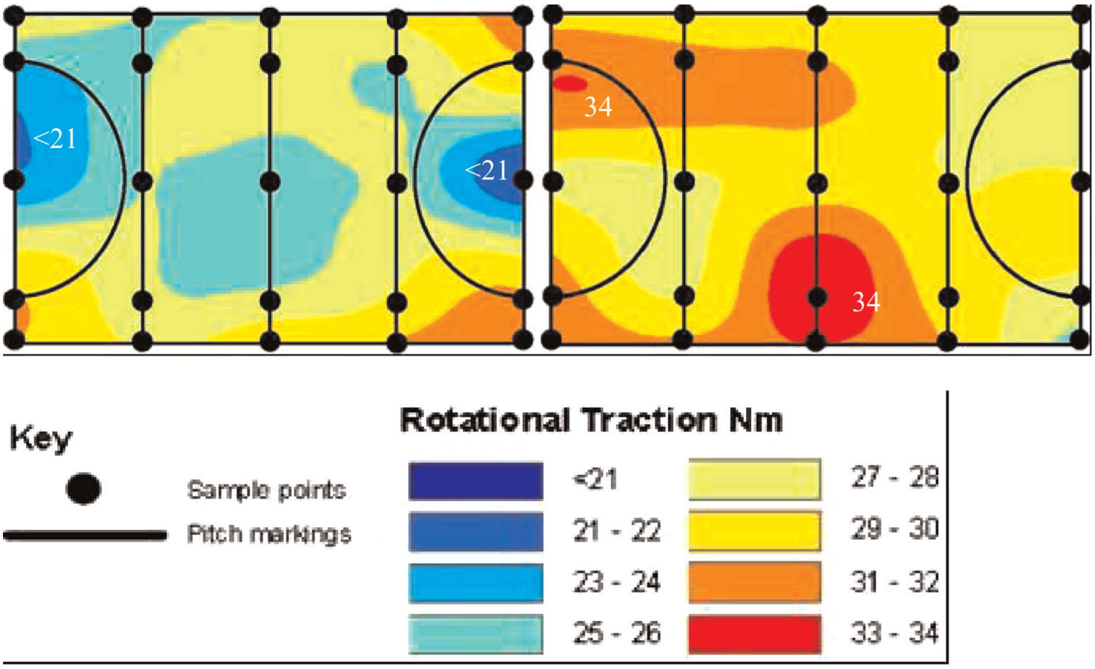

Fig. 2 Hockey pitch rotational traction variability (note the 25 test positions shown as large dots are not equally spaced) for two pitches in the UK with the same construction specification. See section 2.3 for further details of the analysis. The left-hand pitch (Cannock) is several years older than the one on the right (Highfields), and gave much lower traction readings (some sport values are shown) in general and supported by obvious visual signs of wear such as fibre shortening and loss (adapted from [**16**])

in performance over a significant time period, for hockey [**16**], and regarding maintenance [**17–19**]. There are also industry guides [**6**] that present what is considered 'best practice' for maintenance but are largely based on qualitative measures of observed behaviour.

Recent studies of note have contributed increased understanding of the effects of contamination on the performance of sand-based systems [**17**], the use of simple tests to evaluate changes in performance [**18**], and the 'wear' across elite hockey surfaces over several years [**16**, **20**]. Figure 2 shows the results from rotational traction testing on hockey water-based fields [**16**]. The figure shows interpretation of the data from 25 spot test positions (and each values is the mean of five tests at that position) after processing with an interpolation function in the ArcGIS software [**16**] that smoothes the transition between spot values using a simple weighting for each neighbouring value dependent on its distance. The figure is intended not for detailed interpretation but to illustrate the spatial variation of tractions across a pitch to show high and low traction regions, and to compare between two pitches of the same construction specification and with exactly the same artificial turf carpet product. The older carpet (by several years) showed lower peak traction results, corroborated by visual observation of more excessive pile wear.

The results of a project in Holland which monitored 50 long-pile 3G soccer fields to FIFA test standards for the period 2001/02–2008, and which also summarized the hours of use and maintenance regimes have been recently presented [**21**]. In general, these findings showed that the pitches had become harder (average of a 10 per cent drop in force reduction, a 19 per cent change from the original state) and had become less compressible (an average deformation reduction of 5 mm, a 45 per cent change from the original state). The data also showed increased ball roll (average change of 3.5 m, a 35 per cent change from the original state) and increased ball rebound (average increase of 0.15 m, a 17 per cent change from the original state). However, for rotational traction (test 4 in Table 1) the field values remained very similar over the period – perhaps surprisingly in light of the other changing data. It was concluded in the study that there was a (weak) trend of higher use and lower levels of maintenance leading to poorer performance (i.e. failures to comply with the target values in Table 1) across a range of the play-performance-related tests. It was pointed out in the study that during the period of this programme of testing the performance limits in the standards for soccer had changed [**9**] and to an extent so had the surface product designs to meet newer more stringent criteria. This data represents a unique study in the literature but it is unfortunately limited due to non-inclusion of other possibly influential data (which was not collected) such as temperature and moisture state of the surfaces at the time of testing. Furthermore, for the standard FIFA testing six positions are selected from specific sub-areas of a pitch and clearly more test positions would be beneficial to substantiate the extent of changes as would relocating on the same test position for each revisit.

The degradation mechanism(s) of artificial turf wear and the effectiveness of maintenance practice are currently poorly understood and under-researched.

3 SPORT SURFACES AND INJURY RISK

The subject of injury risk is broad and very complex, particularly if the full range of risk factors is considered and a full review of the details of the many epidemiological studies in team sports – even with the specific focus here on sport surfaces. However, this section is offered as a brief overview of some pertinent studies and findings that are considered useful to inform the debate on surface design and testing in relation to aspects of player performance and injury risk.

There have been many major studies on injury incidence, some in reports by government-related bodies such as the European Union (EU), that have analysed the data acquired from the EU injury database for example. In a 2007 EU report [**22**] soccer was stated as responsible for most injuries comprising 36 per cent of the 2 500 000 sport-related injuries reported, and hockey sixth comprising 5 per cent. A study in Australia reported that soccer was responsible for 8 per cent of the total injuries recorded, and rugby and hockey were found to be responsible for 8 and 3 per cent, respectively [**23**]. An added complexity for reviewing past injury studies is that the classification and categorization of injuries and injury types are not comparable between studies reported from around the world. In response to this, a consensus statement was developed in 2006 [**24**] on injury definitions and data collection procedures for studies in soccer, and subsequently for rugby union in 2007 [**25**]. The definition of injury therein includes any physical complaint sustained by a player that results from a match or training, and the analysis and reporting method promotes the expression of injuries per 1000 hours of exposure (typically) – leading to a much better determination of risk and risk management strategies. This specific development in harmonizing data collection has been pivotal and underpinned the recent work of FIFA and the IRB in their research into injury risk of artificial turf in comparison to natural turf. Two studies [**26**, **27**] concluded that injuries on natural and artificial turf, for both genders, was more than seven times higher in a match situation than during a training situation based on the incidence per 1000 playing hours. During the FIFA 2002 and 2006 World Cups the injury incidence [**28**, **29**] in the matches was recorded as extremely high at 81 and 69 per 1000 playing hours, and was compared to a maximum of 28 per 1000 hours in other comparable studies. The increase was attributed to the high value and high intensity of these tournaments, and also relatively short rest periods between matches.

However, against the context of these findings of a relatively high risk of injury at the elite level of professional soccer the question of what changes in injury statistics or patterns is less clear for the surface as a factor, or as a consequence of change in surface from natural to artificial, or from training on artificial and playing on natural, or from varying properties across pitches. There has been concern of a perceived higher risk of injuries on artificial turf in comparison to natural turf for many years, and to some extent this still exists in contemporary media coverage. However, some relatively recent robust injury studies have concluded that there is no difference in risk between natural and artificial surfaces in soccer [**30**]. In a study by Meyers and Barnhill [**31**] on American football they claimed that natural and artificial turf gave similar risk for injuries, but that there were significant differences between the types the injuries. Fuller *et al.* [**27**] looked at the risk factors and showed that player-to-player contact was the highest cause of a risk of injury. Although studies by FIFA have shown very similar statistics regarding in-game activities (passes, tackles, etc.), an increased risk of sliding burns on artificial turf was highlighted in a study by Ekstrand *et al.* [**30**]. FIFA have since added a simulated ‘skin abrasion’ mechanical test requirement to their suite of tests [**9**] for a product to pass and acquire a FIFA star rating.

However, there remains a lack of detail in nearly all injury studies regarding the properties of the surfaces utilized and very little research to date into natural turf behaviour and injury risk. In a study by Orchard *et al.* [**32**] on the risk of anterior cruciate ligament (ACL) injuries in Australian rules football (AFL), they showed differences in injury risk for different species of natural grass (the species is usually chosen to suit the specific growing related climate of the region). Similarly, it is suggested here, that might not differences in pile length and tufting density combined with the type and amount of infill that is used across the range of artificial turf systems be considered to have similar possibilities for affecting the risk of injury to users on artificial turf surfaces? However, previous injury studies have not provided real detail on the surface systems encountered in the studies.

In addition to the better injury study design and reporting overcoming issues of comparing injury datasets, clearly there have also been major changes in many sports relating to the physical conditioning of the athletes, the footwear used, and to an extent the rules or the nature of the game. The evolution of surfaces and their behaviour is another extrinsic factor and is complex.

To date it is not yet clear what affect a change of surface can have on the nature of the athlete–surface interaction, and hence loading on the body, and hence injuries that can be directly attributed to the user's interaction with the surface. One recently reported study has highlighted some problems and limitations of using objective (simple) mechanical tests within an epidemiological study seeking to determine the effect of the surface state [**33**]. In this work by Twomey and colleagues in Australia, detailed ground testing was carried out at the natural turf venues of 41 AFL games, and tests included measures of hardness and peak rotational traction. Of the 130 injuries recorded 12 were considered as likely to be related to ground conditions, and 29 possibly related. However, for those injury events classed as 'likely', the mechanical measurements showed no unacceptably hard (or strong) ground, and six of these 12 injuries were on grounds with very low traction data – as opposed to the usual hypothesis of high traction creating greater risk. In general, the injuries observed in this study occurred on surfaces that were assessed to be in the 'acceptable' range for both hardness and traction. Larger prospective studies such as this are very rare in the research literature and from findings such as these the merits of including the current range of industry standard portable mechanical tests can be questioned, specifically as to whether they are in fact the right tests to use in relation to injury risk studies. It is apparent that these industry tests currently used to 'certificate' pitches to International Governing Body (IGB) standards may not be suited to injury studies if they do not simulate athlete movement and loading (see section 4).

In addition to damage to muscle and bone, a more recently identified concern for human health issues is that of chemical 'contamination' produced from the materials used in the manufacture and construction of artificial turf and also biological contamination from bacteria that may grow more prevalently in the conducive environment of an artificial pitch. Recycled rubber infill (from tyres) has in some countries been under intense scrutiny and been restricted in its use, though the increasing volume of recent related literature suggests a very low risk to human heath from contact or inhalation. *Staphylococcus aureus* bacteria (SAB) is a pathogenic bacterium, termed MRSA [**34**] for strains resistant to methicillin-type antibiotics, and although harmless and prevalent on human skin can access the internal body through cuts and grazes and cause infections that generally take longer to treat and can be severe if untreated. In a recent study a survey of 20 infilled synthetic turf fields, along with two natural turfgrass fields, was conducted [**35**] to determine microbial population and presence of SAB. SAB colonies were not found to be present on any field; however, SAB colonies were found on other tested surfaces such as balls and other accessory equipment. It was concluded in this study that concerns that infilled synthetic turf harbours and provides a breeding ground for SAB is unfounded and unwarranted. However, in addition to this one notable study there are many discussion items and magazine articles in the media, particularly in the USA, relating to both an increase in MRSA in athletes (not necessarily focused on sport surfaces, skin-to-skin contact is a high risk factor). Furthermore, it appears maintenance companies are offering services to regularly treat sport fields with disinfectants to reduce the perceived risk of infection.

It can be concluded that sport surfaces remain a likely and plausible risk factor in sports injury aetiology, albeit perhaps one amongst many other confounding factors, and are perceived as a risk factor by users – especially in the UK for professional soccer players for example [**36**] on natural turf. The user perception of risk relating to the surface they play on is an interesting issue, although little researched it appears. The latest artificial surface products are still relatively new, and older professional players and coaches within the sport of soccer in particular remember the poor quality first generation products that were trialled in the UK in the 1980s and were soon deemed unplayable and banned at the professional level. It is the author's opinion, based on experience, that many users and coaches lack detailed knowledge of the artificial turf systems they play or train on and have had little or no education regarding footwear selection. Clearly, there is also uncertainty as to how to best measure the parameters that describe surface performance in a way that is most relevant to the user regarding their performance and safety and this is discussed in the next section.

4 MEASURING SURFACE BEHAVIOUR

There exists a need to scientifically evaluate the suitability of the specific play-performance tests, introduced in section 2.2, that are utilized in current practice for surface system assessment and approval. Table 1 sets out many of the test requirements, grouped into player–surface interaction and ball–surface interaction, the latter considered no further in any detail in this paper but is clearly very important to the surface users (see section 4.3). In regard to player–surface interaction, the suite of tests currently utilized are aimed at impact behaviour (vertical forces), and foot–surface traction–slip behaviour (horizontal forces).

Impact behaviour and traction behaviour have received the most attention in past research across all sports in general, largely from researchers in biomechanical and engineering disciplines. Impact behaviour in relation to head injury has received considerable attention for sports such as American football and AFL, and more recently in guidance for rugby union (see Table 1 for limits). However, space does not permit further consideration of head impacts in this paper. The focus of the following sections will be on the response of the whole surface system to loading of different magnitudes and different rates of loading and the relevance and interpretation of the available impact tests will be discussed.

Recent research work at Loughborough [**20**, **37**, **38**] has aimed to contribute to the knowledge base of sport surface science, specifically with regard to better describing artificial surface system composition to explain the behaviour under load, and much of the work in this section is drawn from this recent doctoral work.

4.1 Impact response

The interaction of a user with the surface in terms of an impact can take many forms; however, the current testing standards specify tests regarding 'foot contact' and 'head contact'. The industry measurement standard for (simple) foot–surface contact is based on a portable device known as the 'artificial athlete' (AA), mechanical test. The AA measures the peak impact force from a controlled energy spring damped impact, from which force reduction is determined, and the device is adapted by changing the spring (to lower stiffness) to measure the surface's vertical deformation under impact (see Table 1 for limits). Figure 3 shows the AA, in picture and schematic form. The AA test has remained the 'gold' standard test across many sports, and was originally devised for athletic track testing to represent the heel impact of a heel–toe running action and measure cushioning behaviour of a surface as shown in Fig. 4, in simple form. The AA load cell measures the peak impact force (the mechanism involves a 20 kg weight dropped 55 mm onto a sprung bearing plate of 70 mm diameter) and compares this peak value to a reference force representing a rigid surface, and from this determines the 'force reduction' value (in per cent) for the surface under test. Three repeat drops are normally done at each test location. Recent technological developments have introduced the advanced AA which uses an accelerometer (instead of the load cell used in the AA), and by manipulation of the impact data also reports both a peak surface deformation and the 'energy restitution' for each impact – currently a draft European standard. The energy restitution of a surface is currently a topic of interesting debate on whether the surface recovery is a factor in player fatigue and how best to measure it. Figure 5 shows a graph of force reduction for two hockey short-pile carpets, with a range of thickness of shockpad beneath, and demonstrates the large range of force reduction measurement that can be achieved, and in comparison to the limits set out in the FIH requirements (also see Table 1).

Research into human–surface interaction loading has demonstrated that the athlete adapts to the surface at, or soon after, first contact on a change of surface properties [**39**, **40**] by changing leg stiffness through flexion/extension. This observation of human behaviour on surfaces leads to the question as to whether a fixed energy impact device, that produces very different peak reaction forces on the range of different surfaces, is the best method to represent the real human interaction condition. However, the AA force reduction scale is useful to rank 'hardness' across a range of surfaces. When one considers the effect of the (vertical) impact force applied to the materials under test and their likely response, particularly those strain hardening (see Fig. 6) elastomeric materials such as rubber particulate and foams (used widely in sport surfacing products), the stiffness response is clearly dependent on the initial state and also the load

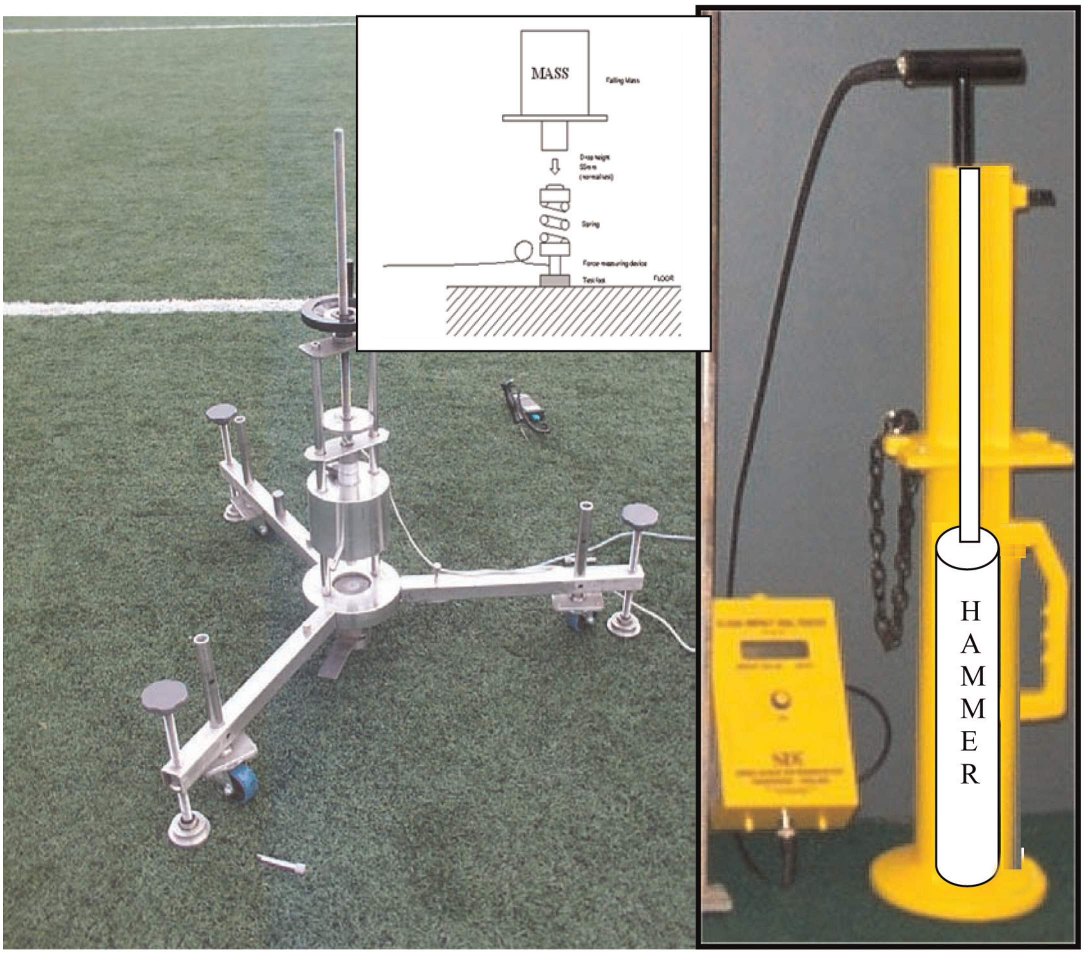

Fig. 3 Impact test apparatus. Left is the AA, showing the 10 kg drop mass and the test foot visible beneath the frame, the schematic drawing shows the impact mechanism. Right is the 2.25 kg Clegg hammer (not to scale) showing the guide tube and readout – the overlaid drawing shows the drop mass connected to the handle

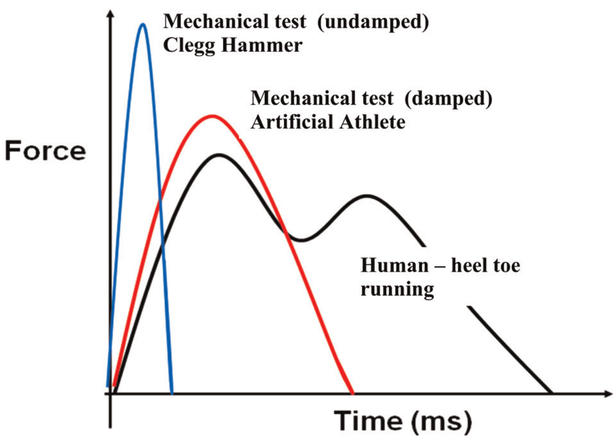

Fig. 4 Comparison of the relative impact loading from a human runner and two mechanical impact testers, the AA and Clegg hammer (see also Fig. 3)

path length (i.e. applied load magnitude). As a consequence, there is a need to carefully set the mechanical test load magnitude (and contact area) to produce the most appropriate material response in relation to the expected response under an athlete's loading. Furthermore, the hysteresis behaviour of the materials under test, i.e. energy loss through deformation, is a function of the strain levels induced and hence the load/area magnitudes applied. As a result, the application of inappropriate loads in mechanical testing will lead to incorrect material responses for deformation and strain, energy loss, and energy return in relation to what may be expected for the human loading. The multi-layer (and thin layer) construction of most modern sport surface systems leads to further exacerbation of these challenges of interpreting impact test data, as the impact response will depend on the stress and strain distribution in possibly all of the layers. The shockpad beneath the carpet, in long pile filled (3G) systems for example, has been show to have a very large affect on force reduction measurements [**20**].

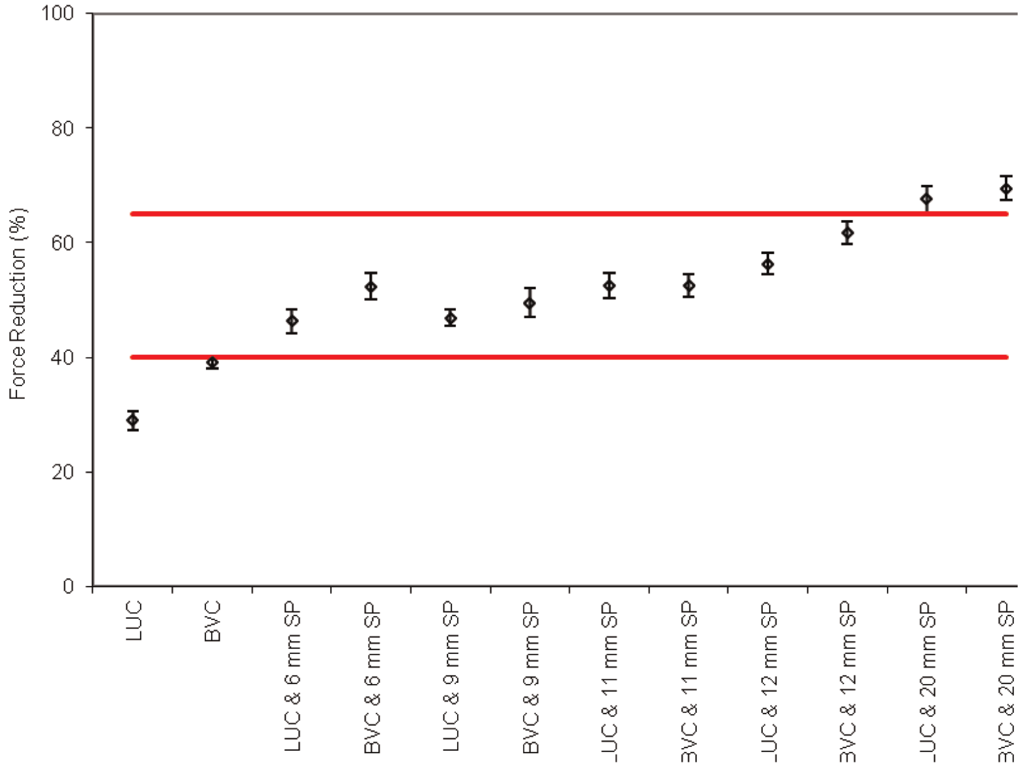

Fig. 5 Mean force reduction measured by the AA on 12 samples of shockpad/carpet system set on a concrete floor in the laboratory. Loughborough University Carpet (LUC) = 11 mm Nylon carpet with a 3 mm integral shockpad and Belle Vue Carpet (BVC) = 11 mm Nylon carpet with 6 mm integral shockpad, shown with increasing thickness of a separate shockpad (SP) system beneath (whiskers show one standard deviation, and the horizontal lines show the 40 and 65 per cent limits for FIH 'Global' level approval). Reproduced from [**20**]

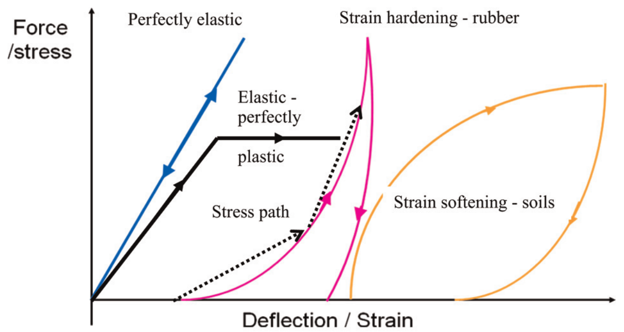

Fig. 6 Material behaviour under load, showing idealized behaviour, elastic and plastic, and 'real' behaviour (hardening/softening) expected for rubber and soil. The two stress path vectors (arrows) attempt to show the variation in rubber stiffness response (non-linearity) expected for the same stress tensor but different initial conditions, whereby when already under some compression/load there is expected a higher stiffness response

In response to the need for low-cost more portable impact testing of surfaces the Clegg hammer (see Fig. 3 – shown with the AA device) has been evaluated and has shown promise for routine measurements. It has demonstrated, in general, good correlations with the AA on sport surfaces. Figure 7 shows two relatively large datasets on a range of pitch systems, one from extensive field testing and with around 100 test positions across a range of five different UK short-pile Nylon (elite level) hockey pitches, with integral and/or *in situ* shockpads beneath [**20**], the other from extensive laboratory evaluation of impact behaviour of a long-pile rubber infilled (3G) soccer surface [**38**]. The two fitted curves show a perhaps surprisingly good similarity in the correlation and overlapping force reduction range. In contrast the sand-based system, medium-pile length of approximately 22 mm, infilled with sand and with a shockpad beneath, shows very little correlation between the impact test devices [**20**]. This is thought to be due to the more rapid rate of loading imparted by the Clegg hammer causing greater inertia reaction effects in the sand-based system and it was also observed that the sand surface was more disturbed and displaced by the Clegg hammer impact than the AA impact. In addition, it was also noted during

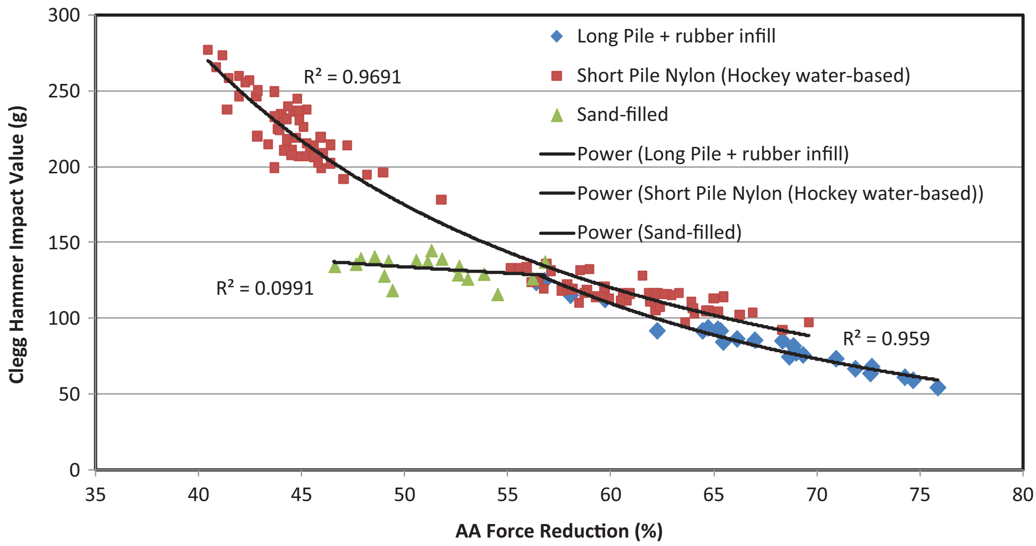

Fig. 7 A graph presenting the relationship between the industry standard AA and the relatively simple Clegg impact hammer, for three different sport surface systems. Note the contrast between the much stronger correlations observed on the more elastic systems and their proximity compared to the sand-based (more plastic) system

fieldwork that large changes in ambient temperature affected the coefficients of correlation between the Clegg and AA for the rubber infilled surfaces, suggesting that estimating an AA force reduction value directly from conversion of the Clegg hammer measurement is inadvisable despite the general correlations presented here. The Clegg hammer is, however, suggested as a useful tool for site monitoring of hardness (e.g. see [**18**] regarding maintenance). If a surface system becomes progressively harder (or softer perhaps but this trend is considered less likely on artificial turf) then the Clegg data, easily collected, could be used to trigger a more detailed inspection, a specific maintenance (e.g. decompaction) process and/or an independent sport surface test specialist to visit and advise.

It should be noted that field testing for compliance is not routinely carried out on all artificial turf pitches installed (in the UK), nor on natural turf, due to costs primarily and a lack of regulation (in the UK and in many countries it is believed) that enforces regular testing for performance or safety aspects, especially for lower level competition and community multi-use surfaces. However, there remains no data on how many pitches are in fact tested.

4.2 Traction behaviour

Players in soccer and rugby use specific footwear with studs to penetrate and interlock with the playing surface, and by so doing generate 'traction' forces. This ability to generate traction between a player's footwear and a sporting surface is a crucial factor influencing the player's movement and performance. The traction force produced contributes to the locomotion of an athlete and their ability to accelerate or decelerate, and to change direction, or in the case rugby help generate scrummage forces between the teams. The level of traction produced at the shoe–surface interface reportedly has the potential to contribute to or cause injury (see section 3) whereby too low a traction resistance force will result in slipping, whilst excessive traction resistance will cause foot 'sticking' to occur [**9**].

Many authors have investigated the traction properties of sports footwear, and have evaluated a combination of a variety of shoe types and surface types, concluding that the traction generated at the shoe–surface interface is generally explicit for each shoe–surface combination [**41–46**]. There has been little attempt in this literature, however, to try and explain and understand the outcomes of the testing, or to develop a model for traction to understand and explain the mechanism of interaction and the relationship between the somewhat complex number of variables involved at the shoe–surface interface. Many of these previous studies, to their detriment, have included very limited information detailing the surfaces used in their trials and specifically their constituents and properties which limits any further interpretation of these datasets. There are, in general, very few papers with high-quality

Table 2 Factors considered to influence shoe–surface traction behaviour [**38**]

Sports-specific movement	Footwear	Playing surface	Environment
Mass of athlete	Number of studs	Physical characteristics of the carpet layer	Water
Loading rate	Stud configuration	Physical characteristics of the infill layer	Temperature
Angle of foot	Size of stud	Mechanical properties of the carpet layer	Chemicals
Speed of athlete	Shape of stud	Mechanical properties of the infill layer	Maintenance
Height before contact	Sole/stud material	Shockpad thickness	Wear
	Contact surface area		

quantitative research data with a focus on surface properties and traction behaviour, particularly for artificial turf surfaces. This gap in knowledge is perhaps somewhat surprising in light of the increasing use of artificial turf pitches used in elite-level sport. However, there has been a recent research investigation [**47**] aimed specifically at further addressing the missing link between shoe–surface interface measurements and the consequent effects on the ACL regarding injury susceptibility. This study utilized clinical measurement of strains and moments in ligaments from foot–shoe–surface interaction tests on cadavers.

A small number of recent studies have shed some light on the relatively complex process of player–surface interaction and the extent to which changes in the surface system can affect the measured traction (from using mechanical test methods not human subjects). For example, Villwock *et al.* [**44**] concluded that the infill type, fibre type, and shoe cleat design all affected the peak torque resistance. They also showed that the combination of shorter cleats and looser fill produced lower rotational traction (peak) values. Additionally, fill size and shape had some influence, as did fill to fibre interaction, on their measured values. Their tests were carried out on outdoor samples, approximately a year old, but the reported work lacked details of the stud penetration, infill depth, and did not discuss their thoughts on the mechanism of traction. In addition, in their work the cryogenic rubber infill (frozen during the cutting phase) produced higher traction than the crumbed rubber (often termed styrene butadiene rubber (SBR)) cut under ambient conditions. This was in contrast to the findings of traction focused work by Alacantara *et al.* [**12**] wherein it was reported that the standard crumbed rubber infill gave higher traction than cryogenic rubber infill. The inconsistency between test protocols and analysis may be the cause of such contradictory findings.

Severn [**38**] carried out a comprehensive programme of laboratory tests to evaluate the effects on traction measurements of changes in the physical characteristics of the surface system (i.e. carpet type, fibre length, density, infill type, size, depth and density, temperature, and wet/dry conditions). Space does not permit a full review of this recent doctoral study; however, Table 2 shows the range of factors that were expected to affect the traction behaviour of the surface system from a thorough review of previously published literature. Although some of these factors may be considered to be 'fixed' by the initial constructed state of the surface, it is clear that the wear and tear during the surface life, and the maintenance regime applied, are expected to affect the consistency of many of these factors during the years the pitch is in use.

This research [**38**] compared the measurement methods and values derived from different traction test techniques, whilst controlling the surface state, and in particular aimed to evaluate the current FIFA (and IRB) standard rotational traction test.

The industry standard test for rotational traction [**9**] comprises a rigid disc with six equally spaced studs attached to the underside, weighted to achieve a total mass of 46 kg (460 N normal force). The studs used are a standard FIFA size, 13 ± 0.5 mm long, and 12.6 ± 0.5 mm wide. Initially, the weighted disc is lifted and dropped on to the test surface from a height of 60 ± 5 mm to aid penetration of the studs into the surface. Rotational torque is then applied to the torque wrench slowly by the operator (a rate of 12 revolutions per minute is specified) and the maximum value of torque is recorded (but not rotation distance).

Figure 8 shows a set of data [**38**] that compares the FIFA standard test with a bespoke mechanical device that uses a rigid last to attach the full soccer boot under test. This figure also shows an increase in the peak rotational traction with increasing infill density (produced through rolling repeatedly with a studded roller reducing the air void content in the infill) for the tests with the soccer boot (the boot is inclined to control contact at the forefoot only). However, the standard FIFA test shows no clear pattern for peak traction versus infill density. This work on infill 'state' [**38**] extends previous work by considering the effect of density and shear strength on the resistance to the boot-stud movement

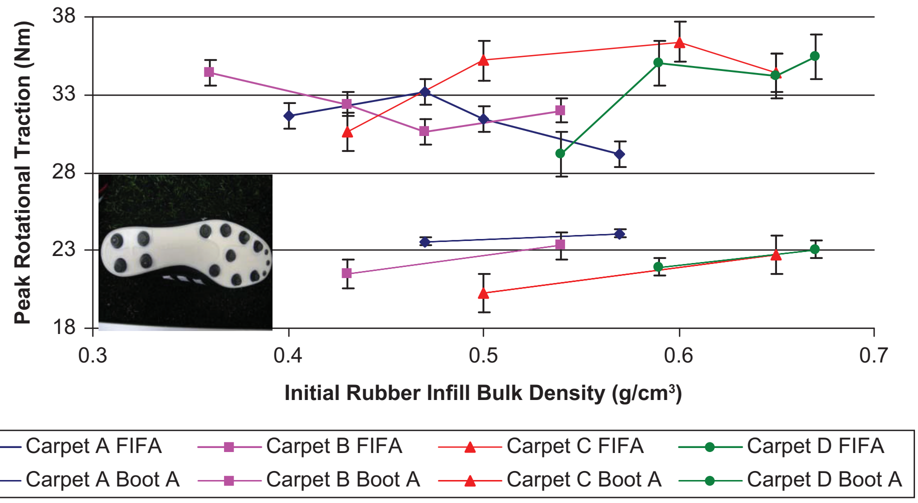

Fig. 8 A graph presenting the relationship between peak rotational traction and surface infill density for the standard FIFA studded disc test and a mechanical test utilizing a studded boot (reproduced from [**38**])

through the infill–carpet system. Observation in the field of rubber crumb infill 'compacting' and pitches becoming 'harder' is a common anecdote from users and operators alike, after several years of use, although it is commonly stated that effective maintenance should delay or recover this effect [**18**, **21**]. In contrast to concerns over increased traction and its perceived injury risk, this recent study [**38**] also demonstrated that traction may be reduced by: loosening the infill; a lower density of carpet fibre spacing; increasing the infill size; and reducing the stud penetration (made possible due to a hard/strong surface, or larger diameter studs, or reducing the static weight of the test device in the case of the FIFA test).

This emerging data and understanding of surface behaviour further highlights that this aspect of surface science has not received much attention in the literature in any detail, and nor has the mechanical behaviour of the crumbed rubber infill. However, laboratory testing and analysis, regarding both recycled rubber shockpad and crumbed infill [**37**, **38**, **48**], has shown the rubber particulate to be relatively complex in terms of its behaviour under compression, compaction, and shear loading. The stiffness response and ultimate shear strength behaviour of the particulate infill was shown [**48**] to be controlled by the loads applied and the amount of strain induced during testing (see Fig. 6). Solid particulate materials, such as natural granular soils that include the sands used in sport surfaces, show dilatant (i.e. increase in volume) behaviour when sheared if in a dense state and this provides a much higher resistance to failure (and is why these materials are compacted to provide better stability in construction applications). However, in sharp contrast the compressible rubber particulate showed little dependence on the initial state, i.e. initial density. An initially loose and dense rubber infill achieved very similar shear strengths and required large shear strains to produce what may be considered a 'peak' value [**48**]. This raises the question as to whether the rubber infill truly shears or is perhaps merely compressed and distorted when providing traction resistance (depending on the strain generated by the foot/boot movement it is suggested).

It is suggested that to further develop the science of artificial turf interactions the rubber infill material behaviour needs to be much more clearly understood. Infill specification is sufficiently 'loose' such that infill size, particle shape, and dust content may vary and the effect of these variations is not known. In addition, the rubber materials are expected to age and the stiffness behaviour to change. To interpret the whole surface system behaviour the infill interaction with the carpet fibres and with the shockpad is also required for the detailed analysis of traction test results. To further explore the infill behaviour, Fig. 9 shows the stiffness response of a rotational traction test on an artificial and a natural surface system [**49**]. This figure shows the greater compression response of the rubber infill compared to the 'stiffer' response of the natural turf soil system, albeit the 'peak' resistance at large rotation angle is similar (note 0.8 rad = 46°).

Based on the previous discussions and system behaviour data it becomes clearer that mechanical

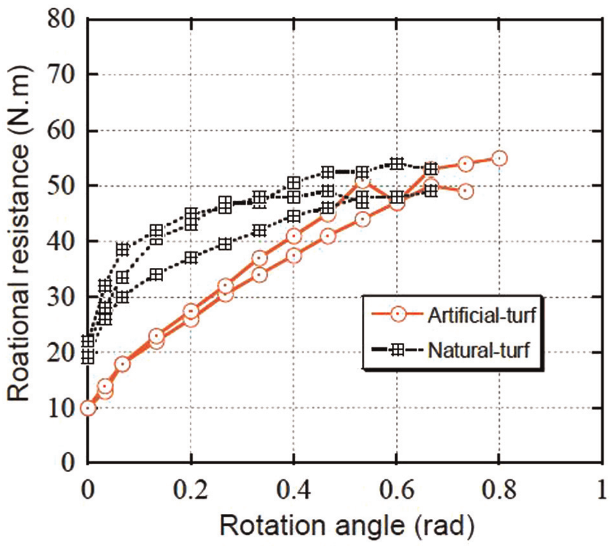

Fig. 9 Interpretation of rotational traction, showing the rotational stiffness behaviour for test on artificial turf and natural turf (reproduced from [**49**]). The data shows an increase in the initial shear stiffness during rotational traction testing of the soil (solid) particles, in comparison to the more compressible rubber particles, although they appear to reach approximately the same 'peak' resistance at maximum rotation angle

test methods, aiming to provide player performance or safety-related data on surface system behaviour, ideally need to be 'biofidelic' (i.e. mimic the athlete loading scenario) in their methodology or they risk being invalid with regard to their interpretation. However, currently the effective measurement of traction and fuller explanation of surface system behaviour in providing traction is somewhat clouded by the many differing test devices used in research around the world that have differing input parameters or test protocols. These variations include: magnitude of normal load applied; area of contact; use of a rigid or flexible foot last to affix a shoe; rate of loading (rotational or translational) applied; use of 'peak' resistance or interpretation at some nominal amount of displacement; and many other issues relating to the surface sample preparation, and its full description, used in the testing. With regard to the analysis of traction behaviour or limits, an informed debate is required regarding the issue of what deformation is deemed appropriate to measure, or what the 'peak' traction represents (translational or rotational) when it may be from several tens of millimetres of displacement. Observations of player foot–surface contact have shown, in the case of a forefoot push off action [**50**], to comprise only a small horizontal movement (of approximately 10 mm) once the standing/leading foot has been planted, for example.

A real limitation of the mechanical test devices currently in use is their application of a constant static normal load during testing, contrary to an athlete's foot contact. It is the combination of vertical load and friction/traction response that develops the surface's resistance to traction movement. It is suggested that replicating 'peak' athlete normal load or some average normal load is dismissing the prospect that foot slippage or 'locking' may occur where the ratios of vertical to horizontal are at their lowest or highest respectively. Figure 10 shows the force plate data from a player executing a 45° cutting manoeuvre on artificial turf to illustrate the high vertical loading, high braking horizontal (shear) loading initially and associated torque, and then the push off forces as the player accelerates away from the turn. The dynamic nature of the action is clearly evident, and the initial impact and braking loads rapidly rise to their peak over around 50 ms duration in this case.

4.3 Optimizing surface design for performance and safety

It appears that much of the advancement from the industry is in response to guidelines for acceptability from the governing bodies and includes some research into performance and injury aimed primarily at the elite/professional markets for sport competition. Some of the guidance has filtered down to the community level and has improved the general advice, guidance, and specifications for community-level selection and aftercare for artificial turf surfaces, in the author's opinion. However, there remain many issues that have not yet been researched regarding user health and safety at the community level. The effect of lower budgets in community schemes on the surface product selected and installation quality in comparison to elite-level facilities have, anecdotally, been the cause of many installed facilities rapidly degenerating or being utilized long past their design life. Many public funding initiatives, in the UK, have focused on widening participation and no national database has been developed that includes any monitoring of the 'quality' of facility provision. However, the Active Places database [**13**] has improved public knowledge of the number and location of sport surface assets. There would be a benefit from feedback on the surface systems that are in use regarding their performance – currently missing from the UK's management procedures of its public facilities in general.

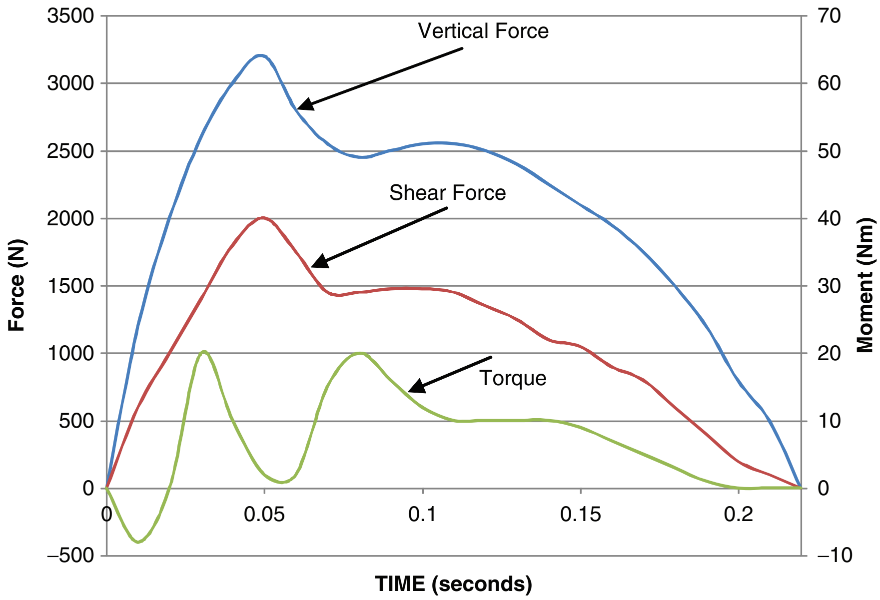

Fig. 10 Typical player loading measured on a force plate during a cutting manoeuvre – a 45° cut on artificial turf (3G)

Player feedback has been a powerful tool in the growth of the newer generation of artificial turfs for soccer and rugby, coupled with better health monitoring (at elite level only) to demonstrate injury occurrence and risks that are shown to be comparable to natural turf (see section 3). However, one study [**51**] showed that in regard to ball bounce in hockey the players were generally more satisfied with having a harder surface to promote lower ball bounce than with regard to any soreness they may have felt on their ankles and knees after matches. It also became apparent from studying the hockey pitches used in the Commonwealth Games – designed at the 'very hard' end of the surfaces monitored (force reduction of between 40 and 45 per cent, see Table 1) – that after the event the local children of middle-school age were also regularly using the facility. It is the author's opinion that National Governing Body (NGBs) and IGBs have a duty to consider their guidance in instances such as this, whereby despite the pitches passing the elite-level hardness test they may not be suited to developing schoolchildren. It is suggested a move to more rational classification of surfaces, such as 'hard', 'medium hardness', or 'soft' within the acceptable range may be more useful to owners and users. However, such a labelling system may be potentially contentious in practice and difficult to introduce to the industry at large. Improved user education regarding products and requirements (such as footwear) is, however, considered to be needed.

There exist shortcomings, recognized in many studies, in the efficacy of many surface performance-related tests in comparison to how players (and balls) interact with a surface. However, there is also clearly a need for devices used in the laboratory and field that achieve a suitable compromise between the complexities of human–surface interaction and the test method's ease of use, repeatability, and robustness. Whilst there has been some debate on this subject [**10**, **52**] by researchers, few studies have attempted to critically appraise the validity of current standard test methods in light of user feedback on a surface. A player perception study on hockey fields [**20**, **51**] appears relatively unique in that it correlated several performance-related mechanical surface tests (such as the AA, rotational traction, ball roll and ball bounce) with the player feedback across six (different) elite-level hockey surfaces in use in the UK, selected based on initial player interview feedback on pitch properties. At each pitch a suite of performance-related tests were done to the FIH standards, though notably there was no rotational traction test in the FIH standard at that time and a modified FIFA traction test was carried out with a dimpled hockey boot sole in place of the standard six stud configuration. Figures 11 and 12 present the correlations for rotational traction and force reduction and show a broad range of results for the mechanical tests and the player perception feedback. The rotational traction data showed quite large standard deviations (shown on the figures) and of interest was that the higher traction measured was for the Nylon fibre carpet systems, and the lower traction for the polyethylene carpet systems as expected from the softer yarn. An exception was at the Cannock site where the Nylon pitch (since replaced)

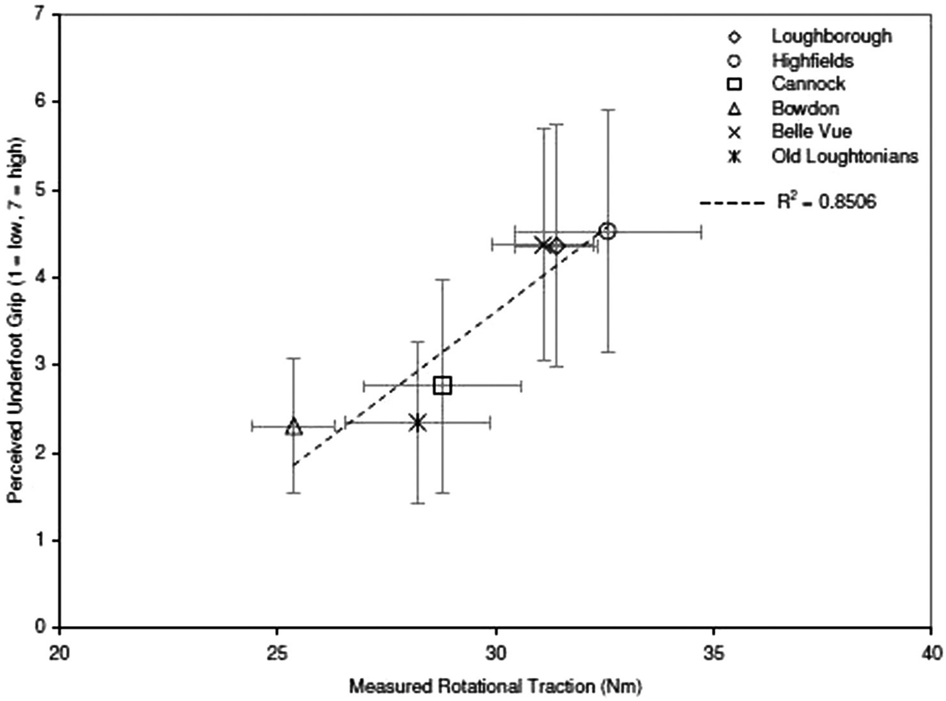

Fig. 11 A graph showing the relationship between the player perception of surface underfoot grip and the mechanical measurement of rotational traction (reproduced from [**20**])

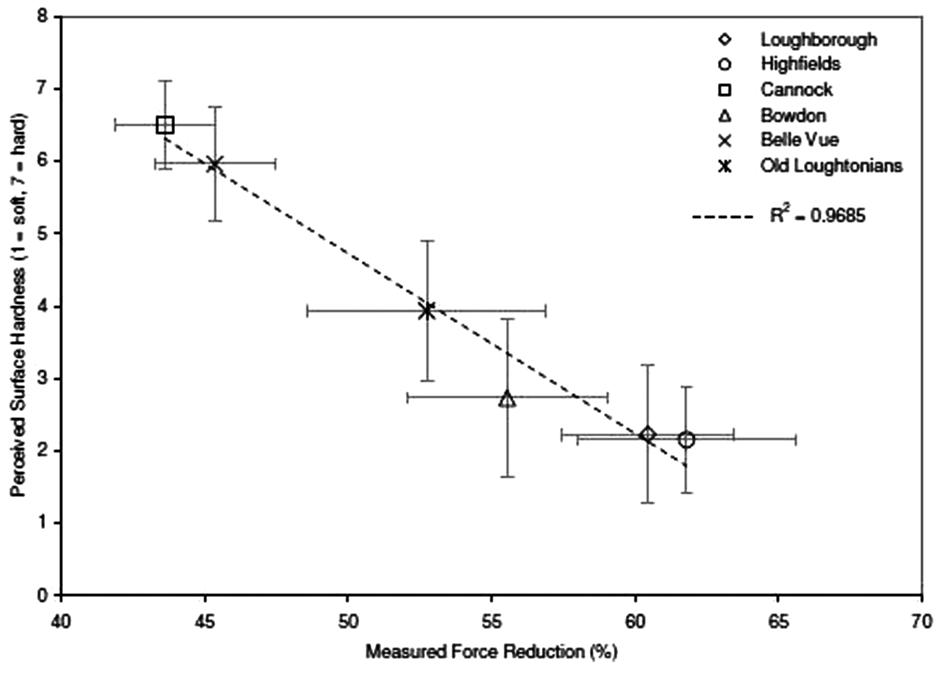

Fig. 12 A graph showing the relationship between the player perception of surface hardness and the mechanical measurement of force reduction (reproduced from [**20**])

was suffering from an algae problem and also some carpet fibre damage, both visually easy to ascertain, which did lead to lower traction results. The force reduction data correlated well with the thickness of shockpad at each site, the thinnest design at Cannock and Belle Vue and a thicker design at Loughborough and Highfields (Nottingham). These data suggest that these two relatively simple devices did differentiate between surface systems that the players also differentiated between. In contrast, although not shown here very poor correlation was found between the simple vertical ball bounce test and users' feedback. More studies similar to this would help both further corroborate these findings and assess other performance-related tests, or for other sports, in regard to their applicability to what the users perceive.

5 DISCUSSION – THE DEVELOPMENT AND FUTURE FOR 'SPORT SURFACE SCIENCE'

This paper has presented a broad overview of synthetic turf classification and evaluation within the context of current sport governing body requirements. There have been many advances in recent years in terms of surface products and fibre technology in particular. 3G infilled surfaces, better suited to rugby and soccer, have become prolific since the 1990s. However, surface systems that need little or no infill, and for the fibres to retain durability and resilience throughout the operating life, is still a goal as is multi-use surfaces that satisfy all sports. In addition, maintenance technology and practice has improved, with many treatment processes aimed at prolonging the playable life of these costly leisure assets. The applicability of artificial surfaces to a wider range of sport-specific requirements has been achieved, with a somewhat iterative process between product development and sport governing body requirements. Sports governing bodies have advanced their own knowledge, in general, such that guidance has been improved, and also new tests have been developed and implemented aimed specifically at improved player experience (e.g. for skin friction and angled ball bounce in soccer). The soccer and rugby communities have embraced artificial turf for training and at nearly all levels of competition. The future seems to be that this amenity will increase and that artificial turf will become an important income-generating asset at many amateur and professional club venues. However, that is not to say that natural turf will lose its place or relevance at many high-profile sporting venues, nor in many community amenity plans. The large initial capital cost of an artificial turf pitch is still a significant barrier to many clubs and communities.

In response to the growing interest in, and uptake of, artificial turf there will inevitably be further technological developments that may need careful acceptance and approval within governing body policies and with appropriate safeguards for end users. Recent examples of health scares have been touched upon in this paper such as the release of toxins from recycled rubber and the persistence of MRSA-infecting bacteria in artificial turf, and thus far increased health risks are unsubstantiated it appears. The increasing demand and relative high cost of these specialist sport surface products is already leading to a more and more confusing array of available products on the market – some of which may be inferior in quality. For many clients the safeguard against sub-standard products and work should be by appointing qualified consultants, ensuring compliance testing is followed up periodically, and that proper maintenance regimes are in place. It is the author's opinion these are all areas requiring further improvement in the UK practice, and probably elsewhere in the world, for this niche industry.

The impact of climate change and the sustainability agenda can provide both momentum and some barriers to artificial turf. The momentum will come from increasing pressure to reduce water usage in parks and leisure amenities such as for natural turf sports facilities [**53**]. The difficulty of growing and maintaining grass in parts of Australia has already recently had the effect of a sudden interest and move to artificial turf in community football [**3**]. The barriers may come in the form of issues regarding recycling and reuse of artificial turf products, currently in the UK they are land-filled at the end of their useful life in general. The 'carbon footprint' of sports amenities, including the raw construction materials, manufacturing, and maintenance processes, is under increasing scrutiny as clients and funders look to show their 'green' credentials (see [**54**] for a study on golf courses).

Notwithstanding the social and economic aspects of sport surfaces and their appropriate provision for an increasingly health-conscious society, there remain many scientific questions that will keep researchers busy for some time to come. Research into the science of surface behaviour and user and ball interactions has lagged behind many other aspects of advancing athletic performance and enhancements to the design and engineering of equipment, providing an 'edge' to the athlete in competition. It is also argued that without multidisciplinary approaches to understanding the player–surface interaction in particular, and without suitable research funding, many important questions will remain unanswered. For the industry, to fully optimize the design of sport surfaces and enhance the user experience many aspects of their behaviour and durability need to be more fully understood and implemented into their design, construction, and aftercare. These broad research aims require many complementary experimental programmes of research work, for a number of years, comprising teams of research engineers and material scientists, and the integration of suitable elements of epidemiology and biomechanics to measure (understand) the (likely) effects on users (and balls).

It is the author's opinion that what is required to move the research domain forward for example with the further development of mechanical tests, is more 'in-game' loading measurements from players/athletes during their interaction with surfaces to develop a useful 'state of the art' (live) database. This would then enable the enhanced development or modification of test devices that can more closely recreate these loading conditions and also contribute to more reliable testing procedures wherein the players themselves are used as the test devices. In addition, and concurrently, a separate strand of research is required that moves the science forward in both measuring and modelling surface behaviour under load and its 'ageing' process(es). Studies that measure the response of the system, at a suitable level of detail for each of the respective component's behaviour is required for the development and validation of numerical modelling of sport surface systems. From the development of suitable models will come the more powerful predictive tool for determining the likely effects of material and/or system design changes, and the prediction of the likely loading effects on the user for performance and their safety. Epidemiological studies are required, perhaps concurrently, to better understand the importance of the surface properties, and changes in properties, on traumatic and chronic (overuse)-related injuries that can arise in the users, at all levels of ability and performance. However, a major challenge for injury studies is the proper measurement of surface properties that are relevant to injury as such tests are currently missing from the portfolio of mechanical tests available.

It is also the author's opinion that the sport governing bodies need to play a larger part in driving forward the research programmes required, focused on either performance or safety or both, in accordance with their duty to their members and sport participants in general – ideally in partnership with government health departments and the public funding bodies for sport. Without the sport governing bodies/funders taking some leadership and helping set and drive (and fund) the research agenda the current situation of isolated pockets of good research will remain largely perpetuated and the benefits of larger integrated studies will not be realized.

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The Contribution of Artificial Turf to Global Warming

Leslie M. Golden

Abstract

This article discusses how the substitution of artificial grass for natural grass contributes to global warming. An algebraic model of the atmospheric transmittance in the infrared wavelengths from 0 to 15 microns is used to modulate the Planck law, yielding both the energy absorbed by the atmosphere and that transmitted through the atmosphere as a function of the ground temperature. The calculation shows that the energy absorbed by the atmosphere increases more rapidly than the amount transmitted through the atmosphere with increasing ground temperature. In situ experiments demonstrate that artificial grass reaches significantly greater temperatures than those reached by natural grass under the same meteorological conditions. As a result, artificial grass creates an additional amount of energy absorbed by the atmosphere. With the number of nationwide artificial grass installations, a typical result yields an additional energy deposited into the atmosphere during moderately warm summer days of 10 to 20 gigawatts. The annual nationwide cost savings to local governments by the substitution of artificial grass for natural grass is shown to be trivial.

Keywords: artificial grass; atmospheric transmittance; climate change; global warming; greenhouse effect; infrared window

Introduction

Background

In this paper we distinguish "artificial turf," the term used in the industry, from "artificial grass." The latter refers to the actual visible green plastic blades, which attain high temperatures under sunlit conditions, whereas the former includes infill and matting material. We prefer the term "artificial grass" and use it throughout as that which is not only visible but also relevant, as the radiating material, to the contribution to global warming.

Artificial grass was initially introduced for use in professional indoor athletic stadiums. Outdoor professional athletic stadiums, park districts, and school districts followed this lead and adopted artificial grass fields for athletic purposes. As areas in the southwest of the United States suffer from drought conditions, a large market has developed for use of artificial grass for landscaping.

The manufacture of artificial grass requires plastics and heavy metals, which after a short lifetime are disposed, presenting environmental hazards. Decrying the use of plastics in general given their environmental dangers yet replacing natural grass with artificial, plastic, grass is inconsistent policy. Only by educating the public of the environmental consequences of installing artificial grass can this worrisome trend be mitigated or indeed terminated.

To document one aspect of this hazard, an algebraic model of the transmittance of radiation in the range of infrared wavelengths from 0 to 600 μ was created to determine the amount of energy flux both transmitted through the atmosphere and absorbed by the atmosphere as a function of the ground temperature. *In situ* studies have found a significant difference between the enhanced temperatures of artificial grass compared to natural grass under the same meteorological conditions. These data were used to help calculate the additional amount of energy radiated from the artificial grass and absorbed by the atmosphere compared to natural grass as a function of the ground temperature. A hypothetical case in which the

Center for Computational Astrophysics, Oak Park, Illinois, USA; Physics Department, University of Illinois at Chicago, Chicago, Illinois, USA.

atmosphere absorbs a greater amount of radiation was also computed. Estimates show that the nationwide cost savings to local governments for the replacement of natural grass with artificial grass are relatively small. In addition, in contrast to the monochromatic transmittance utilized in the analysis, the total transmittance in the range of infrared wavelengths from 0 to 600 μ as a function of temperature for actual radiating blackbodies was determined to be about 26 percent.

Because artificial grass contributes to global warming in the United States, local, state, and federal policies need to be involved in efforts to reduce or ban their use. The rapid increase in the number of artificial turf fields being installed in Europe and the Asia-Pacific region warrants international attention. To mitigate the problem education about the negative effects and true costs of artificial grass will be important in changing behaviors of local officials on elected boards of local park districts and school districts as well as state and federal officials, all of whom could opt to retain natural grass. A numerical national rating system for artificial grass products based on life expectancy, chemical composition, and thermal behavior would help officials make more rational policy decisions regarding the use of artificial grass.

Environmental Problems with Artificial Grass Include Its Contribution to Global Warming

Various criticisms of using artificial grass include direct damage to the environment when natural grass and its inhabitants—insects as well as burrowing creatures such as worms—are killed; loss of the rainwater-absorbing quality of natural grass; loss of food source for birds; and negation of the oxygen-producing function of natural grass (Kaminski, 2019; Peeples, 2017). To make room for the artificial grass, the existing soil is cleared from the installation site and discarded into a landfill (Guerriero, 2021). Rainwater does not penetrate as rapidly through artificial grass as it does through natural grass, resulting in decreased water entering watersheds and increased localized flooding (Peeples, 2017). Because natural materials such as grass absorb carbon dioxide during photosynthesis, replacing them with artificial grass also directly contributes to the increase of carbon dioxide (a primary greenhouse gas) in the atmosphere. The plastic and infill material of artificial grass does not provide either greenhouse gas capture or air-purifying services (Peeples, 2017).

Artificial grass can get hot, creating health problems for those walking or running on it (Guerriero, 2021; Peeples, 2017; G. Pulley, personal communication, January 28, 2020; Williams & Pulley, 2002). The elevated temperatures also increase the rate at which toxic gases such as benzothiozole and toluene are released from the artificial grass (Peeples, 2017).

Noting that not only does artificial grass have no climate benefit but also that production of the plastic blades emits carbon and uses fossil fuels, the UK Committee on Climate Change has recommended removing artificial grass fields and replanting natural grass, as well as planting trees, to help battle global warming (Kaminski, 2019). The common practice of replacing soil with sand to provide a more stable bed for the artificial grass also releases carbon dioxide stored in the Earth (Kaminski, 2019).

During the lifetime of artificial grass, the plastic blades are fractured, and those fragments become part of the environment. The toxic chemicals used as colorants (Action, 2013) create disposal problems for artificial grass when it has reached the end of its useful life. It is generally recognized that the elevated temperatures reached by artificial grass may contribute to global warming (Peeples, 2017). This article provides the first mathematical analysis of the severity of the problem. The analysis shows that a direct global warming results from radiation of additional energy flux into the atmosphere from the manufacture and installation of artificial grass. To those concerned about the health of the planet, this is worthy of discussion.

The replacement of natural grass by artificial grass leads to a decrease in the number of trees in urban forests, with severe environmental effects, including enhanced global warming. Trees, which are able to grow on natural grass, not only are natural refrigerators of their proximate environment by shading but also during photosynthesis absorb carbon dioxide, a significant greenhouse gas responsible for a major portion of the terrestrial greenhouse effect (Bordelon, n.d.). Trees purify the air by removing sulfur dioxide (SO_2), ozone (O_3), nitrous oxide (N_2O), and smoke particulates, in particular those generated by diesel engines (Bordelon, Urban Forestry Network). Along with water vapor, methane (CH_4), chlorofluorocarbon-12 (CCl_2F_2), and hydrofluorocarbon-23 (CHF_3), three of these substances filtered out of the air by trees, namely carbon dioxide, ozone, and nitrous oxide, are primary greenhouse gases (2007, NASA/Goddard Space Flight Center Conceptual Image Lab; Center for Climate and Energy

Solutions). They also provide food and habitat for insects, birds, and mammals. Trees do not grow in the plastic of artificial grass. Indeed, replacement of natural grass areas by artificial grass often entails destruction of trees, including entire stands of old growth trees.

This discussion considers how infrared radiation is transmitted through and absorbed by the atmosphere, which requires mathematical integration of the product of the Planck blackbody radiation law (see Appendix) with the transmittance of the atmosphere for radiating substances of varying temperatures. The radiating substances, in this case natural grass and artificial grass, are characterized by their thermophysical parameters. Analysis of these parameters, in particular the reflectance, specific heat capacity, and thermal conductivity, shows that artificial grass both absorbs more insolation energy from the sun and retains it to a greater extent than natural grass, leading to its elevated temperatures. *In situ* measurements by various groups confirm the extent of this excessive heating.

The model calculations (see Appendix) show that on a typical warm summer day, the energy flux absorbed by the atmosphere from artificial grass installations in the United States alone exceeds that absorbed from an equal area of natural grass by an amount equivalent to that of 10 to 20 moderately-sized nuclear power plants. This contribution to global warming continues to increase as an additional 1,200 to 1,500 sites replace natural grass with artificial grass annually in the United States (Lundstrom and Wolfe, 2019; Woodall, 2019). In addition, a frightening trend has appeared in which homeowners discard their natural grass and install artificial grass to eliminate the need for lawn maintenance, conserve water, and to demonstrate to their family, neighbors, and friends that they are, ironically, "green." This trend is particularly popular in areas of the southwest United States that are experiencing drought conditions.

The Thermal Properties of Artificial Grass

The thermophysics of artificial grass compared to natural grass indicates that the former will provide a relative source of heating. This is confirmed by independent *in situ* studies.

The relevant thermophysical parameters are the emissivity, the reflectance, the thermal conductivity, and the specific heat capacity. The emissivity of green natural grass and plastics are about the same. The former range from 0.95 for dry grass to 0.99 for green grass, with some dependence on season, whereas the emissivity for plastics generally is about 0.95. Natural grass is marginally able to radiate more efficiently. A major distinction resides with the reflective properties of artificial grass compared to that of natural grass. From about 0.7 μ to about 1.3 μ, the reflectance of natural grass is about 0.60. Although it decreases at greater wavelengths, it remains greater than that of green artificial grass, which is about 0.06 out to 2.4 μ (Devitt *et. al.*, 2007). The remainder of the insolation incident on artificial grass is absorbed.

Without an abundance of conducting free electrons, the thermal conductivity of both water and plastics is low. The thermal conductivity of water, the major constituent of natural grass, 70%, is 0.58 W/m-K, whereas the thermal conductivity of polyethylene and polypropylene, the olefin fibers out of which artificial grass is manufactured, ranges from 0.09 W/m-K to about 0.50 W/m-K, with many of their composites being in the 0.20 to 0.25 W/m-K range. The energy absorbed by the blades of artificial grass is relatively less efficiently conducted to its subsurface material. That subsurface material, similarly, made of plastics, is also a poor thermal conductor. In contrast, soil can be a relatively good conductor, with a thermal conductivity, depending on organic content, from 0.15 W/m-K to about 2 W/m-K, and, if saturated, from 0.6 W/m-K to about 4 W/m-K, for a total range of 0.15 to about 4 W/m-K.

Water has by far the highest specific heat capacity of any common substance, 4186 J/kg-K. Those of polyethylene and polypropylene range between 1700 and 1900 J/kg-K. This means that a large amount of thermal energy absorbed by natural grass can heat its water without the water temperature greatly increasing. Viewed alternatively, a given amount of thermal energy will cause a mass of polyethylene or polypropylene to increase its temperature by more than twice the temperature rise of an equal mass of water. In total, Devitt *et. al.* (2007) found that more than 90% of the insolation heats the blades of the artificial grass with a resultant radiation into the atmosphere and less than 10% is conducted below the artificial grass material and into the soil.

Natural grass possesses another mechanism to remove heat, the evaporative cooling that results from transpiration and nighttime guttation, the expulsion of droplets of water. Neither mechanism is available to plastics.

Although the emissivity of natural grass is slightly greater than that of artificial grass, taken together consideration of the thermophysical parameters indicates that under the same meteorological conditions artificial grass will attain higher temperatures than natural grass and largely retain those higher temperatures, in addition to the lack of transpiration and guttation. Because its temperature can rise significantly higher than natural grass, artificial grass radiates more energy flux into the atmosphere than natural grass. This leads to enhanced absorption of energy by the atmosphere in the range of wavelengths near the infrared window.

The actual contribution to heating of the atmosphere depends on the extent to which the temperature of artificial grass rises. The implications of these considerations of the thermophysics that greater temperatures are achieved by artificial grass compared to natural grass under the same meteorological conditions have been confirmed experimentally by several groups. They found comparable quantitative results.

Devitt et. al. (2007) measured the temperature of artificial grass in seasons of moderate temperatures. They found that the maximum surface temperature of the artificial grass was approximately 38 K higher than that of natural grass and 34 K higher than the air temperature. The maximum artificial grass temperature recorded was 349 K (76° C), reached during the hottest summer months. Williams and Pulley (2002) performed similar measurements and had comparable results. They found that the grand mean temperature for artificial grass was 320 K (47°C), with a maximum mean in one hourly period of 343 K (70° C). The corresponding temperatures for natural grass were 22 K and 38 K lower, the latter figure agreeing with the finding of Devitt et. al. (2007). The highest temperature recorded for the surface of artificial grass was 367 K (94° C). McNitt and Petrunak (2016) measured a maximum surface temperature for artificial grass surfaces of 345 K (72° C), which was 41 K greater than the air temperature, while Buskirk et. al. (1971) found that the surface temperatures of artificial grass could exceed that of natural grass by temperatures from 35 K to 60 K, recording a maximum temperature for artificial grass of 333 K (60° C).

From these studies, one can reasonably and conservatively suggest that artificial grass can attain temperatures 30 K above that of natural grass in the same environment. Particular differences depend on the artificial grass product, namely, its material and construction, location, season, and time of day. These maximum surface temperatures suggested model calculations up to 370 K. Thermophysics and the lack of water to provide evaporative cooling can explain the phenomenon. In short, after being heated by sunlight, the temperature of artificial grass rises more quickly than that of natural grass, and that elevated temperature is maintained.

Results and Discussion

Numerical and Graphical Results

Details of the calculation of energy flux absorbed in the atmosphere from artificial grass compared to natural grass are provided in the Appendix. We report the results here.

Due to partial opacity in the infrared wavelengths, a portion of the energy radiated from surfaces of given temperatures is absorbed in the atmosphere. Table 1 shows the radiation

Table 1. The Energy Flux Emitted by Blackbodies at Temperatures from 275 K to 370 K[a]

T (K)	F_{BB} (watts/m^2)	F_{tr} (watts/m^2)	F_{abs} (watts/m^2)	T (K)	F_{BB} (watts/m^2)	F_{tr} (watts/m^2)	F_{abs} (watts/m^2)
275	323.8	75.1	248.8	325	631.7	170.7	461.1
280	348.0	82.4	265.6	330	671.5	183.2	488.3
285	373.6	90.2	283.4	335	713.1	196.3	516.8
290	400.5	98.5	302.0	340	756.7	210.1	546.6
295	428.8	107.2	321.6	345	802.2	224.4	577.8
300	458.6	116.5	342.2	350	849.7	239.4	610.3
305	490.0	126.2	363.8	355	899.3	255.1	644.2
310	522.9	136.5	386.4	360	951.0	271.5	679.6
315	557.5	147.3	410.1	365	1005.0	288.5	716.5
320	593.7	158.7	435.0	370	1061.2	306.3	754.9

[a]Based on the findings of Buskirk et. al. (1971), Devitt et. al. (2007), McNitt and Petrunak (2016), and Williams and Pulley (2002) for the highest temperatures attained by artificial grass, the calculations extend to 370 K.

emitted by blackbodies in the wavelength interval 0 to 600 μ at temperatures from 275 K to 370 K. This radiation is only partially transmitted through the atmosphere. The differences between the energy flux absorbed and transmitted, as given in Table 1, are presented in Table 2. The curves shown in Figure 1 were created by drawing smooth lines through the results of the calculations at 5 K intervals of equation (5), equation (6), equation (7), and equation (8) (see Appendix), as provided by the data in Table 1 and Table 2. In Table 2, the second and fifth columns provide the results for the current abundance of greenhouse gases in the atmosphere. The third and sixth columns present the results if the transmission through the atmosphere were decreased by 50 percent, to be discussed below.

The behavior of the absorbed and transmitted radiation results from two effects. First, as the temperature increases, the amount of blackbody radiation increases. The behavior, however, results from the nature of the transmittance function (see Figure 5 and Figure 6). Figure 4 shows that the absorbed radiation increases with temperature more rapidly than does the transmitted radiation, that which escapes through the atmosphere. These differences between the amounts of radiation absorbed and transmitted as a function of temperature, are indicated by drawing smooth lines through the results presented in Table 2.

The Magnitude of the Effect

Consider a day in which the temperature reaches only a moderately warm 81^{o} F, that is, 300 K. From Figure 2 (see Appendix), if the artificial grass reaches a temperature 35 K higher than the natural grass, then the amount of energy flux absorbed by the atmosphere is about 175 watts/m^2 greater than would be absorbed from the radiation from natural grass. At the temperature of 300 K, then, a playing field measuring 100 x 100 meters deposits into the atmosphere of about 1.75 megawatts more (calculated as: 175 watts/m^2 $\times$ 10^4 m^2 = 1.75) by absorption in the wavelength interval 0 to 600 μ than the same size natural grass field. This is the order of magnitude of the power-generating capacity of a solar photovoltaic power plant. Based on the estimated 13,000 artificial grass surfaces in the United States, these artificial grass surfaces deposit 2.3 $\times$ 10^{10} watts more energy flux than that generated by natural grass, equivalent to 23 moderately-sized nuclear power plants. Although this figure is small compared with the total energy budget of the atmosphere, it remains significant as an additional source of global warming. (Chestney & Januta, 2021).

Because of difference in sizes of installed artificial grass playing fields, variation in materials used by manufacturers, and climate variations seasonally, daily, and across the country, these figures should be considered only as an order of magnitude estimate. To compensate for cloud cover, a conservative estimate of nationwide additional power output from artificial grass is about the equivalent of ten such power plants.

The problem does not result from the magnitude of the energy deposited by absorption of the radiation emitted by artificial grass, but rather that these emissions are another source of global warming. Adding such another source is folly. Although governments try to fight global warming by reducing the magnitude of its various sources, every additional amount of energy deposited into the atmosphere must be balanced by some process to remove energy. None, though, exist.

We note that even at the current rate of installation of artificial grass playing fields, the acreage in the foreseeable future is much less than the

Table 2. The Difference in the Energy Flux Absorbed by the Atmosphere and Transmitted through the Atmosphere as a Function of the Temperature of the Radiating Blackbody

T (K)	ΔF Current (watts/m^2)	ΔF Projected (watts/m^2)	T (K)	ΔF Current (watts/m^2)	ΔF Projected (watts/m^2)
275	173.7	248.8	325	290.4	461.1
280	183.2	265.6	330	305.1	488.3
285	193.2	283.4	335	320.5	516.8
290	203.6	302.0	340	336.6	546.6
295	214.4	321.6	345	353.3	577.8
300	225.7	342.2	350	370.8	610.3
305	237.5	363.8	355	389.1	644.2
310	249.9	386.4	360	408.1	679.6
315	262.8	410.1	365	428.0	716.5
320	276.3	435.0	370	448.7	754.9

Note: These results are presented graphically in Figure 3. The results in columns 2 and 5 are derived from the data presented in Table 1 and are presented in graphical form in Figure 1.

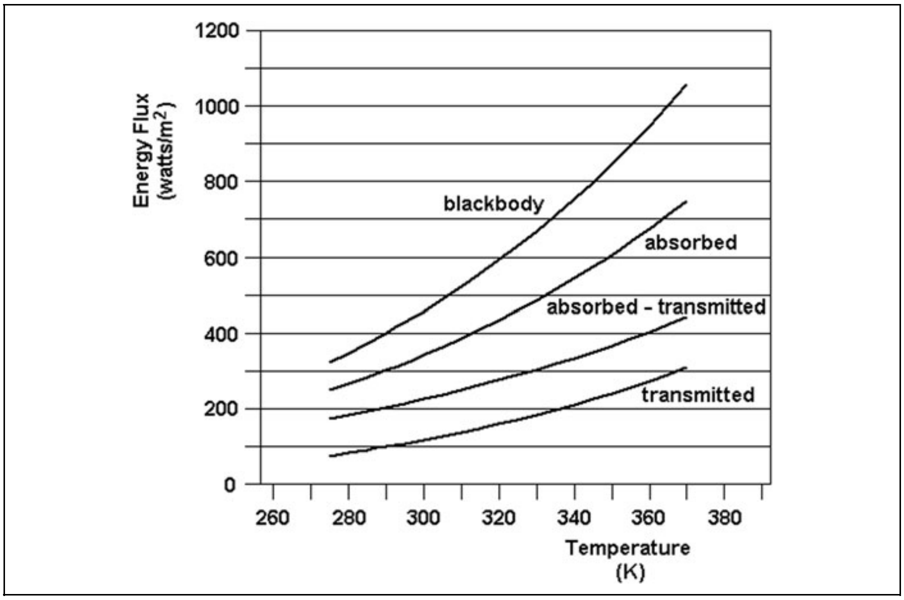

Figure 1. Energy radiated from surfaces of given temperatures based on approximately the abundance of greenhouse gases that exist today. The results of the calculation depicted in Figure 6 (see Appendix) falls on these curves at 300 K, with the result for the energy absorbed at 300 K as noted in Table 1 being 342.2 watts/m^2.

acreage of other heat-generating surfaces in urban heat islands such as concrete, asphalt, and roofing material. Although *in situ* studies show that concrete and asphalt in fact attain temperatures significantly lower than that attained by artificial grass under the same daytime temperatures (Devitt *et. al.*), because of such differences in areal coverage the contribution of the latter surfaces to direct heating of the atmosphere thereby far exceeds that of artificial grass playing fields. In addition, as noted, the direct contribution of urban heat islands to global warming is much less than the indirect cause of greenhouse gases. The concern lies in the installation of environmentally-harmful artificial grass being optional.

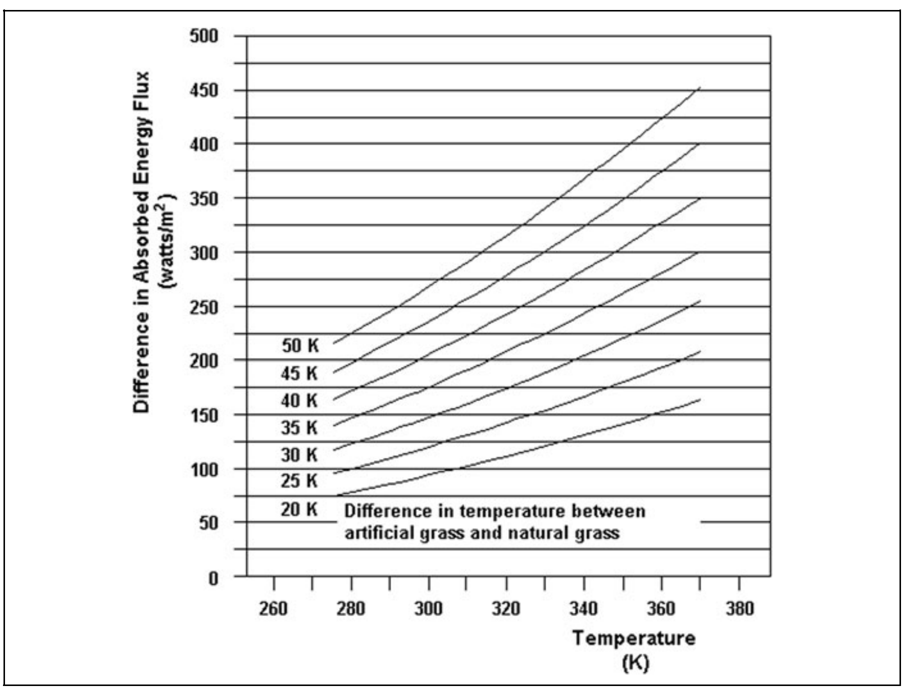

Figure 2. The difference in absorbed energy flux created by artificial grass and natural grass. The difference in energy flux is shown for values of ΔT from 20 K to 50 K as a function of the temperature of the natural grass. This result leads to the conclusion that artificial grass contributes to global warming.

Conjectures: Feedback Loops and the Future Atmosphere of the Earth

The calculations presented in the foregoing were performed using the transmittance as defined in Table 3, the current transparency in the infrared region near the infrared window of the atmosphere. As additional greenhouse gases are deposited into the atmosphere, global warming results from a decrease in this transparency of the atmosphere and an associated increase in absorption.

As evidenced in Figure 5 (see Appendix), the effects are most prominent with water vapor and carbon dioxide. As the atmosphere warms, it creates a feedback loop, leading to additional deposits of water vapor. As the temperature rises, more water vapor enters the atmosphere through evaporation. The warmer atmosphere can retain the H_2O in the water vapor phase. The H_2O lines get deeper because of its increased abundance, and wider, because of increased thermal broadening with the increased temperature, further enhancing the ability of the H_2O lines to absorb. The equivalent width of the lines thereby increases. As more CO_2 enters the warmer atmosphere because of human-made emissions its absorption lines also get deeper and broader. These deeper and wider absorption lines of H_2O and CO_2

Table 3. The Algebraic Expressions Fit to the Transmittance Function Model (see Figure 5, bottom graph)

Wavelength Range (microns)	Factor
$\lambda \geq 0.1$ and $\lambda \leq 1.2$	0.62
$\lambda \geq 1.5$ and $\lambda \leq 1.9$	0.76
$\lambda \geq 2.0$ and $\lambda \leq 2.5$	0.79
$\lambda = 3.0$ or $\lambda = 3.1$	0.28
$\lambda > 3.1$ and $\lambda < 3.5$	0.42
$\lambda \geq 3.5$ and $\lambda \leq 4.1$	0.90
$\lambda \geq 4.5$ and $\lambda \leq 5.4$	$(385.0 - 70.0\ \lambda)/100$
$\lambda \geq 7.7$ and $\lambda < 8.4$	$(-745.0 + 98.0\ \lambda)/100$
$\lambda \geq 8.4$ and $\lambda < 10.8$	0.78
$\lambda \geq 10.8$ and $\lambda < 13.4$	$(224.0 - 13.5\ \lambda)/100$
$\lambda \geq 13.4$ and $\lambda \leq 13.9$	$(787.5 - 56.3\ \lambda)/100$

Note: The transmittance equals 0, indicating 100 percent opacity, except as noted. The factors define the atmospheric transmittance function in the infrared, $T(\lambda)$.

mean more radiation is being absorbed by the atmosphere and the atmosphere increases in warmth. A feedback occurs.

Changes in the atmosphere can be codified by decreasing the values defining the *current* transmittance shown in Table 3. This will result in changes in Figure 1 and Figure 2. The energy flux transmitted through the atmosphere from 0 to 600 μ will decrease and the energy flux absorbed will increase, leading to a net increase in the energy flux absorbed.

To show the effect of increasing abundances of water and carbon dioxide in the atmosphere, modifications to the model were made. The transparency was decreased arbitrarily by 50 percent in each of the wavelength segments of the transmission function defined in Table 3. This change decreases the amount of radiation transmitted through the atmosphere by 50 percent, and because the radiation emitted by the blackbody remains the same, increases the amount of radiation absorbed by the atmosphere by the same numerical amount by which the radiation transmitted was decreased. The results are shown in Figure 3.

Figure 4 compares the difference between the energy flux absorbed by the atmosphere and that transmitted through the atmosphere as a function of temperature for the two cases. The results on which these curves are based are calculated from equation (8) (see Appendix) and presented in Table 2. Although the results shown Figure 3 are hypothetical, they are reminders of what we might be doing to the Earth and the need to prevent increased global warming in both its direct and indirect modes.

Comparison of Strategies to Reduce the Effects on Global Warming

The total surface area of fields converted to artificial grass is orders of magnitude less than that of reflective surfaces such as asphalt roads, automobile roofs, building rooftops, and the like. These, however, are relatively permanent features of our civilization, whereas the trend to convert natural grass surfaces to artificial grass can be mitigated and can have an immediate effect. Asphalt roads and parking lots in urban heat islands will be with us as long as we have automobiles. Advances in engineering design of asphalt and use of reflective colors to decrease the absorption of sunlight by roads and buildings promise to reduce the heat contribution from new construction in urban heat islands. Actual conversion of a significant portion of existing infrastructure, however, is financially untenable for municipal governments and private developers.

The indirect contribution of greenhouse gases won't, even under optimistic models, be mitigated for decades if not centuries or millennia (Chestney & Januta, 2021), if ever. Knowledge of the effect of replacing artificial grass with natural grass contrast, can lead to a reduction in such actions within only a few years, including replanting of natural grass when the first generation of artificial grass fields must be replaced. The contribution of artificial grass can be reduced or eliminated in the time cycle of the expected life of artificial grass, within a generation. Although the contribution of artificial grass is small compared to the contribution of urban heat islands, and the contribution of urban heat islands is small compared to that of greenhouse greenhouse gas emissions, every contribution to global warming is significant (Chestney & Januta, 2021).

Replacing artificial grass with natural grass would not require diverting significant funds from those earmarked for reducing the major contributions to global warming, the anthropomorphic creation of greenhouse gases. The

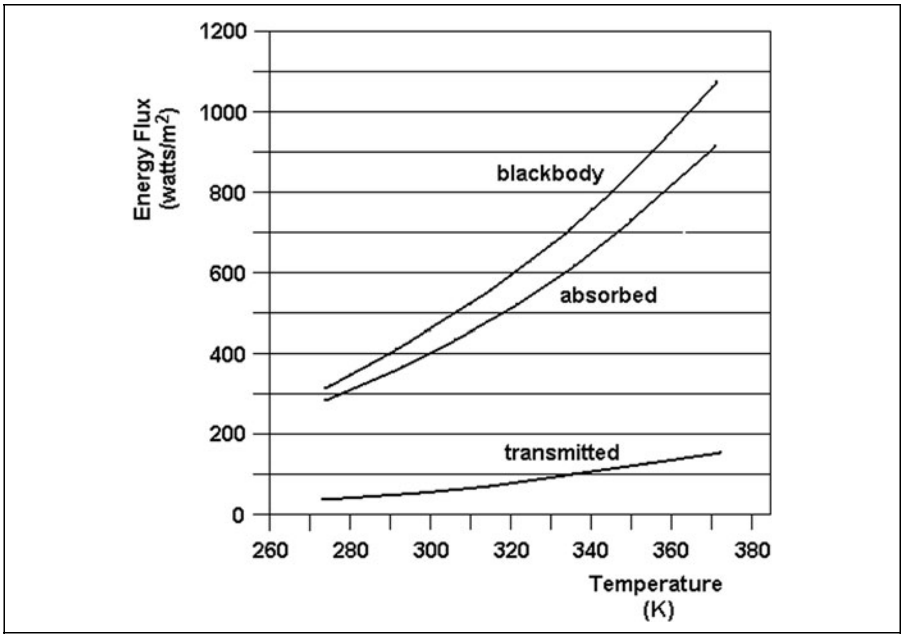

Figure 3. The portion of the energy radiated from surfaces at given temperatures that would be absorbed if the transmission of energy flux through the atmosphere were decreased by 50 percent. To avoid clutter on the graph, the difference between the energy flux absorbed and that transmitted is not displayed.

major cost would be disposal of the existing artificial grass fields. The cost of removal and disposal into a landfill is approximately \$65 per ton (Woodall, 2019). The material weighs about 0.5 lb/ft^2, or 5.4 lb/m^2. The total weight of a 100-square meter playing field then would be about 54,000 lb, with a disposal price tag of about \$1,800. This cost could be borne by local school districts and park districts; it would not funnel money away from the federal government, energy supplier research programs working to reduce greenhouse gas emissions, or automobile manufacturers.

Decrying the use of plastics in general for their environmental dangers yet replacing natural grass with artificial, plastic grass is inconsistent policy. Only by educating the public of the environmental consequences of artificial grass and changing government policy can this worrisome trend be mitigated or indeed terminated.

The Trivial Cost Savings with Artificial Grass

The rationale for government officials to rip up natural grass and its insect inhabitants (Kaminski, 2019) and install artificial grass resides in reducing maintenance costs and the cost of watering, as well as the need to conserve water in the increasingly drought-stricken western and southwestern states. Outdoor sports stadiums may be open year-round in the southern and western states but only six months long in the northern and eastern states. Thus, nine months can be used as a representative average to estimate cost savings. An estimate of maintenance for natural gas includes the cost of water at \$10 per thousand gallons and a weekly watering that uses 1,000 gallons. This estimate does not factor in rain, the cost of commercial mowing (which averages \$50 per each mowing of natural grass), or the once-per-year aeration and fertilization costs. Using these generous numbers, maintenance is about \$2,200 annually per field. Based on the total of about 13,000 artificial grass playing surfaces in the United States, the annual nationwide cost savings based on maintenance and water usage can be estimated as:

$$\begin{aligned} &\textit{Annual Savings} \\ &\quad = 1.3 \times 10^4 \textit{fields} \\ &\qquad \times \$60/(\textit{week-field}) \times 36\ \textit{weeks} \\ &\quad = \ \$28,000,000\ , \end{aligned}$$

which is likely an overestimate. This cost is trivial compared to the potential economic, social, and demographic costs of global warming, to which the replacement of natural grass by artificial grass contributes. This realization by local governments could deter them from such expensive action (Golden, 2013). Although a more robust analysis would follow, after Loss et al. (2014), the multiplicative Monte Carlo analysis presented by Golden (2021), in which distributions of both the sizes of artificial grass fields and their thermal behavior could be analyzed to produce a more precise value for the energy flux deposited by artificial grass fields above that generated by natural grass fields nationwide, the relatively small contribution to global warming does not justify such an additional analysis.

McNitt and Petrunak (2016) in their discussion of the higher temperatures reached by artificial grass note that “some organizations have installed irrigation systems to reduce the heat” and that “irrigation of these fields dramatically reduce (sic) the surface temperature,” but their testing showed that “a dramatic reduction in temperature is short term.” Williams and Pulley (2002) found the same short-term effect for irrigation on reducing the temperature. Some manufacturers of artificial grass actually recommend spraying water on artificial grass to wash off dog feces

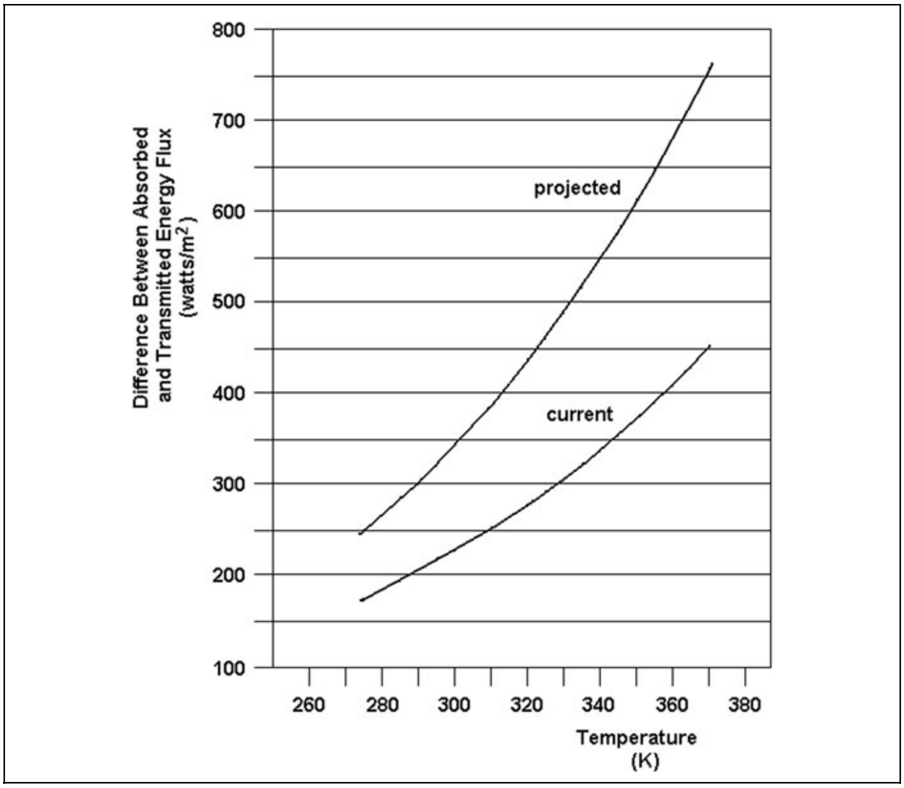

Figure 4. The difference between the energy flux absorbed in the atmosphere and transmitted through the atmosphere in the range of infrared wavelengths from 0 to 600 μ increases markedly with increasing temperature.

The results based on the infrared window as presented in Figure 5 and Figure 6 (see Appendix) are referred to as "current." They are presented as the "absorbed-transmitted" curve in Figure 1. Those referred to as "projected" are results based on a hypothetical case in which the wavelength region near the infrared window becomes more opaque than is currently the case, thereby decreasing the amount of energy flux that is transmitted through the atmosphere.

and other contaminants and to reduce the elevated temperatures that cause artificial grass to release toxic chemicals, such as benzothiazole and toluene, that are released from some artificial fields (Peeples, 2017). Ironically, the cost and water-saving benefits claimed by these organizations are attributable largely from not sprinkling water on natural grass.

Final Thoughts

Those concerned with climate change routinely ignore the result of replacing natural grass with artificial grass as part of the urban heat island. Although this is understandable, its contribution being much smaller than the contribution of greenhouse gases created by fossil fuels, that plastic and infill material must also be considered in the context of its life cycle and, in the more general sense, the environmental impact of all products that we produce, use, and discard. This article highlights the need for critical involvement in our choices for what we use and consume, from the individual homeowner to levels of government. That involvement must include not only the immediate effects of our actions but also the effects of the life cycle of a product, from its manufacture to its disposal. Only then can we attain a state of sustainability.

As an example of this need for critical involvement, we recognize the attractiveness of replacing natural grass by artificial grass in drought-stricken areas, such as the American southwest, and the consequent saving of water used for irrigation of the natural grass. For such landscaping, use of the traditional rock gardens, natural low-water-use flora such as cactuses and succulents, and drought-resistant grasses, the most drought-resistant being buffalo grass, can greatly reduce the water consumption and should be considered. Indeed, such flora have adapted to high temperature climates and can be expected to survive under all but unimaginably extreme global warming.

We have only one Earth. It is our responsibility, for ourselves, our future generations, and indeed for all the flora and fauna that inhabit the Earth that we attain that state of sustainability.

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Address correspondence to:
Leslie M. Golden
Center for Computational Astrophysics
934 Forest Avenue #201
Oak Park, IL 60302-1310
USA

E-mail: drlesgo@aol.com

Appendix

Absorption of Terrestrial Blackbody Radiation by the Atmosphere

The intensity of energy radiated per second from a unit area of an idealized object at temperature T in a wavelength interval $\Delta\lambda$ centered at λ into a unit solid angle is given by Planck's blackbody radiation law,

$$B_\lambda(T) = \left[\frac{2hc^2}{\lambda^5}\right]\frac{1}{e^{hc/k\lambda T}-1}, \qquad (1)$$

where h is Planck's constant, $h = 6.63 \times 10^{-34}$ joules-s, c is the speed of light in a vacuum, $c = 3.0 \times 10^8$ m/s, and k is Boltzmann's constant, $k = 1.38 \times 10^{-23}$ joules/K. The Stefan-Boltzmann law provides the energy radiated per second per unit area over all wavelengths, referred to as the radiative energy flux, $F(T)$, or simply the energy flux,

$$F(T) = \sigma T^4 \qquad (2)$$

where the Stefan-Boltzmann constant $\sigma = 5.67037 \times 10^{-8}$ watts/m^2-K^4 and T is the temperature in Kelvin. Our quoting σ to six significant figures is explained below. Wien's displacement law provides the wavelength at which the amount of radiation is maximum for a blackbody of temperature T,

$$\lambda_{\max} = \frac{0.00290}{T}\ m-K\ , \qquad (3)$$

where T is in K.

Planck's law, equation (1), provides the intensity of radiation which is radiated per unit solid angle. The radiation, assumed isotropic, which is emitted into 2π solid angles vertically, in the outward direction, and is therefore relevant here is the monochromatic radiative (or radiant) energy flux, or simply the radiative (or radiant) energy flux, viz.

$$B'_\lambda(T) = \pi B_\lambda(T) \qquad (4)$$

Henceforth, we will forego the additional notation of $B'_\lambda(\lambda)$, and will use $B_\lambda(T)$ to refer to the observable, the monochromatic radiative energy flux or, more simply, the radiative nature being understood, the monochromatic energy flux.

Modeling the Region near the Infrared Window

The top graph in Figure 5 shows the transmittance in the atmosphere of infrared wavelengths 0 through 15 μ. The atmosphere is largely opaque to infrared radiation, resulting in the heat radiation being absorbed. A small region of the infrared portion of the spectrum, between 7.7 and 14 μ wavelength, is partially transparent, the so-called infrared window. From about 14 to beyond 1,000 μ, or 1 mm, the atmosphere is essentially 100 percent opaque. In the bottom graph in Figure 5 the graphical representation of an algebraic model, $T(\lambda)$, is superimposed for the transmittance function, the details of which are provided in Table 3.

Radiation Transmission and Absorption

The energy flux radiated outward in a wavelength interval of interest, λ_1 to λ_2, by a blackbody at temperature T is obtained by a simple integration:

$$F_{BB}(T) = \int_{\lambda_1}^{\lambda_2} B_\lambda(T)d\lambda\ , \qquad (5)$$

(Appendix continues →)

where $B_\lambda(T)$ is the monochromatic radiative energy flux as defined by equation (4). To determine the amount of the energy radiated in the 0 to 600 μ region that is transmitted through the atmosphere, the product of the transmittance function and the Planck law are numerically integrated, as follows:

$$F_{tr}(T) = \int_{\lambda_1}^{\lambda_2} T(\lambda) B_\lambda(T) d\lambda \quad (6)$$

That radiation not transmitted is absorbed by the atmosphere. The amount of radiation over these wavelengths that is absorbed, $F_{abs}(T)$, is then, using equation (6),

$$F_{abs}(T) = F_{BB}(T) - F_{tr}(T) = \int_{\lambda_1}^{\lambda_2} [1 - T(\lambda)] B_\lambda(T) d\lambda \quad (7)$$

The difference in the amount absorbed and transmitted in this infrared wavelength region is:

$$\Delta F(T) = F_{abs}(T) - F_{tr}(T) \quad (8)$$

and the ratio of the energy flux transmitted through the atmosphere to the energy radiated by the blackbody is:

$$R(T) = \frac{F_{tr}(T)}{F_{BB}(T)} \quad (9)$$

Radiation emitted in directions other than the vertical will pass through greater path lengths before leaving the atmosphere and will therefore be more greatly absorbed. All absorbed radiation, not simply that traveling in a vertical, outward, direction, will heat the atmosphere. As a result, the numerical results presented here are underestimates of the amount of radiation that is absorbed.

We integrate from 0 to 600 μ, in the far infrared, including all but the long wavelength tail of the blackbody curve. An interval of $\Delta\lambda = 10^{-7}$ m, corresponding to 0.1 μ, is used in the numerical procedure, with the transmittance function $T(\lambda)$ evaluated at the center of the intervals. The first interval, for example, from 0 to 0.1 μ, corresponding to 1×10^{-7} m, is in this way evaluated at 0.05 μ. The calculation is performed at 5 K intervals for temperatures from 275 K to 370 K, corresponding to 2 °C to 97 °C, which includes the range of temperatures that artificial grass surfaces will attain on a sunlit summer day. This can be up to 40 K greater than the ambient temperature.

To estimate the error in the numerical integration, the result for the total radiation emitted by the blackbody, σT^4, equation (2), is compared to the result of the integration for a blackbody at the same temperature. Using the value of σ to six significant figures, errors of only 0.14 percent were found to be a result of this numerical technique.

Figure 6 shows the situation described in equation (6) in graphical form for a blackbody at the temperature of 300 K, about 81° F, a typical temperature for a warm summer day. Although much of the transmission of radiation occurs in the infrared window between wavelengths of 7.7 and 14 μ, the peak for a blackbody at higher temperatures will migrate as given by equation (3) (see Appendix) to smaller wavelengths, placing it in

(Appendix continues →)

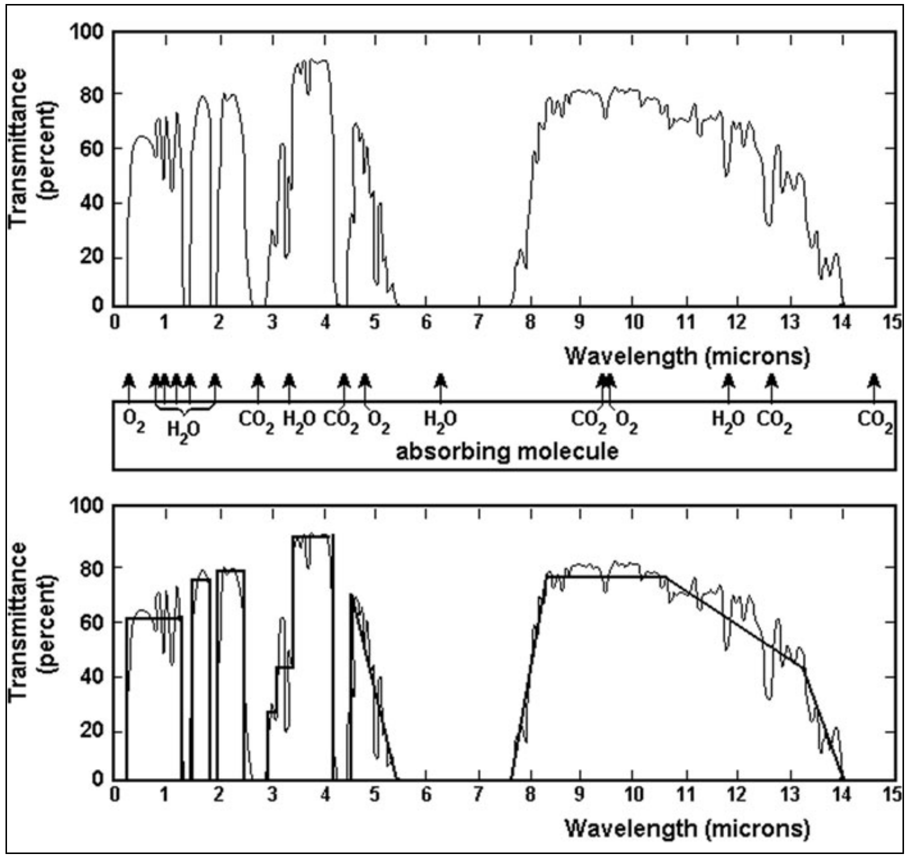

Figure 5. The graph on the top shows the percent of radiation transmitted through the atmosphere. The graph on the bottom shows the numerical model, $T(\lambda)$, the transmittance function based on calculations by the author. Adapted from U. S. Naval Academy, usna.edu.

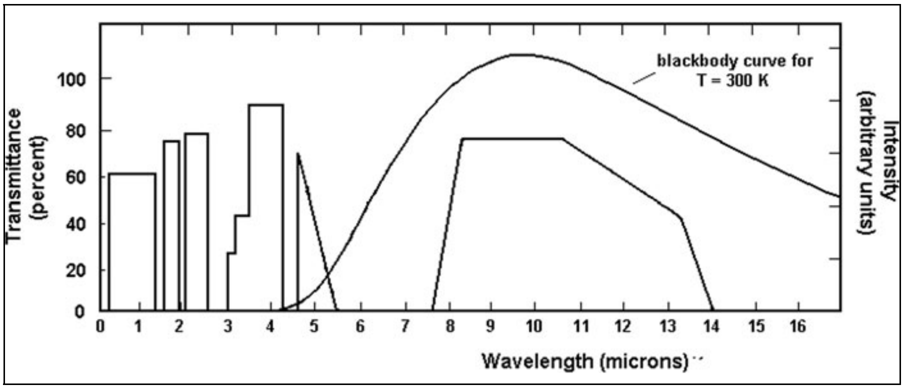

Figure 6. To determine the amount of radiation that is absorbed by the atmosphere in the range of infrared wavelengths of interest, first the amount that is transmitted is determined by multiplying the Planck blackbody curve at given temperatures by the transmittance function, as modelled piece-wise, and integrate from 0 to 600 μ, equation (6). Then equation (7) gives the amount absorbed. The graph shows the scenario for a blackbody at a temperature of 300 K, about 81 °F. Here the peak of the blackbody curve occurs at 9.7 μ wavelength, just long of the wide wavelength interval of zero transmittance. Much of the energy emitted by such a blackbody is absorbed by the atmosphere.

the middle of the 5.5 to 7.5 μ interval of zero transmittance. As a result, increasingly larger amounts of energy will be absorbed from objects radiating at increasingly higher temperatures.

Determination of the best fit model

To determine the equation which best fits the results for the absorption of energy as a function of temperature in the range of wavelengths from 0 to 600 μ, provided in the fourth and eighth columns of Table 2 it is reasonable based on physical considerations to assume a form

$$F_{abs}(T) = a_1\, e^{a_2 T} \sigma T^4 \ , \qquad (10)$$

where σ is the Stefan-Boltzmann constant and a_1 has the units of watts/m^2. Using the results presented in the fourth and eighth columns of Table 2, shown as the curve labeled "absorbed" in Figure 1, we find the best fit to the absorption results is given by

$$a_1 = 0.891$$
$$a_2 = -6.424 \times 10^{-4}\ K^{-1}$$

with a standard error of estimate, defined below, of 2.1 watts/m^2 based on two degrees of freedom resulting from the use of the two parameters. This small standard error of estimate, compared to the values of absorption to which the fit is imposed, indicates that equation (10) provides an excellent fit.

Similarly, a fit of the same form as equation (10), viz.

$$F_{tr}(T) = b_1\, e^{b_2 T} \sigma T^4 \ , \qquad (11)$$

can be made to the transmitted results, presented in the second and fifth columns of Table 2, shown as the curve designated as "transmitted" in Figure 1. We find the best fit to these transmission results is given by

$$b_1 = 0.161$$
$$b_2 = 1.652 \times 10^{-3}\ K^{-1}$$

with a standard error of estimate of 2.4 watts/m^2 based on two degrees of freedom resulting from the use of the two parameters. As with the absorption data, this small standard error of estimate, compared to the values of transmission to which the fit is imposed, indicates that the form of equation (10) and equation (11) provides an excellent fit.

The difference, equation (8), a measure of the energy being deposited into the atmosphere compared to that being transmitted, over the range of temperatures 275 K to 370 K, is given then by

$$\Delta F(T) = \left(a_1 e^{a_2 T} - b_1\, e^{b_2 T}\right) \sigma T^4$$

from equation (10) and equation (11).

By equation (10), we can then calculate the difference in the energy flux absorbed by the atmosphere in the range of wavelengths from 0 to 600 microns between that radiated by artificial grass and that radiated by natural grass for various differences in temperatures. If ΔT is the (positive) difference between the temperature reached by artificial grass compared to that reached by natural grass under the same meteorological conditions, then we can use equation (10) to calculate the increase in the energy flux absorbed by the atmosphere in the infrared from 0 to 600 μ as

$$\Delta F_{abs}(T) = a_1 e^{a_2 (T+\Delta T)} \sigma (T+\Delta T)^4 - a_1\, e^{a_2 T} \sigma T^4 \ , \qquad (12)$$

where T is the temperature of the natural grass and σ is the Stefan-Boltzmann constant. Figure 5 shows the results for a range of six values of ΔT in 5 K increments from 20 K to 50 K, which bracket the values found by Devitt *et. al.* (2007), Williams and Pulley (2001), and Buskirk *et. al.* (1971). These results lead to the conclusion that artificial grass contributes to global warming.

The natural transmittance of the atmosphere

With these results, we can revisit the transmittance of the atmosphere in the infrared. Figure 5 and Figure 6

(Appendix continues →)

presented the transmittance in the wavelengths near the infrared window as usually presented, as *monochromatic* transmittance. This, however, is relevant for spectral observations of celestial objects in infrared astronomy. Real, natural objects radiate approximately as blackbodies, and that is our concern here. In that context, the meaningful transmittance should be discussed relative to the temperature of the blackbody, not a particular frequency or narrow bandpass. Figure 4 presents the ratio, $R(T)$, of $F_{tr}(T)$, the energy flux generated by blackbodies which is transmitted through the atmospheric infrared window, to $F_{BB}(T)$, the energy flux of the blackbody, as a function of temperature of the blackbody, equation (9). We can refer to this ratio as the "natural transmittance" of the atmosphere. The values of the ratios $R(T)$, deduced from the results presented in Table 2, are, as seen, small numbers.

Although the interval between 7.7 and 14 μ may be referred to as the infrared "window," we see that, for natural radiating objects, the wavelength region between 0 and 14 μ cannot be described as transparent. Despite the ordinate scale in Figure 5 being expanded to show detail, one can state that for objects radiating at terrestrial temperatures the natural transmission through the portion of the infrared from 0 to 600 μ is 26 ± 3%.

This contrasts greatly with the monochromatic transmittance detailed in Figure 5 and Figure 6, as represented algebraically in Table 3. We see that the window has regions of transmittance of up to 90%, between 3.5 and 4.1 μ, with other wavelength regions having a transmittance above 75%. Yet, for real, natural radiating objects, the transmittance, as a function of the blackbody temperature, is about 26%. We see that, in fact, for natural objects, in the wavelength range from 0 to 600 μ, the atmosphere absorbs about 74% of the energy flux. That figure provides a reference when considering additional direct sources of energy flux being deposited into the atmosphere.

Fitting a function of the form

$$R(T) = a - \frac{b}{T - 250} \tag{13}$$

to the data we used to draw the natural transmittance curve of Figure 7, deduced as said from the results presented in Table 2, with the temperature measured in Kelvin, we find a best fit for

$$a = 0.298 \pm 0.002$$
$$b = 1.917 \pm 0.005\ K,$$

with a standard error of estimate of 0.0048 based on two degrees of freedom resulting from the use of the two parameters. This indicates an excellent fit. That the value of a resulting from the fit is similar to the numbers provided in the ordinate scale of Figure 7 justify choosing the form of equation (13).

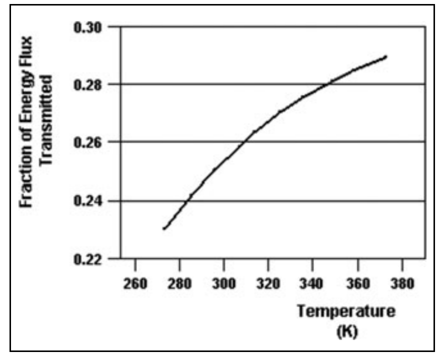

Figure 7. The ratio of the energy flux generated by a blackbody at a given temperature which is transmitted through the atmosphere to the energy flux of the blackbody provides a meaningful measure of the nature of the transmittance in the range of infrared wavelengths from 0 to 600 μ for natural objects. We can refer to this, in contrast to that depicted in Figure 5 and Figure 6, as the natural transmittance of the atmosphere.

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Artificial turf surfaces: Perception of safety, sporting feature, satisfaction and preference of football users

Pablo Burillo , Leonor Gallardo , Jose Luis Felipe & Ana Maria Gallardo

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ORIGINAL ARTICLE

Artificial turf surfaces: Perception of safety, sporting feature, satisfaction and preference of football users

PABLO BURILLO[1], LEONOR GALLARDO[2], JOSE LUIS FELIPE[3], & ANA MARIA GALLARDO[4]

[1]*Sport Science Institute, Camilo Jose Cela University, Madrid, Spain,* [2]*Faculty of Sport Science, University of Castilla-La Mancha, Toledo, Spain,* [3]*Faculty of Sport Sciences, European University of Madrid, Madrid, Spain, and* [4]*Faculty of Health, Physical Activity and Sport, Catholic University of San Antonio, Murcia, Spain*

Abstract
The aim of this research is to understand the experience of the football sector on the use of artificial turf (satisfaction, safety, sporting feature, or the advantages and disadvantages). The study was conducted on a random selection of 627 male participants (404 amateur/semi-professional footballers, 101 coaches and 122 referees) that regularly train/compete on artificial turf in Spanish football leagues. The results of the skin abrasion, muscle strain and the possibility of sustaining an injury, on a Likert-type 10-point interval scale, gave a perception of 'somewhat dissatisfied' for the participants. The main advantages of artificial turf were their sports features, the evenness of the surface and the good state of conservation. Participants were satisfied with the artificial turf surface. Approximately three out of four participants gave an overall ranking of highly satisfied. The players were significantly less satisfied than the coaches and referees. The overall satisfaction with artificial turf fields was strongly influenced by previous experience, particularly those who had previously played on dirt pitches. These results highlight the versatility of artificial turf to adapt to any circumstance or requirement for local sport and top-level professional competitions alike.

Keywords: *Artificial turf, football, perception, safety, user satisfaction, preference*

Introduction

Football has experienced wide change over the last 40 years as far as playing surfaces are concerned. Football has traditionally been played on natural grass pitches. However, in large areas of southern Europe, Africa and Asia, dirt pitches have often been the surface for locations with more limited economic resources and for lower leagues (FIFA, 2007a). In fact, only professional clubs and wealthier suburban areas have been able to build, and particularly maintain, their grounds with natural turf (ESTO, 2008). In recent years, there has been a marked introduction of artificial turf. This playing surface can be attractive for amateur footballers of all ages who were formerly used to dirt pitches and natural surfaces in a poor state (Burillo, 2009).

The number of natural turf pitches has reduced dramatically in favour of artificial turf. McNitt (2005) forecasted a 20% increase in artificial turf football grounds per year in the United States, mainly because of the potential for exploitation of this surface. Furthermore, artificial turf is considered to be an ideal surface for the training of young footballers (Stiles, James, Dixon, & Guisasola, 2009). However, this increase is also due to the fact that dirt pitches are a poor 'advertising' for the sport, particularly in today's global context. In addition, investment in natural turf fields is very expensive to maintain for most local organisations, particularly where there are high temperatures and low annual rainfall (Orchard, 2002). Furthermore, their restricted periods of use are not consistent with current strategies for promoting the sport. Thus, sports

Correspondence: L. Gallardo, University of Castilla-La Mancha, Avda. Carlos III, s/n. Edificio Sabatini 1.52. 47051, Toledo, Spain. E-mail: leonor.gallardo@uclm.es

organisations are asking themselves which type of playing surface offers the best response to their needs (Gallardo, Burillo, García-Tascón, & Salinero, 2009).

It was not until 2003 that International Federation of Association Football (FIFA) accepted artificial turf for official competitions (Burillo, 2009). The arrival of third-generation artificial turf (with rubber and sand infills) in the 1990s saw the disappearance of most of the problems attached to previous generations, such as high stiffness, friction, degree of skin abrasion, or distorted bounce and roll of the ball (Ekstrand, Timpka, & Hägglund, 2006; McNitt, 2005; Steffen, Andersen, & Bahr, 2007), and was welcomed by a large proportion of the sporting, political and social sectors (Ekstrand et al., 2006).

At first, artificial turf received a lukewarm reception because of the higher number of injuries when compared with other surfaces, particularly natural turf (Schmidt-Oltsen, Jörgensen, Kaalund, & Sörensen, 1991). However, the various studies carried out comparing third-generation artificial turf with all the other natural surfaces have redressed this imbalance in injury numbers (Ekstrand et al., 2006; Foster, 2007; Meyers, 2010; Meyers & Barnhill, 2004; Naunheim, Parrott, & Standeven, 2004; Steffen et al., 2007). Since then, FIFA has acknowledged artificial turf as an alternative, not a substitute (FIFA, 2007a). Nevertheless, the professional sector, in general, remains unconvinced, and artificial turf is still used in a very limited manner.

Artificial turf has also led to the spread of seven-a-side football as an amateur sport; a great advance for community football. The increase in the number of users has led to a major increase in active sports participation by the public, and various pitches are needed to meet this demand (Gallardo et al., 2009; Whitlock, 2008).

Several researchers have documented user satisfaction on other football playing surfaces as compared with natural turf (Andersson, Ekblom, & Krustrup, 2008; Ford et al., 2006; Foster, 2007; Zanetti, 2009). However, there has been limited research done on the perception of artificial turf in particular; for instance, the actual degree of satisfaction. Understanding user satisfaction is imperative in developing artificial turf facilities and improving the service (Burillo, 2009). The success of sporting organisations lies in the awareness they have of the needs, expectations, attitudes and nature of their potential users. Users may initially be largely influenced by the appearance of the sports facility (Zanetti, 2009). The first impression is usually visual, and so the overall image is very important. However, subsequent experience defines a user's satisfaction in the final analysis. The aim of this research is to document the experience of the sporting sector (i.e., football players, coaches and referees) on the use of artificial football turf and its sociodemographic profile (age, levels, years of experience and previous playing surface), perception of safety, sports feature, advantages and disadvantages, preferences regarding type of playing surface and overall satisfaction.

Methods

Participants

The study was conducted on a random selection of 627 male subjects (mean 28.4 years; $s = 7.7$), of whom, 404 were amateur/semi-professional footballers (mean 26.2 years; $s = 6.4$), 101 coaches (mean 43.1 years; $s = 10.8$) and 122 referees (mean 24.7 years; $s = 5.9$) from the Royal Spanish Football Federation database. Each group was composed of participants who regularly train and compete on artificial turf pitches in amateur football competitions in Castilla-La Mancha (Spain). The sample size was defined with a 95% confidence level, the standard error being 3% for the players, 5% for the coaches and 4% for the referees.

There was a homogenous distribution of participants in terms of age, level and years of experience of artificial turf (Table I). Previously, most of the participants had trained/played either on dirt pitches (66% of the total), while the rest had trained on natural turf (34%).

None of the artificial turf pitches on which the participants have trained or competed had been previously certified by any federation (FIFA or the Spanish Federation). There were a total of 79 pitches (87% of the whole sample in Castilla-La Mancha). The artificial turf was third generation [monofilament or fibrillated fibres of 50–60 mm, with sand and Styrene Butadiene Rubber (SBR) infills], with an average age of 3.9 years ($s = 2.4$). Ninety per cent of the fields do not have shock pad. It is not known how many of these fields are regularly maintained.

Data compilation was conducted *in situ* before daily training sessions, and in the case of the referees, at their technical meetings, during the final part of the 2008 to 2009 season (February–April). The participants were informed (both oral and written) about the study and were given instructions for filling in the questionnaire, the ethical approval (previously reviewed by an institutional ethics panel) and the informed consent.

Design of the study

A questionnaire was designed specifically for this survey to study user satisfaction with artificial turf. The following phases of research were followed in

Table I. Summary of categorical variables of participants

Categorical variables	Players (*N*,%)	Coaches (*N*, %)	Referees (*N*, %)	Total (*N*, %)
Age				
16–19 years	97 (24, 0)	0 (0, 0)	33 (27, 0)	130 (20, 74)
20–25 years	129 (31, 9)	15 (14, 9)	45 (36, 9)	189 (30, 14)
26–35 years	105 (26, 0)	37 (36, 6)	26 (21, 3)	168 (26, 79)
> 36 years	73 (18, 1)	49 (48, 5)	18 (14, 8)	140 (22, 32)
Level				
Youth sport	82 (20, 3)	54 (53, 5)	22 (18, 0)	158 (30, 60)
Regional	212 (52, 5)	39 (38, 6)	56 (45, 9)	307 (45, 67)
National	110 (27, 2)	8 (7, 9)	44 (36, 1)	162 (23, 73)
Previous experience with artificial turf				
1–3 years	176 (43, 6)	42 (41, 6)	48 (39, 3)	266 (41, 50)
> 3 years	228 (56, 4)	59 (58, 4)	74 (60, 7)	361 (58, 50)
Previous playing surface				
Natural turf	162 (40, 1)	38 (37, 6)	28 (23, 0)	228 (33, 57)
Dirt pitches	242 (59, 9)	63 (62, 4)	94 (77, 0)	399 (66, 43)
Total	404 (100%)	101 (100%)	122 (100%)	627 (100%)

order to check the questionnaire's validity and reliability (Thomas, Nelson, & Silverman, 2005).

The first phase consisted of proposing a set of variables (55 items) regarding perception of satisfaction based on previous questionnaires and studies. A number of factors were defined based on other questionnaires about satisfaction with artificial turf (Andersson et al., 2008; Ekstrand et al., 2006; Meyers & Barnhill, 2004; UEFA, 2004).

In the second phase, content and criterion validity was assessed by 14 experts, who were asked to select the most important variables in the artificial turf study. These experts are recognized in their respective fields (university lecturers, such as a Ph.D. in Sport Management and Facilities, a Ph.D. in Biomechanics, and a Ph.D. in Sport Medicine; two sports managers; three football players; two coaches; two referees; and two artificial turf manufacturers). The Group Discussion technique was used to identify the most suitable variables to explain and determine the perception of the football sector on the use of artificial turf. The experts presented and discussed the factors and variables in previous studies and changes most requested by those engaging in artificial turf fields.

The result was a questionnaire adapted to the characteristics pertaining to each group of participants: 45 items for players, 51 for coaches and 45 for referees, with the following measures: sociodemographic profile (such as age, level, years of experiences and previous playing surfaces), safety, sports feature, advantages and disadvantages, preferences regarding type of playing surface and overall perception of satisfaction. Almost all the items of the questionnaires were constructed by Closed Questions. The sociodemographic factor has made by Categorical responses. The sections of Safety (6 questions), Sports feature (14 questions for players and referees, 17 questions for coaches), Preferences regarding type of playing surface (4 questions) and Overall perception of satisfaction (12 questions) were built by Scaled items. These variables were graduated on a Likert-type 10-point interval scale, following the recommendations of Hill, Brierley, and MacDougall (2003) and Thomas et al. (2005), with a minimum value (1), which denoted 'Extremely Dissatisfied' and a maximum value (10), denoting 'Extremely Satisfied'. Finally, the section of 'Advantages and disadvantages' was built with two Open-Ended questions: discuss the main advantage/disadvantage of the artificial turf surface on the others surfaces on which you trained/competed, such as natural turf. The responses were synthesized and grouped into categories for interpretation (percentage of response).

In the third phase, a pilot study was conducted on the questionnaire, in which 23 players, 10 coaches and 11 referees from different levels and age groups took part. The fourth phase checked the questionnaire's construct reliability and validity. Responses were always examined to determine whether the items seem clear and appropriate. No substantial changes were mandated by the results of the pilot study (only some changes of format and layout of the survey). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Bartlett's Sphericity Test and Cronbach's Alpha coefficient were used here. The KMO test gave a satisfactory result of 0.724 for players, 0.763 for coaches and 0.834 for referees, all with a significance of $p < 0.01$ in Bartlett's Sphericity Test. The questionnaires obtained excellent results in Cronbach's Alpha coefficient (0.888 players, 0.864 coaches and 0.846 referees, on a scale of 0 to 1), to quantify the level of reliability of the measurement scales.

Statistical analysis

The statistical analysis was based on the subjective form of satisfaction perception measurement, as had been done previously in similar studies (Andersson et al., 2008; Meyers & Barnhill, 2004; Steffen et al., 2007; Zanetti, 2009). The SPSS 15.0 statistics programme for Windows was employed. Various statistical tests were applied: a descriptive variable analysis (including mean, standard deviation, percentage); the Kolmogorov–Smirnov test ($p < 0.05$), to check normality and compare non-normal distributions; the Chi-squared (χ^2) statistic ($p < 0.05$) for contingency tables and contrast of observed and expected values; the Kruskal–Wallis test ($p < 0.05$) comparing distributions applying a non-parametric method; and the Spearman Rho correlation ($p < 0.05$) in non-normal distributions. A confidence level of 95% was established.

Results

The participants gave low ratings to artificial turf safety aspects (Table II). Skin abrasion (in sliding tackles) (2.90, $s = 1.61$), muscle strain (4.86, $s = 1.69$) and the risk of sustaining an injury (4.29, $s = 1.99$) gave a perception of 'somewhat dissatisfaction' for the group. In general, players were more dissatisfied, returning values that were lower than those of coaches and referees.

As far as sports feature was concerned, the overall evaluation obtained from the participants was positive. The highest-scoring aspects were the perception of pitch markings (7.84, $s = 1.67$), the evenness of the surface (7.47, $s = 1.61$) and the state of conservation of the pitch (7.25, $s = 1.79$). The rest of the variables also received satisfactory scores, particularly those connected with the interaction between the surface and the ball and movement on the pitch. The lowest-scoring variables were playing at high temperatures (5.10, $s = 1.86$) and with a snow-covered or frozen surface (5.13, $s = 1.87$).

One particular group, the coaches were asked about the suitability of artificial turf for youth football, amateur regional leagues, or for top-level players. The coaches gave a high ranking for this surface, both for teaching football and for regional leagues.

In the comparison between groups, the players were significantly less satisfied than the coaches and referees when it came to safety aspects ($p < 0.01$), except for muscle strain, for which we only found differences between players and referees, with a confidence level of 95% (Table II). The players were significantly less satisfied than the referees in all sporting aspects ($p < 0.01$), and less satisfied than the coaches except for the state of conservation of the pitch and its evenness which received similar scores. Coaches and referees did not differ significantly in most variables analysed, giving similar scores, except in two safety variables ($p < 0.01$) (skin abrasion and possibility of sustaining an injury) and two of sports feature (speed movements, $p < 0.05$, and behaviour of the ball, $p < 0.01$). Also, significant differences ($p < 0.01$) were detected in the overall satisfaction of players as against coaches and referees.

One of the foremost aspects for the coaches was the suspension of the activity or training session due to the pitch conditions. Altogether, 84% of the coaches had never had to cancel any training session because of the condition of the artificial turf. Other coaches (16%) have cancelled only 1–3 training sessions. Nobody has cancelled 4 sessions or more in artificial turf.

The main advantages of artificial turf for the football users were its sports feature (23.4% of whole group), the evenness of the surface (20.3%) and the good state of conservation of the pitch (13.6%) (Table III). Advantages of artificial turf identified by the players were its sporting feature and improved performance (29.7%), as well as the evenness of the surface (17.6%). Meanwhile, advantages recognised by the coaches and referees for this surface were its good state of conservation (24.8% and 13.9%, respectively) and the evenness of the surface (18.8% and 30.3%). On the other hand, all agreed that skin abrasion, especially in sliding tackles, was the biggest disadvantage of artificial turf, with a mean percentage of 33.2%.

As far as perception of overall satisfaction with artificial turf (Table II) was concerned, the participants were satisfied with the current artificial turf surfaces which they usually use, with a mean score of 7.29 ($s = 1.89$). Coaches and referees displayed significantly greater satisfaction with artificial turf than the players did. As for the preferred surface (Table III), participants could choose between three possibilities as favourite surface: artificial turf, natural turf, or both surfaces. Approximately 39% of participants preferred natural turf as a training/competition surface, while 32% preferred artificial turf and the remaining 29% preferred both surfaces.

The 'competition level' was an influence factor for the satisfaction of the football users ($p < 0.01$ for players and coaches; $p < 0.05$ for referees). Generally, participants expressed a perception of overall satisfaction with artificial turf that was significantly lower as the playing level increased (Table IV). There were also significant differences with regard to age for players ($p < 0.01$) and coaches ($p < 0.05$). Similarly, participants whose previous playing surface was dirt pitches were significantly more satisfied than those who had played/trained on a natural turf surface ($p < 0.01$ for players and referees; $p < 0.05$ for coaches).

Table II. Assessment and Kruskal–Wallis tests of safety, sporting feature and perception of satisfaction with artificial turf

Variable	Players, P 1–10 $\bar{X}$(s)	Coaches, C 1–10 $\bar{X}$(s)	Referees, R 1–10 $\bar{X}$(s)	Whole group $\bar{X}$(s)	Contrast	K–W test	Significance
Safety							
Muscle strain	4.73 (1.59)	5.00 (1.46)	5.20 (2.10)	4.86 (1.69)	P–C	0.5789	0.4467
					P–R	4.9655	0.026*
					C–R	0.8306	0.3620
Skin abrasion	2.71 (1.41)	2.75 (1.27)	3.66 (2.19)	2.90 (1.61)	P–C	220.00	0.000**
					P–R	16.938	0.000**
					C–R	8.4115	0.003**
Possibility of sustaining an injury	3.82 (1.80)	4.42 (1.86)	5.71 (2.02)	4.29 (1.99)	P–C	8.1746	0.004**
					P–R	76.550	0.000**
					C–R	22.603	0.000**
Sports feature							
State of conservation of the pitch	7.05 (1.86)	7.56 (1.11)	7.64 (1.93)	7.25 (1.79)	P–C	2.1423	0.1432
					P–R	9.4021	0.002**
					C–R	1.6532	0.1985
Evenness of the surface	7.32 (1.64)	7.69 (1.30)	7.75 (1.69)	7.47 (1.61)	P–C	1.9242	0.1653
					P–R	7.0197	0.008**
					C–R	0.7983	0.3715
Speed movements	5.69 (1.98)	7.52 (1.21)	7.84 (1.48)	6.40 (2.03)	P–C	75.172	0.000**
					P–R	105.59	0.000**
					C–R	4.9059	0.026*
Ball rebound	6.12 (1.88)	7.65 (1.31)	7.20 (1.84)	6.58 (1.77)	P–C	86.29	0.000**
					P–R	50.597	0.000**
					C–R	4.5225	0.033*
Player running	6.34 (1.68)	7.63 (1.27)	7.54 (1.46)	6.78 (1.76)	P–C	44.415	0.000**
					P–R	43.64	0.000**
					C–R	0.000	0.9982
Behaviour of the ball	6.37 (1.64)	8.24 (1.28)	7.66 (1.65)	6.92 (1.81)	P–C	99.848	0.000**
					P–R	51.886	0.000**
					C–R	8.322	0.004**
Playing at flooded surface	6.41 (1.80)	7.56 (1.34)	7.25 (2.04)	6.76 (1.82)	P–C	41.99	0.000**
					P–R	21.99	0.000**
					C–R	0.2698	0.603
Playing at snow-covered or frozen surface	4.77 (1.72)	5.83 (1.44)	5.74 (2.41)	5.13 (1.87)	P–C	42.69	0.000**
					P–R	22.24	0.000**
					C–R	0.066	0.7971
Playing at high temperatures	4.64 (1.77)	5.80 (1.53)	6.02 (2.22)	5.10 (1.86)	P–C	53.38	0.000**
					P–R	45.9	0.000**
					C–R	2.106	0.146
Perception of pitch markings	7.45 (1.68)	8.50 (1.35)	8.61 (1.54)	7.84 (1.67)	P–C	41.513	0.000**
					P–R	51.814	0.000**
					C–R	1.8734	0.171
Suitability for youth competition		8.78 (1.39)		8.78 (1.39)			
Suitability for regional competition		8.35 (1.32)		8.35 (1.32)			
Suitability for professional competition		6.65 (1.69)		6.65 (1.69)			
General satisfaction with artificial turf	7.14 (2.01)	7.61 (1.52)	7.53 (1.69)	7.29 (1.89)	P–C	9.2081	0.009**
					P–R	9.0902	0.009**
					C–R	0.0079	0.929

*$p < 0.05$; **$p < 0.01$.

Significant differences ($p < 0.01$) were observed with regard to the overall perception of satisfaction with artificial turf displayed by participants and their preference for the type of playing surface (Table IV). Participants who chose artificial turf as their preferred surface were very satisfied (scores of 8, 9 and 10 from nearly 85%). Meanwhile, those who preferred natural turf expressed a greater degree of dissatisfaction with artificial turf, scores given were below 7.

Discussion

Safety

For a long time, artificial turf has been believed to give rise to more sporting injuries than natural turf (Canaway, Bell, Holmes, & Baker, 1990; Schmidt-Oltsen et al., 1991). In spite of this, recent epidemiological studies on third-generation artificial turf claim that the risk of injury is no greater on this

Table III. Summary of advantages and disadvantages of artificial turf and preference surface for users

	Players N (%)	Coaches N (%)	Referees N (%)	Whole group N (%)
Advantages of artificial turf				
Sporting practicability and improved performance	120 (29.7)	10 (9.9)	17 (13.9)	147 (23.4)
Evenness of the surface	71 (17.6)	19 (18.8)	37 (30.3)	127 (20.3)
Good state of conservation of the pitch	43 (10.6)	25 (24.8)	17 (13.9)	85 (13.6)
To spend more time on this surface	55 (13.6)	11 (10.9)	3 (2.5)	69 (11.0)
Playing at flooded surface	29 (7.2)	8 (7.9)	17 (13.9)	54 (8.6)
Lower risk of sustaining an injury	20 (5.0)	8 (7.9)	5 (4.1%)	33 (5.3)
Lower physical fatigue	18 (4.5)	0 (0)	0 (0)	18 (2.9)
Suitable for teaching football	0 (0)	11 (10.9)	0 (0)	11 (1.8)
Perception of pitch markings	0 (0)	0 (0)	6 (4.9)	6 (1.0)
Don't know/refusal	48 (11.9)	9 (8.9)	20 (16.4)	77 (12.3)
Disadvantages of artificial turf				
Skin abrasion (sliding tackles)	160 (39.6)	20 (19.8)	28 (23.0)	208 (33.2)
Playing at high temperatures	64 (15.8)	12 (11.9)	10 (8.2)	86 (13.7)
Risk of sustaining an injury	43 (10.6)	18 (17.8)	25 (20.5)	86 (13.7)
Worst sporting performance	36 (8.9)	12 (11.9)	12 (9.8)	60 (9.6)
Dangerous components (Hydrant, artificial turf joints, etc.)	20 (5.0)	5 (5.0)	11 (9.0)	36 (5.7)
Rapid deterioration	19 (4.7)	6 (5.9)	7 (5.7)	32 (5.1)
Better natural turf in good state	9 (2.2)	19 (18.8)	1 (0.8)	29 (4.6)
Don't know/refusal	53 (13.1)	9 (8.9)	28 (23.0)	90 (14.3)
Preferences %				
Artificial turf	25.5	42.6	27.0	31.72
Natural turf	41.3	29.7	46.7	39.23
Both surfaces	33.2	27.7	26.2	29.04

surface (Steffen et al., 2007). Ekstrand et al. (2006) state that in artificial turf, there is significantly greater risk of ankle injury but less risk of muscle injury. Also, other studies (Pasanen, Parkkari, Rossi, & Kannus, 2008) show that there is an increased risk of injury in artificial turf caused by increased friction surface of the footwear. The type of studs and their distribution on the sole modify the resistance to frictional forces (Bentley, Ramanathan, Arnold, Wang, & Abboud, 2011; Kernozek & Zimmer, 2000). By contrast, according to Steffen et al. (2007) and Meyers (2010), the latest generation of artificial turf is safer to play because of the lower frequency and severity of injury. It should be clarified that most of these studies have not specified whether the sample of artificial turf fields (very small in some cases) passed the quality control of international certification services (EN or FIFA Quality Concept) because the percentage of fields certified by FIFA Quality Concept 2009 (1 or 2 stars) did not even reach a trifling 1.5% of the total in Europe.

All the participants displayed a noteworthy degree of dissatisfaction with regard to the three aspects surveyed concerning safety, principally with regard to skin abrasion, with an average mark of 2–3 out of 10, which shows that this aspect is very poor. Skin abrasion was also the biggest disadvantage of artificial turf over other surfaces for most participants, as was the case in other studies (Chivers, 2008; Meyers & Barnhill, 2004; Zanetti, 2009), because it may cause abrasions or friction burns. Although third-generation artificial turf fields have considerably reduced the incidents of skin abrasion in the interaction between player and surface, the problem has not disappeared (Steffen et al., 2007). Alcántara, Gámez, Rosa, and Sanchís (2009) pointed out that this was the main disadvantage over natural turf for both FIFA and Union of European Football Associations (UEFA). Skin abrasion is one of the main aspects currently being addressed in the improvement of synthetic surfaces (McNitt, 2005). Many laboratories and companies are working on new fibres, such as lineal low-density polyethylene (LLDPE), to reduce skin abrasion in artificial turf (Sandkuehler, Torres, & Allgeuer, 2010; Torres, Sandkuehler, Garcia Muenzer, & Allgeuer, 2010).

Sporting feature

Sports feature is crucial in ultimate sporting performance (Hughes & Franks, 2005). This being so, sporting feature and better performance on artificial turf are two of the main advantages cited by the participants. The parameter of greatest satisfaction was the visibility of pitch markings on artificial turf, together with the evenness of the pitch and the state of conservation (preservation). The treatment against UVA rays has been one of the most improved features of artificial turf fibre (Foster, 2007). This treatment began to be applied in third-generation artificial turf. Since the fibre's resistance against

Table IV. Pearson's test of satisfaction with artificial turf pitches and Satisfaction of users based on the surface preference

Satisfaction with artificial turf pitches		Players $\bar{X}_{(s)}$	Players Pearson χ^2	Players Significance	Coaches $\bar{X}_{(s)}$	Coaches Pearson χ^2	Coaches Significance	Referees $\bar{X}_{(s)}$	Referees Pearson χ^2	Referees Significance
Age	16–19 years	7.93 (1.42)	82.861	0.000**	–	28.018	0.014*	7.70 (1.53)	25.598	0.541
	20–25 years	7.50 (1.56)			8.53 (0.92)			7.53 (1.66)		
	26–35 years	7.09 (2.04)			7.19 (1.70)			7.38 (1.58)		
	> 36 years	5.53 (2.42)			7.65 (1.42)			7.44 (2.25)		
Level	Youth sport	8.05 (1.33)			8.15 (1.52)			8.05 (1.70)		
	Regional	7.50 (1.60)	90.885	0.000**	6.90 (1.23)	38.222	0.000**	7.38 (1.85)	32.847	0.017*
	National	5.77 (2.43)			7.50 (1.51)			7.48 (1.44)		
Experience with artificial turf	1–3 years	6.66 (2.21)	25.127	0.003**	7.54 (1.47)	4.538	0.716	7.40 (2.02)	8.943	0.443
	> 3 years	7.51 (1.75)			7.84 (1.70)			7.62 (1.45)		
Previous playing surface	Natural turf	6.10 (2.21)	90.723	0.000**	7.00 (1.63)	13.284	0.039*	6.18 (1.68)	40.267	0.000**
	Dirt pitches	7.83 (1.51)			7.98 (1.34)			7.94 (1.48)		

		Sport surface preference					
		Artificial turf $\bar{X}_{(s)}$	Natural turf $\bar{X}_{(s)}$	Both $\bar{X}_{(s)}$	Pearson χ^2	df	Asymptotic significance (two-tailed)
Satisfaction with artificial turf $\bar{X}_{(SD)}$	Players	8.37 (0.99)	5.70 (2.11)	7.99 (1.19)	169.2	18	0.000**
	Coaches	8.23 (1.17)	6.50 (1.48)	7.89 (1.43)	32.3	14	0.004**
	Referees	8.52 (1.00)	6.67 (1.87)	8.06 (1.05)	35.6	18	0.008**

*$p < 0.05$; **$p < 0.01$.

direct sunlight is increased, the field has a better appearance (Foster, 2007).

There is another aspect where there are certain differences in users' perception, the ball interaction variables (bounce, movement along the ground, control, among others). In general, moderate satisfaction was displayed for these aspects (with mean scores between 6 and 8). Burillo (2009) stressed that the new generation of artificial turf met needs related to the bounce and roll of the ball, as against previous generations, considered to be less practical and more uncertain for the players. Similarly, FIFA (2007c) conducted various studies analyzing the performance and run of play in competitions on artificial turf, and there were clear similarities with natural turf in most aspects (including ball possession, control, and attacking play). However, these studies were conducted on 2-star (FIFA-certified) artificial turf fields that comprise a trifling proportion of pitches in the world. Similarly, in other studies, in which the quality of artificial turf is not specified, there were significant differences in a better ball roll, ball bounce and player-surface on natural surfaces (Martinez et al., 2004; Stiles et al., 2009).

But we cannot assume that all artificial turf is the same, and that all natural turf is the same. The performance of an artificial turf field depends on the type of components used, the way they are installed on site, the intensity of usage a surface is subjected to and the maintenance carried out (Alcántara et al., 2009; Martinez et al., 2004). There exists huge variability in the products available (fibres and rubber infill) that could change the mechanical properties of the field. For example, the types of infill or the greater density in the infill system clearly affect the maximum traction generated by the surface (Severn, Fleming, Clarke, & Carré, 2011). Similarly, the larger size of the rubber infill increases the impact forces and the ball bounce (Alcántara et al., 2009). To ensure a surface is delivering the anticipated acceptable levels of performance owners should make a good choice of the surface components and it may be tested throughout its life.

The variables relating to play in extreme weather conditions (high temperatures or snow-covered pitch) were the most unfavourable aspects of sporting feature. Zanetti (2009) stated that players usually preferred to play on artificial turf when the weather was mild or cold. Thus, playing in high temperatures was one of the main disadvantages expressed by the participants. Zanetti (2009) noticed this problem; particularly in areas with extreme temperatures (Africa, Asia, southern European countries, etc.). In contrast, natural turf acts as a regulator of both temperature and moisture (Orchard, 2002). For this reason, FIFA (2007b) recommends irrigation for pitches wherever the temperatures are high and rainfall is scarce. Watering the turf, as well as improving the pitch conditions, lubricates the fibre, thereby helping to minimise potential skin abrasions, cools the surface, and also stabilises the infill, thus preventing any dispersion thereof (FIFA, 2007b; Simon, 2010). Consideration should be given to innovation in fibres and thermoplastic infills, natural materials (including cork and coconut fibre, among others), watering the surface prior to a game and replacing asphalt-type underlays, in order to reduce the surface temperature, as has been shown in other studies (McNitt, Petrunak, & Serensits, 2008; Williams & Pulley, 2002), and thus imitate the surrounding thermoregulation properties of natural turf.

However, the coaches considered that artificial turf was highly suitable for youth or amateur football, and went so far as not to rule out its suitability for professional competitions. Various studies (Burillo, 2009; ESTO, 2008) noted that in its early days artificial turf was not highly thought of by sports federations, but now this perception has changed and this surface is beginning to be positively considered for any type or category of competition.

Satisfaction

Participants (players, coaches and referees) were satisfied with the artificial turf surface they used frequently. In the three groups, approximately three out of four participants gave an overall ranking of highly satisfied for artificial turf (marks between 7 and 10). This may be attributed to the development of football in Spain, where in the last 20 years, the vast majority of amateur and semi-professional pitches were dirt pitches, with very few natural turf grounds (let alone those in perfect condition) (Burillo, 2009). Two out of three participants stated that, looking back on their playing days, most of their games/training sessions were carried out on dirt surface.

The overall satisfaction with artificial turf fields was strongly influenced by previous experience, which represented a major change for most of the participants (particularly those who had previously played on dirt pitches). These participants perceived that their sporting performance had improved, and this has had a positive bearing on their satisfaction. In Zanetti's study (2009), the participants gave a significantly higher ranking to artificial turf surfaces compared to dirt pitches in almost all the factors analysed. In addition, the participants expressed that artificial turf fields have a higher utilisation and hours of use. Time that previously was usually restricted to high-level teams (McNitt, 2005). There is no doubt that the introduction of this third-generation synthetic surface in football has been a major step forward from dirt pitches. Several authors (Foster, 2007; Martinez et al., 2004; O'Donnell, 2008; Zanetti, 2009) indicate that the artificial turf football fields have over three main advantages over other surfaces: 1. the resistance to adverse weather conditions. The drainage system causes the water is evacuated rapidly and the floods are nearly impossible after abundant rains. Also, it allows that the snow could be removed without damaging the pitch; 2. the behaviour of the ball on the surface. The ball interacts with the field uniformly, without any strange element that impairs its movement; 3. the homogeneity of the properties of the field. It causes that 'player-surface' interaction and 'ball-surface' interaction are safe and reliable.

There was different perception of satisfaction among participants depending on their level within the three groups (players $p < 0.01$; coaches $p < 0.01$; referees $p < 0.05$). Overall satisfaction has increased when the participants' level decreased. Furthermore, the youngest users expressed an overall satisfaction for artificial turf that was significantly higher, and this evaluation became progressively smaller the older the participant. This may be explained by the substantial improvement to be found on artificial turf pitches in the last 10 years, and their incorporation above all into youth football (FIFA, 2007a; McNitt, 2005). For the *Youth Sport* group, it may be possible that artificial turf is the best known sports surface. The youngest users (and thus the ones with the least playing experience) went straight from playing on dirt or natural turf pitches (usually in poor condition) to third-generation artificial turf surfaces, without the negative experience of first- and second-generation surfaces (Burillo, 2009; O'Donnell, 2008).

Similarly, among the coaches, we found it significant that 84% of them had never had to cancel a training session because of the condition of an artificial turf pitch. The training session is a cornerstone criterion as far as coaches are concerned. The chance to improve the team, where the coach has more control and power of decision, comes during a training session on the pitch (Burillo, 2009). Thus, the satisfaction of the coaches rest on the low incidence of training session cancellations due to the state of the artificial turf.

Preference

Artificial turf can be said to be widely accepted, as it was chosen as one of the favourite surfaces for football by 60% of participants in the study of the three possible options (the 31% chose artificial turf and the 29% chose both, artificial and natural surfaces). However, while artificial turf received a joint satisfaction ranking that was moderately high, natural turf was favoured by 40% of participants (reaching the 69% if we add the 29% of both surfaces). We found significant correlations between the choice of ideal surface for football and the perception of overall satisfaction for artificial turf for the three groups ($p < 0.01$). Participants whose ranking for artificial turf was excellent or very satisfactory opted for this surface. On the other hand, participants whose overall satisfaction ran from moderate to low (scores of 5–8 points on the scale 1–10) expressed a preference for natural turf. This makes us reflect on that artificial turf fields are well perceived by many football users, although some of them, especially players, still prefer to play on natural turf.

Furthermore, participants who had mostly played on natural turf fields still had a certain preference for that surface, even though currently they may have been training/playing on artificial turf. Apparently, the biggest obstacle for acceptance of artificial turf was the user's prior experience. Previous studies (Martinez et al., 2004; Meyers & Barnhill, 2004; Schlegel, 2009) consider that changing natural turf to artificial turf could be negative for football players in the beginning, regardless of the time they have been playing in artificial turf, because their football training has been developed in another kind of surface. In view of the fact that youth football is mainly played on artificial turf fields today, it seems fair to predict that future discrepancies between artificial and natural surfaces will progressively decrease, and the introduction of artificial turf in first-class football will be less traumatic. As Stiles et al. (2009) state, artificial turf is gradually removing natural turf from its leadership in many sports. However, it is worth noting that the results of this study come from 'user group' who compete and train in Mediterranean climate regions or South Europe. It is possible that in other regions such as Central and North Europe, where the state of natural turf fields is often excellent due to a higher average rainfall and lower average temperature, the perceptions are different.

Conclusion

Artificial turf has been gradually meeting a large proportion of footballers' demands, especially in non-federated leagues (youth football, local leagues, seven-a-side, veterans and so on). Football stakeholders, the coaches and referees in particular, are extremely satisfied with artificial turf football fields. Approximately three out of four participants gave an overall ranking of highly satisfied. The overall satisfaction with artificial turf fields was strongly influenced by previous experience, particularly those who had previously played on dirt pitches. Although majority of the participants who were used to natural turf pitches still prefer that surface, there is a noticeable trend of appreciation for artificial turf. The perception of artificial turf was positive in most of the variables analysed, especially among the younger participants. Furthermore, artificial turf had a 60% acceptance rate as the ideal surface for football (particularly among coaches) and it is very close to the level of natural turf (69% acceptance).

The main advantages of artificial turf were its sporting feature and the fact that it made for improved performance, its good state of conservation and the visibility of pitch markings. The vast majority of coaches had never had to cancel a training session because of the condition of an artificial turf pitch. On the other hand, the main disadvantages were skin abrasions and playing in high temperatures. These results highlight the versatility of artificial turf to adapt to any circumstance or requirement for local sport and top-level professional competitions alike. However, the future success of artificial turf pitches will be also linked to a regular maintenance and a supervision of the technical, biomechanics and security properties that can improve the fields' quality and user satisfaction.

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Assessing Differences in the Thermal Stress of Soccer Players on Natural Turfgrass and Artificial Turf

By YouJoung Kim, Ph.D., Chase Straw, Ph.D., Steven E. Riechman, Ph.D., and Brown D. Robert, Ph.D.

Playing soccer on a scorching hot summer day may affect athletes' physical performance and lead to exertional heat illness. Microclimates – human-level meteorological conditions modified by nearby manmade and natural objects – have been shown to be significantly impacted by differences between natural turfgrass (NT) and artificial turf (AT) (Francis, 2018; Jim, 2017; Guyer, 2020). But less attention has been paid to how athletes' thermal sensation is affected between the two field types. Therefore, the purpose of this study was to compare Texas A&M University Men's Club Soccer players' thermal stress when competing on NT and AT fields. While quantifying objective and subjective thermal comfort, particular attention was given to determine differences in the players' physiological and perceived thermal stress on each field type. Microclimate and questionnaire survey data were collected on each field type and from all players, respectively, over four summer days in September 2021. An energy budget model that can estimate human thermal comfort using energy flux theory was used to quantify their physiological thermal stress.

METHODS AND MATERIALS

Study site

Two soccer fields at Penberthy Rec Sports Complex in College Station, Texas, were selected as sites for the study. According to the Köppen climate classification, College Station's climate is considered Humid Subtropical Climate (Cfa), where the average daily high temperature between June and September is above 88.8°F.

Both soccer fields are managed by SSC Services for Education at Texas A&M University. The NT field was 105,000 ft^2 and consisted of 'Tifway 419' hybrid bermudagrass on native soil, and the AT was 115,000 ft^2 and consisted of Astroturf RootZone 3D3 Blend 52 that was installed in 2008 and had a blend of monofilament, slit film, and nylon "rootzone" fibers with crumb rubber infill. The area around the fields was wide open with no presence of natural or manmade objects nearby (e.g., buildings, water bodies, trees, and vehicle roads) that may potentially affect thermal conditions. The study area location, field layouts, photographs of the weather sensors used, and infrared thermal imagery taken from grass and turf are shown in Figure 1.

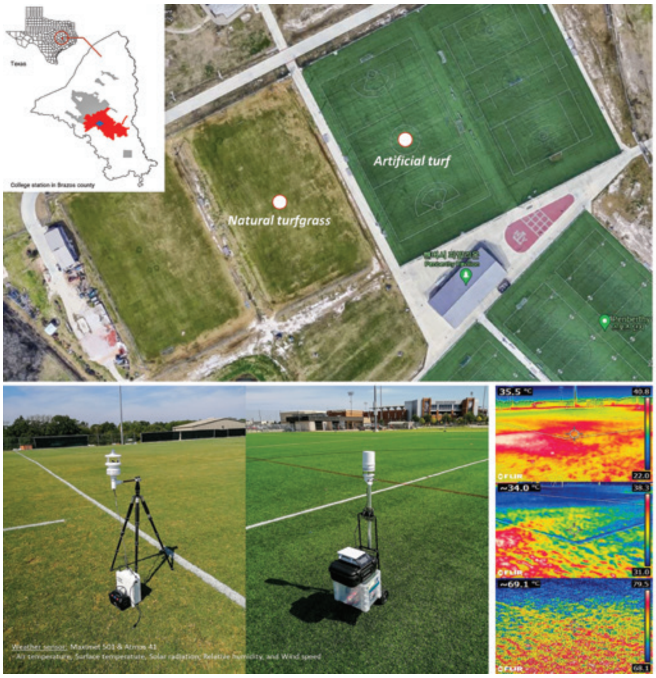


Figure 1. Microclimate measurement on Penberthy Rec Sports Soccer fields in College Station, Texas.

Data collection

Microclimate measurement

Microclimate conditions of the soccer fields were measured on hot, sunny summer days (Sep 7, 8, 21 and 22 of 2021). Two sets of weather sensors (Maximet 501 and ATOMS 41) were installed at the center of each natural turfgrass and artificial turf field. The microclimate – air temperature (°F), relative humidity (%), wind speed (mph), wind direction, and solar radiation (W/m^2) – was collected from 11 a.m. to 6 p.m. CST with a 1-minute recording interval. In addition, the surface temperature was measured every 15 minutes on both filed types by two trained surveyors using a thermal infrared camera (FLIR IR E5). The measurement height of those sensors was five feet above the ground to represent the thermal conditions at an athlete's chest level. The summary of measured microclimate over four days is presented in Table 1. Although the same weather sensors were not used for data collection, they were thoroughly calibrated prior by multiple field tests.

TABLE 1) SUMMARY OF MICROCLIMATE CONDITION ON PENBERTHY SOCCER FIELD

Date		Air temperature (°F)	Solar radiation (W/m²)	Relative humidity (%)	Wind speed (mph)
Sep 7th	Mean	91.92	810.26	33.75	3.81
	Sd	2.52	156.61	7.25	0.46
Sep 8th	Mean	91.49	622.89	32.23	7.41
	Sd	1.65	314.81	3.43	1.70
Sep 21st	Mean	91.27	570.96	55.71	6.54
	Sd	3.09	136.72	8.53	1.84
Sep 22nd	Mean	83.18	736.66	26.15	8.27
	Sd	0.40	105.07	0.36	0.59
Total	Mean	89.46	685.19	36.96	6.50
	Sd	1.91	178.30	4.89	1.15

* Standard deviation (Sd)

Questionnaire survey

An on-site questionnaire survey was adopted to measure the perceived thermal stress that the soccer players felt during matches. Over the four days of data collection, six soccer matches (6v6) were played with TAMU men's club soccer players who volunteered as study participants. Two matches were held approximately 11 a.m. to 1 p.m. CST, and the other four matches approximately 2 to 4 p.m. CST to have a wide range of daytime field thermal conditions. Matches consisted of four quarters, where each quarter of a match lasted 22.5 minutes with a 10-minute break in between. At each break, three out of 12 players were randomly asked to respond to eight questions about how thermally comfortable they were during the matches with a 10-point rating scale, where 0 represented "much too cold" and 10 represented "much too hot." These questions can be grouped in three parts: 1) perceived exertion (i.e., a laborious or perceptible effort), 2) perceived surface heat conditions, 3) perceived thermal stress. The response rate was 87.5%, meaning 63 out of 72 participants responded to the survey without missing values.

Estimation of objective thermal stress

To evaluate the athlete's physiological thermal stress, the COMFA energy budget model was employed. It is an outdoor thermal comfort index that estimates the objective thermal comfort of a person based on energy budget equation. In other words, it calculates the physiological thermal load that the human body receives to maintain thermal balance with the surrounding outdoor environment. The energy budget is described as follows:

$\Delta S = M + R - C - K - E$ (Eq1) where ΔS is the change in heat storage (W/m²). When the change in heat storage is near 0, the inputs and outputs of energy would nearly balance, and a person would be thermally comfortable. A large positive value would suggest that a person is receiving much more heat than they are giving off, and they would feel too hot. A large negative value would have the opposite effect. The major energy streams are convective heat loss (C), evaporative heat loss (E), conductive heat loss (K), radiative exchange (R), and metabolic heat production (M) (Kenny et al, 2009). The estimated physiological thermal stress, also called energy budget value, can be measured as watt per square meter of a person's surface area (W/m²), a unit of energy density. The measured microclimate and the athlete's surveyed exertion level were the main inputs to the COMFA model estimation. The metabolic rate of a running person ranged between 300 – 650 W/m² depending on exertion level, and the summer uniform was selected to determine the clothing insulation level.

RESULTS

Microclimate condition

Surface temperature showed a significant difference between NT and AT. The differences in microclimate between the two field types are summarized in Table 2. Regarding the overall pattern, all the measurement values of AT's microclimate (e.g., air temperature, solar radiation, relative humidity, and wind speed) were slightly higher than NT. However, except for surface temperature, the degree of their difference is not significant considering their error ranges of measurement. In contrast, the surface temperature presented a large deviation between AT and NT, whose average difference was over 70.0 °F.

The daytime pattern of AT and NT surface temperature was further explored to identify the difference in variation over the day (Figure 2). AT's surface temperature showed considerable fluctuation over time compared to NT's. Over the four days of measurements, the surface temperature ranged between 104.6°F and 161.6°F for AT and between 86.8° F and 102.6° F for NT. It

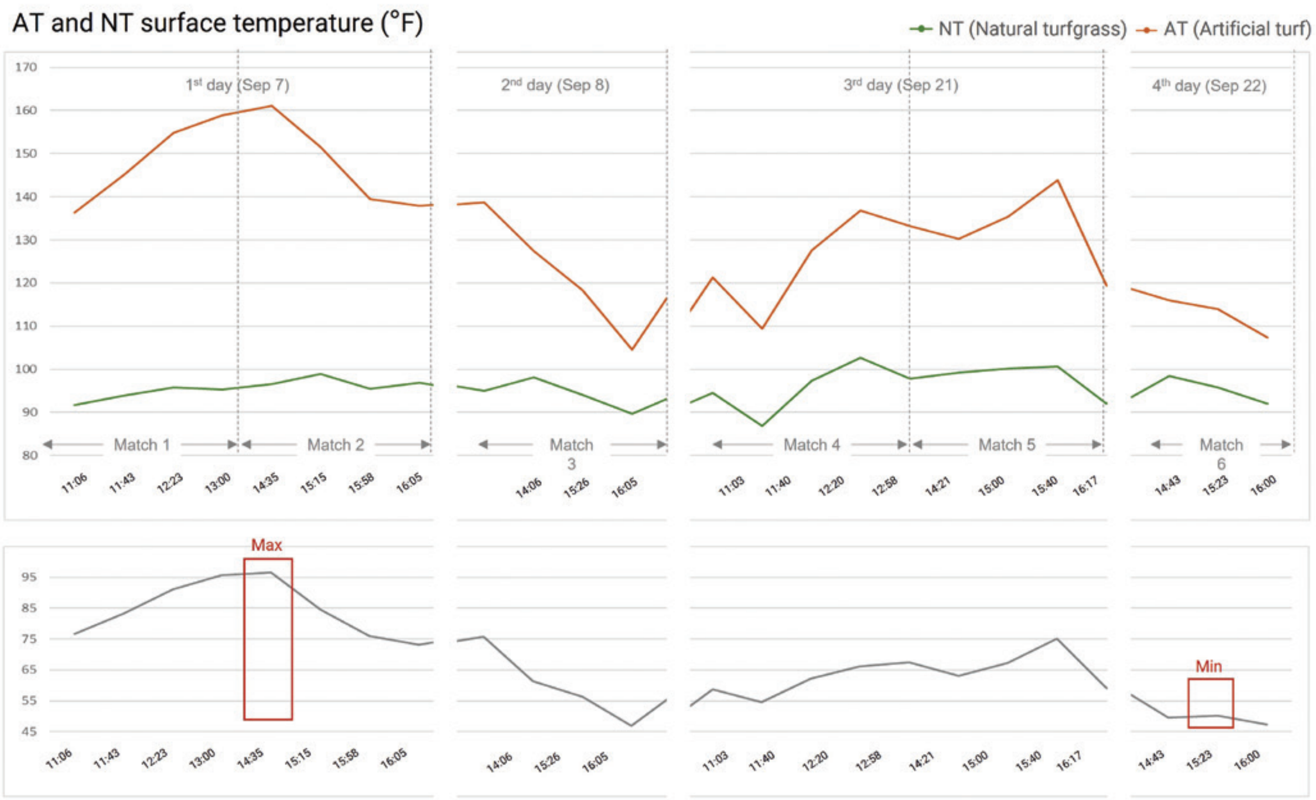


Figure 2. Daytime pattern of AT and NT surface temperature and its difference.

seems that their daytime mean surface temperature was primarily affected by cloud cover. Overall, the surface temperatures peaked on September 7 when the cloud cover was at the lowest at 10%. Meanwhile, surface temperatures were lowest on September 22 when the cloud cover was relatively higher at 40%, with a somewhat cooler ambient temperature.

The AT – NT difference in surface temperature showed similar daytime patterns with the mean surface temperature. Their difference reached a peak of 96.5°F at 2:30 p.m. CST, September 7 and lowest at 46.8°F at 3:30 p.m. CST, September 22. The degree of temperature gap was likely due to increase from morning to high solar noontime at around 1 p.m. CST and after then declining toward evening at 4 p.m. CST. As surface temperature was the microclimate component primarily determined by field characteristics, we expected it to be a crucial driver causing differences in players' thermal stress.

TABLE 2) AT – NT DIFFERENCE IN MICROCLIMATE CONDITIONS

Variable	Mean	Sd	Min	Max
Diff. in Air temperature (°F)	33.12	0.38	32.57	33.90
Diff. in Solar radiation (W/m^2)	16.58	35.76	-29.54	74.76
Diff. in Relative humidity (%)	2.97	0.95	1.33	4.38
Diff. in Wind speed (mph)	1.67	1.40	-1.57	4.56
Diff. in Surface temperature (°F)	70.15	14.39	46.88	96.50

*Standard deviation (Sd) *Difference (Diff.)

Perceived thermal stress (survey response)

Soccer players felt higher thermal stress when playing on artificial turf (AT) than natural turfgrass (NT). Figure 3 presents the frequency distributions of players' perceived level of surface temperature and thermal stress for AT and NT. The X axis is the heat scores of perceived surface temperature (upper figure) and perceived thermal comfort (bottom figure), respectively. These values reflect how thermally comfortable they were on each field type during match. The Y axis is the number of players choosing each score. The upper histogram shows that AT has a relatively higher perceived surface temperature score with a broader range than NT. The frequency distribution curve also indicates that the mean AT's heat score is 6 points, which is one point higher than the mean NT's. Moreover, the heat score of the AT ranges between 4 and

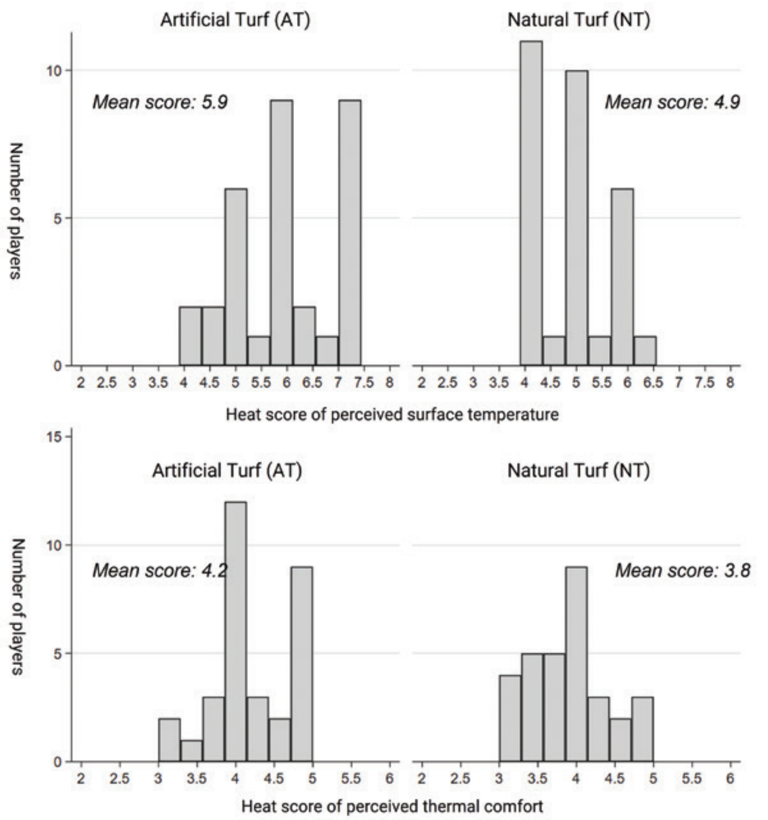
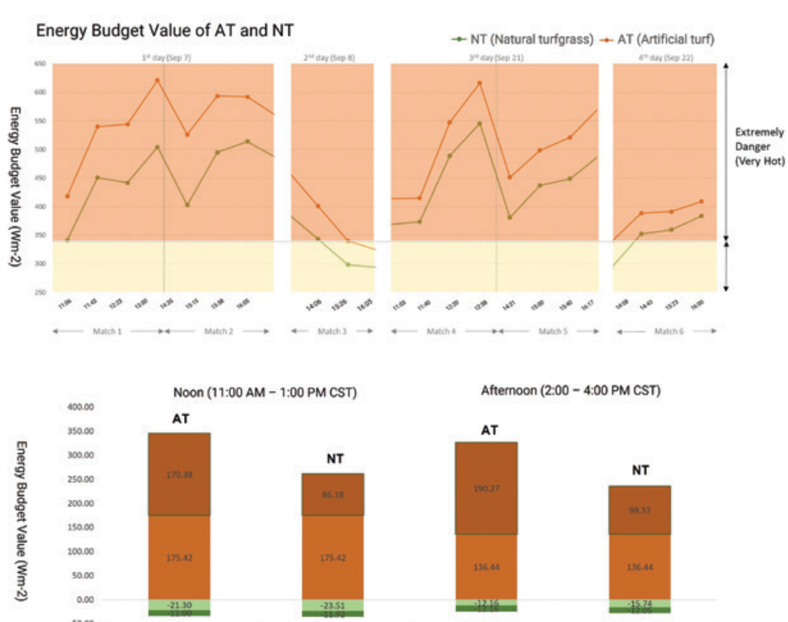


Figure 3. Distribution of perceived thermal stress on AT and NT.



	(AT) Noon	(NT) Noon	(AT) Afternoon	(NT) Afternoon
Labs	170.38	86.18	190.27	99.37
Kabs	175.42	175.42	136.44	136.44
Evapo_loss	-12.00	-11.92	-12.16	-12.05
Convec_loss	-21.30	-23.51	-12.16	-15.74

Figure 4. Estimated physiological thermal stress of AT and NT (upper) and their composition of thermal loadings (bottom).

7.5, which is slightly broader than that of the NT. Regarding the perceived thermal comfort, although the range of heat score range is identical as it ranges between 3 to 5, the mean AT score is at 4.3 points, which is higher than the mean NT score of 3.8.

Objective thermal stress (Energy budget model)

Evaluation of thermal stress on natural and artificial turf

Physiological thermal stress of soccer players on the two field types were evaluated using the COMFA model. The estimated COMFA output was described as energy budget values that can be categorized into four classified thresholds of heat stress values (Harlan et al., 2006): Caution (65–120 W/m^2), Extreme caution (121–200 W/m^2), Danger (201–339 W/m2), and Extreme Danger (340 or higher W/m^2). According to the classification, Figure 4 showed that, for the majority of the match, the players felt very hot and had Extreme Danger levels of thermal stress. Energy budget values reached the peak of 620 W/m^2 at 2 p.m. CST on September 7, and arrived at the low of 300 W/m^2 at 4 p.m. CST on September 8, and 2 p.m. CST on September 22. Only limited periods, from 2 to 4 p.m. CST on Sep 8 and from 2 to 2:30 p.m. CST on September 22, fell into Danger level of thermal. Their daytime patterns with peak and bottom hours were highly coupled with surface temperature.

When it comes to the AT-NT difference in physiological thermal stress, it was found that NT can reduce the thermal stress of soccer players by up to 20% compared to AT. Overall daytime patterns of thermal stress demonstrated that the difference in energy budget values between AT and NT was 10.6 % higher in the afternoon than the noon during clear sunny days. Their highest difference was on September 7 around 3 p.m. CST at 124 W/m^2, while their lowest difference was on September 22 around 4 p.m. CST at 25 W/m^2. It seemed that the magnitude of disparities in thermal stress was likely to increase when the shortwave solar radiation (or direct solar beam) coming from the sky was strong. Meanwhile, their disparities tended to decline when the cloud cover was relatively larger with high wind speed.

The most significant components of thermal loading to which players are exposed are Kabs for NT and Labs for AT. Figure 4 indicates individual contribution of four energy components [absorbed solar radiation (Kabs), absorbed terrestrial radiation (Labs), convective heat loss (C), and evaporative heat loss (E)] to thermal loadings that athletes received during daytime hours. The Kabs are the amount of incoming shortwave solar radiation that a player absorbs, and the Labs are the amount of absorbed longwave ground radiation emitted from field. Evaporative heat loss is the loss of body heat that occurs through respiration and perspiration, whereas convective heat loss is the transfer of heat from the body due to the wind. Kabs and Labs comprise the largest proportion of the net energy budget, leading to the overall increase in thermal stress of players. As the Kabs was determined by exposure level to direct solar radiation, no difference was observed between the field types. Meanwhile, the Labs of AT was 97.7% and 91.5% higher at the noon and the afternoon, respectively, compared to NT.

Effects of AT and NT surface temperature on player's thermal stress

The impact of AT and NT surface temperature on players' thermal stress was estimated using a statistical modeling procedure called multiple linear regression, where time of day and day of week were considered. Two sets of models were developed for players on each field type - physiological thermal stress and perceived thermal stress. Particular attention was given to (1) the comparison of the impact of turf surface temperature on different types of thermal stress, as well as to (2) investigate the explanatory capacity of turf surface temperature as a proxy of thermal stress. Upper plots showed the predicted changes in physiological thermal stress (W/m^2) by an increase in one Fahrenheit degree of AT and NT surface temperature, whereas the bottom plot indicated the predicted shifts in perceived thermal stress. All models were statistically significant, indicating that both filed types affect physiological and perceived thermal stress significantly.

The impact of surface temperature on athletes' thermal stress is higher on NT than AT. The coefficient slope of NT is 11.6 for physiological thermal stress, meaning that the 1°F increase in surface temperature led to 11.6 growth in energy budget values (W/m^2). The coefficient slope of AT was 6.9m, which was three times less than NT. Interestingly, a similar outcome was found in perceived thermal stress, where NT's coefficient slope (0.014) was higher than AT's (0.008). These findings indicate that both the perceived and physiological thermal stress of the players are more sensitive when they are performing on NT. We assume that this is mainly due to the higher thermal stress level on AT that may result in the reduced performance (or amount of activity) and lower metabolic rates leading to decreases in thermal stress of players compared to NT.

Explanatory power of surface temperature for thermal stress varies on the types of thermal stress. In this study, explanatory power indicates the ability on how much variations in players' thermal stress can be explained by the surface temperature. Overall, the surface temperatures showed better performance in explaining athletes' physiological thermal stress than the perceived thermal stress model. In the physiological thermal stress model, the explanatory power (or adjusted r-squared) values are 57% and 49% for AT and NT, respectively, which are around 30% higher than the perceived thermal stress model. This implies that, considering their high explanatory power of around 50%, surface temperature can be considered a superior proxy when it is used for measuring the physiological thermal stress of soccer players.

CONCLUSION

Our findings confirmed that surface temperature is the main driving factor that leads to an increase in both perceived and physiological thermal stress of the soccer players in summer daytime. The highlights of the key findings are as follows:

- Mean AT-NT difference in surface temperature was over 68.0°F, which tends to be more pronounced when the direct solar beam is stronger, and the time reaches solar noon at around 1 p.m. CST
- Athletes performing on AT had higher perceived and physiological thermal stress than those on NT. Compared to AT, NT can reduce the physiological thermal stress by up to 20% in a setting of a clear, hot and sunny day.
- The impact of NT surface temperature on player's perceived and physiological thermal stress is higher than that of AT. This implies that athletes are likely to be more sensitive to field heat conditions when performing on NT.

The findings of this study are useful for biometeorology and sports field management to enhance the athletes' safety from heat stress and increase their match

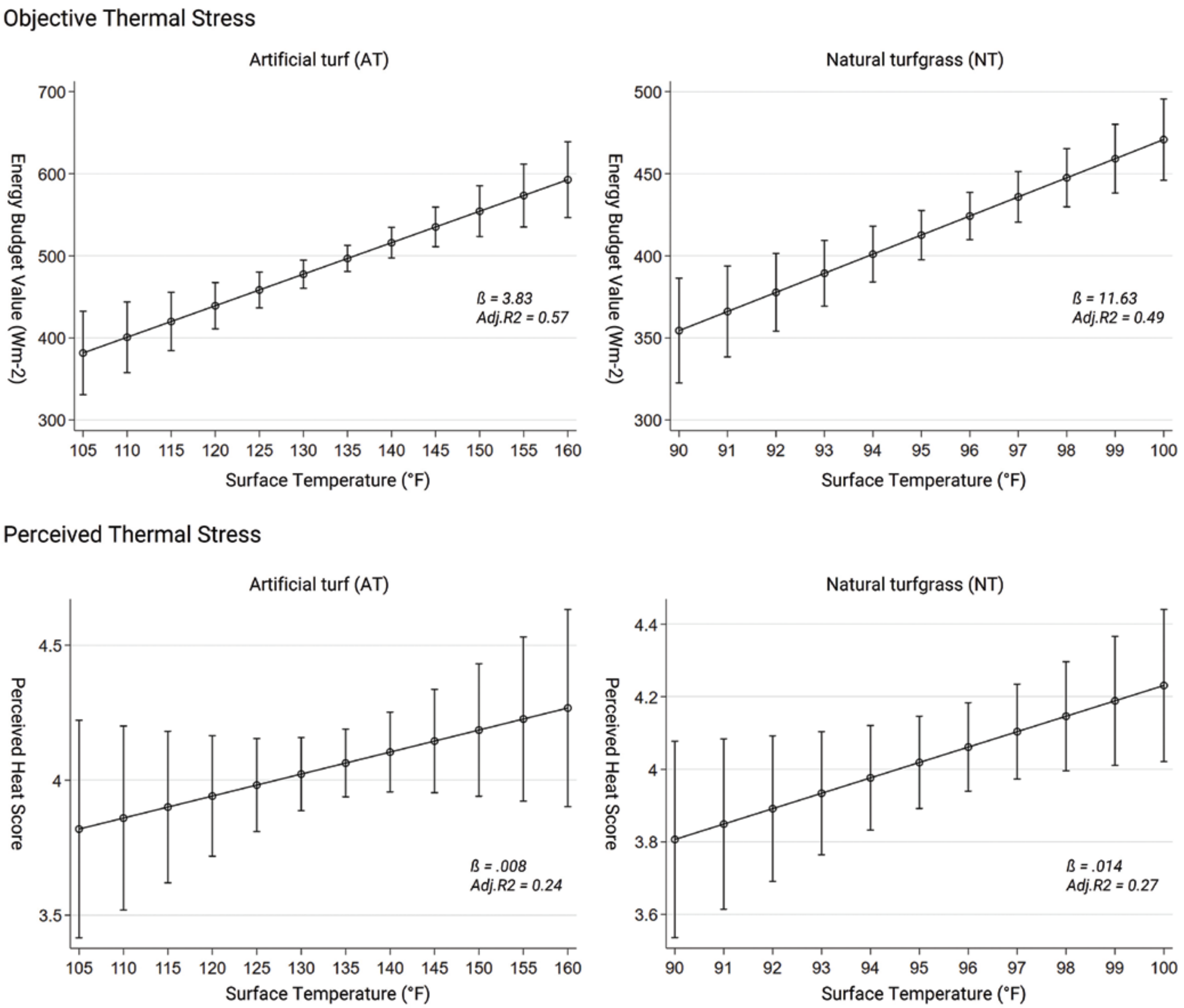


Figure 5. Relationships between turf surface temperature (AT and NT) and thermal stress (physiological and perceived sensation).

performance. Future studies need to address how the difference in thermal stress induced by AT and NT affects the athlete's physical performance and physiological body changes, such as hydration. **SFM**

YouJoung Kim, Ph.D., Department of Landscape Architecture and Urban Planning; Chase Straw, Ph.D. Department of Soil and Crop Sciences; Steven E. Riechman, Ph.D. Department of Health and Kinesiology; Brown D. Robert, Ph.D. Department of Landscape Architecture and Urban Planning, Texas A&M University, College Station, Texas.

Research reported in this publication was financially supported by The Lawn Institute

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Independent research

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https://www.theguardian.com/environment/2022/aug/18/pfas-forever-chemicals-new-method-decompose-drinking-water

https://www.nbcsports.com/bayarea/49ers/49ers-nick-bosa-sounds-nfls-artificial-turf-problem

https://www.center4research.org/children-athletes-play-toxic-turf-playgrounds/

https://peer.org/toxic-forever-chemicals-infest-artificial-turf/

https://www.ctinsider.com/news/article/RTM-proactively-bans-crumb-rubber-artificial-turf-13464197.php

https://www.center4research.org/nchr-letter-to-members-of-the-board-of-the-los-gatos-union-school-district-on-artificial-turf-and-playgrounds/

Desiree Adair

From: Chad Smith <austinchadsmith@gmail.com>
Sent: Wednesday, November 16, 2022 7:07 AM
To: Desiree Adair; Ashley Wayman; Alec Robinson; Makayla Rodriguez
Subject: Fwd: [Test] City Council Controversy- Little League

Follow Up Flag: Flag for follow up
Flag Status: Completed

Can you please share with City Council? Thanks!
Chad

Chad Smith
(512) 922-5431

Begin forwarded message:

From: Sean Kincaid <sean@kmisportsconstruction.com>
Date: November 15, 2022 at 5:29:29 PM CST
To:Subject: Re: [Test] City Council Controversy- Little League

Here are some FAQ's and answers

HOW IS SYNTHETIC TURF MADE?

Most synthetic turf systems installed today include a drainage layer, a multi-layered backing system, and resilient "grass" blades that are infilled with a granular filler to resemble natural turf. "Infilled" means that the man-made grass blades are interspersed with a top soil created with sand and/or granulated recycled tire rubber or other infill materials that provide the necessary stability, uniformity, and resiliency. Each blade customarily stands above the infill material. The typical blade length and system characteristics are determined by the specific activity requirements. In some applications, the synthetic turf system includes a pad or elastic layer underneath the turf, often in combination with lower pile height and less infill.

HOW IS THE NEW GENERATION OF SYNTHETIC TURF DIFFERENT FROM THAT OF THE PAST?

Increasing demand for high quality playing surfaces and intense competition for field accessibility has given rise to a new generation of synthetic turf systems that replicate the look and feel of lush, natural grass. While the first artificial turf systems used in the 1960's and 1970's were hard, significant advancements have been made during the past few decades. By the 1990's, the first synthetic turf systems with sand and rubber infill were introduced, which dramatically improved player performance and safety. Today's synthetic turf, used by many NFL franchises, as well as member associations and teams of the Union of European Football Associations (UEFA), Fédération Internationale de Football Association (FIFA), the International Rugby Board and other international sports federations, combines the playing characteristics, look and feel of natural turf, with the advantages of increased frequency of usage, extra revenue generation, safety, longer playing sessions, fewer canceled games, and lowest cost per playing day.

HOW DOES SYNTHETIC TURF IMPACT THE ENVIRONMENT?

Synthetic turf has a measurable, positive impact on the environment. Depending on the region of the country, a typical grass sports field requires between 500,000 to a million gallons of water or more each year. During 2010, between four to eight billion gallons of water were conserved through its use. According to the U.S. Environmental Protection Agency (EPA), the average American family of four uses 400 gallons of water a day. Therefore, a savings of four to eight billion gallons of water equates to the annual water usage of over 27,000 to 55,000 average American families of four.
Tax credits and rebates are being offered to residential and corporate users by an increasing number of local governments in light of the tremendous impact on water conservation. The Southern Nevada Water Authority estimates that every square foot of natural grass replaced saves 55 gallons of water per year. If an average lawn is 1,800 square feet, then Las Vegas homeowners with synthetic turf could save 99,000 gallons of water each year or about $400 annually. In Atlanta, homeowners could save $715 a year, not including much higher sewer charges.

The estimated amount of synthetic turf currently installed has eliminated the need for millions of pounds of harmful pesticides and fertilizers, which has significant health and environmental implications. For example, according to the North Carolina Department of Environment and Natural Resources, polluted storm water runoff is the number one cause of water pollution in their state, with common examples including over fertilizing lawns and excessive pesticide use.

In addition, synthetic turf helps reduce noxious emissions (the EPA reports that a push mower emits as much pollution in one hour as 11 cars and a riding mower emits as much as 34 cars) and reduces grass clippings, which the EPA states are the third largest component of municipal solid waste in landfills.

THETIC TURF SAFE

More than 50 independent and credible studies from groups such as the U.S. Consumer Product Safety Commission, and statewide governmental agencies such as the New York State Department of Environmental Conservation, New York State Department of Health and the California Environmental Protection Agency, have validated the safety of synthetic turf (see Position Statements to learn more).

Recent highlights include:

- In October 2010, the California Office of Environmental Assessment completed its multi-year study of air quality above crumb rubber infilled synthetic turf, and bacteria in the turf, and reported that there were no public health concerns.
- In July 2010, the Connecticut Department of Public Health announced that a new study of the risks to children and adults playing on synthetic turf fields containing crumb rubber infill shows "no elevated health risks."
- The California EPA released a report dated July 2009 which indicated there is a negligible human health risk from inhaling the air above synthetic turf.
- Independent tests conducted by the New York State Department of Environmental Conservation and New York State Department of Health, released in May 2009, proved there were no significant health concerns at synthetic turf fields.
- In July 2008, a U.S. Consumer Product Safety Commission staff report approved the use of synthetic turf by children and people of all ages.

IS CRUMB RUBBER SAFE

Yes. Crumb rubber infill, made from reclaimed tires, is a popular infill option for many synthetic turf fields. It has been safely utilized since being introduced in 1997, and in playgrounds and tracks for much longer. This resilient material provides enhanced durability and safety. Its use in synthetic turf sports fields and landscape has also kept more than 105 million used tires out of landfills. Crumb rubber has been critically examined and studied since the late 1980's. Science has proven it to be safe for children and people of all ages (see Research and Latest Thinking and Crumb Rubber FAQs to learn more).

Regards,

Sean Kincaid
KMI Sports Construction
President / CEO
512-287-9636
7070 US 290
Dripping Springs, TX 78620
Facebook - @kmisports
Instagram - @kmiturf
www.kmiconnect.com

Visit our KMI YouTube Channel

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Staff / Park Commission

Agenda Item:

Discussion and possible action on a recommendation from the Park Commission regarding land clearing to the north of the swim facility

Description:

At the November 7, 2022 Park Commission meeting, the Park Commission made the following motion.

Chad Smith moved to create a committee of Chad Smith, Melissa Morrow and Mary Elizabeth Cofer to tag the trees and propose to the City Council that the Park Commission would like to do some clean up at a cost of $1,400, and for City Administrator Wayman and Mayor Massingill to sign off on the trees to be removed, and once approved by the City Council and City Administrator Wayman and Mayor Massingill, move forward, as well as that no maintenance would be added and that Chad Smith would seek out the funding. Melissa Morrow seconded the motion.

The motion carried with 7 in favor and 0 against.

Action Requested:

To take action on a recommendation from the Park Commission regarding land clearing to the north of the swim facility

Fiscal Impacts:

No significant fiscal impact anticipated at this time

Attachments:

- Example Images and Presentation – Land Clearing


asv
RT-120
FAE

GD Land Improvements

(512) 934-1535

17.

17.

AGENDA ITEM SUMMARY SHEET

City of Rollingwood

Meeting Date: November 16, 2022

Submitted By:

Council Member Phil McDuffee

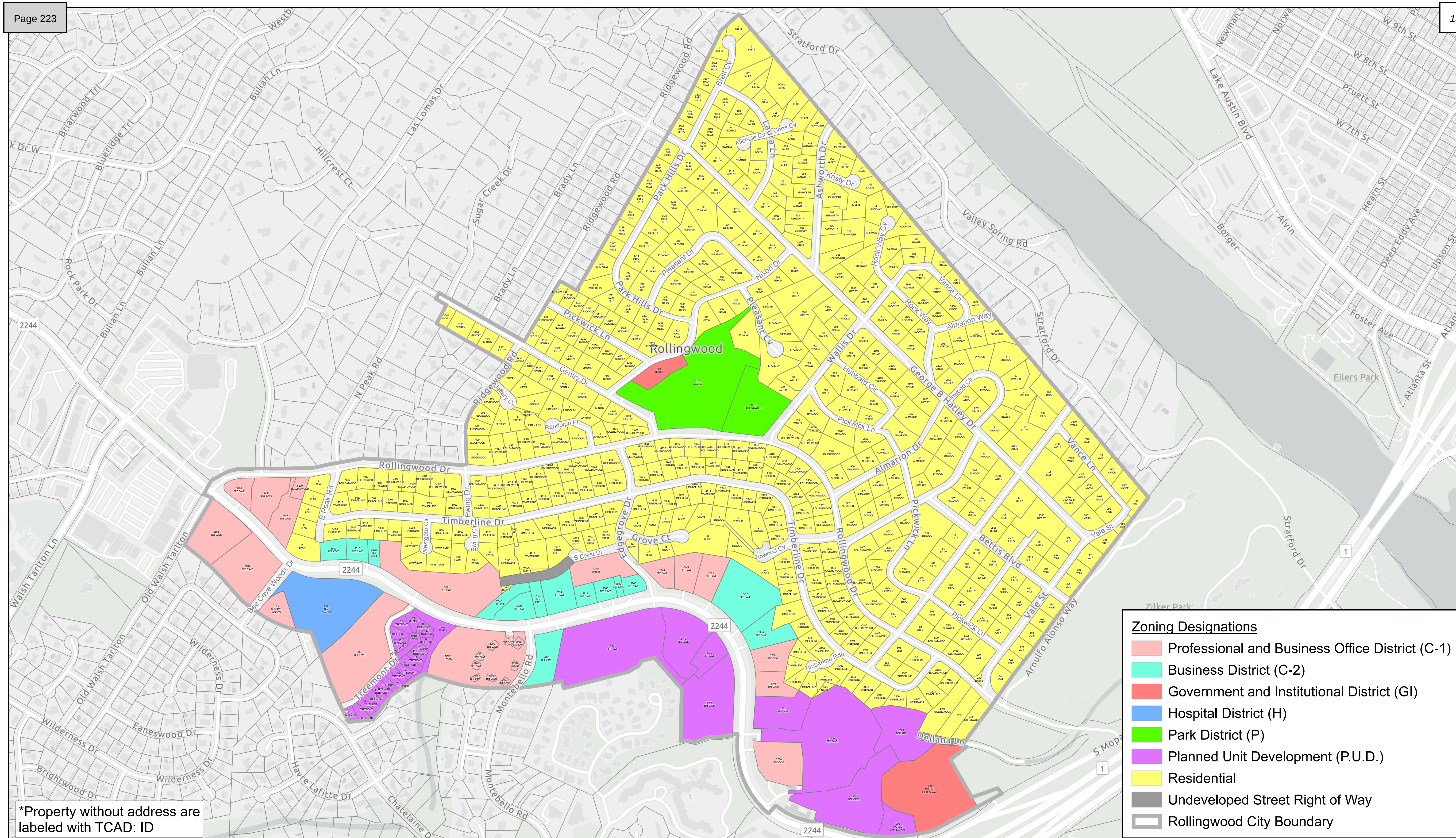
Agenda Item:

Discussion and possible action to protect trees and other vegetation on land zoned Park District (P).

Description:

Rollingwood's current Tree Ordinance provides no protection for any trees growing in land zoned in the Park District (P). Until we can revise the current Tree Ordinance, Council may want to provide some protection for the trees and other vegetation in Rollingwood's Park District (Zone P).

Please see the attached City of Rollingwood Zoning Map for reference.



Official Zoning Map

City of Rollingwood, Texas
Adopted May 18, 2022

N
0 650 Feet
1 inch = 650 feet

wsb

ROLLINGWOOD TEXAS

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Rollingwood TX City Council Message Board

New posts Post thread...

City Council Forums

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Rollingwood City Council Message Board	2	4	This is a new tread on Ashworth Monday at 1:18 PM · Phil McDuffee

Members online

awayman

Total: 1 (members: 1, guests: 0)

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Latest: Phil McDuffee · Monday at 1:18 PM
Rollingwood City Council Message Board

Test Post 11/14/2022
Latest: awayman · Monday at 1:15 PM
Rollingwood City Council Message Board

Forum statistics

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Messages:	4
Members:	3
Latest member:	Phil McDuffee

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Test Post 11/14/2022

awayman · Monday at 1:02 PM

Unwatch •••

Monday at 1:02 PM #1

awayman
Ashley Wayman

Test Post 11/14/2022

Report Edit Delete IP Reply

Monday at 1:06 PM #2

Phil McDuffee
Council Member

My Reply

Report Edit Delete Spam IP Warn Like Reply

Monday at 1:15 PM #3

awayman
Ashley Wayman

Test Reply

Report Edit Delete IP Reply

Preview

Write your reply...

TRAVIS CENTRAL APPRAISAL DISTRICT

November 2, 2022

CITY OF ROLLINGWOOD
THE HONORABLE GAVIN MASSINGILL, MAYOR
403 NIXON DRIVE
ROLLINGWOOD, TX 78746

The deadline has passed for the jurisdictions in the western part of Travis County to make nominations for their representative member of the Board of Directors of the Travis Central Appraisal District. The term for the prospective member's service will be two years, starting on January 1, 2023. The following are the nominations and sponsoring jurisdictions for the Western Travis County member for our Board:

BALLOT

______	**Tom Buckle**	**City of Jonestown, Leander ISD**
______	**Bob Lawrence**	**City of Lago Vista**

This letter serves as a ballot, and is being sent to the presiding officer of each city and school district in Western Travis County. **On or before December 5, 2022 your jurisdiction should vote and return the ballot to the Chief Appraiser of the appraisal district at the following mailing address or email address**:

Marya Crigler
Travis Central Appraisal District
P.O. Box 149012
Austin, TX 78714-9012
mcrigler@tcadcentral.org

On or before December 16, 2021, I will inform you of the results of the election and send you a complete list of the Board members. If you have any questions, please feel free to call me at (512) 834-9317 ext. 337.

Sincerely,

Marya Crigler
Chief Appraiser
Travis Central Appraisal District

W. THOMAS BUCKLE

EXPERIENCE

2022-present **Law Office of William Thomas Buckle** **Austin, TX**

- Primary Areas of Practice: Commercial and Residential Real Estate, including all aspects of land use controls; Wills, Trusts and Estate Planning, Probate and Guardianship and the creation and representation of various business entities.

2019-2022 **Scanlan, Buckle & Young, P.C** **Austin, TX**

Of Counsel

- Primary Areas of Practice: Commercial and Residential Real Estate, including all aspects of land use controls; Wills, Trusts and Estate Planning, Probate and Guardianship and the creation and representation of various business entities.

1995-2019 **Scanlan Buckle and Young, P.C.** Austin, TX

Principal

- Primary Areas of Practice: Litigation, Municipal Law, Commercial and Residential Real Estate, including all aspects of land use controls; Wills, Trusts and Estate Planning, Probate and Guardianship and the creation and representation of various business entities.

1988-1995 **Scanlan & Buckle, P.C.**

Principal

- Primary Areas of Practice: Litigation, Commercial and Residential Real Estate; Muncipal Law; and Wills, Trusts and Estate Planning; Probate and Guardianship; and, the creation and representation of various business entities.

1978-1987 **Scanlan, Buckle & Fleckman** Austin, TX

Partner

- Primary Areas of Practice: Litigation, Environmental law, Commercial and Residential Real Estate. Highly active in the State Bar's Environmental Law Section and also lecturing at a number of continuing legal education seminars concerning environmental matters.

1975–1978 **Office of the Attorney General** Austin, TX

Assistant Attorney General

- Primary Areas of Practice: Environmental Protection Division of the Attorney General's office representing the state's environmental agencies advising them on air pollution matters. Litigated cases throughout the

2007 to 2013; 2015 to present; Treasurer, Family Eldercare 2008 and 2009; Chair Travis Central Apprasil District 2019.

Assistant City Attorney: City of Westlake Hills, Texas, 1979 to 1985; City of Lakeway, Texas, 1981 to 1990; City of Sunset Valley, Texas 1982 to 1990.

City Attorney: City of Jonestown, Texas, 1985 to 1995; City of Lakeway, Texas, 1990 to 2007; City of Sunset Valley, Texas, 1990 to 2020; Village of Volente, Texas, 2004 to 2017.

ROBERT LAWRENCE

Lago Vista, TX 78645
bob-lawrence@sbcglobal.net
714-814-6225

EXECUTIVE PROFILE

Seasoned senior executive with success in growing organizations, developing long and short term growth strategies. Engaging and articulate communicator with forty plus years of accomplishment with large and small companies and volunteer and charitable organizations. Expertise in planning, revenue development, change management and personnel development. Forward thinking offering experience in overseeing operations, business creation, and distribution networks.

SKILL HIGHLIGHTS

- Public relations understanding
- Market trend expertise
- Market access and expansion
- Recruiting and hiring top talent
- Controls systems enhancement
- Relationship management
- Strategic planning
- Project management
- Employee training

PROFESSIONAL EXPERIENCE

CEO

TEMECULA OLIVE OIL CO. TEMECULA, CA

March 2016 to May 2018

Consolidated operations into single modern facility, increased bottling capacity, expanded vendor support, created operational infrastructure, set up credit facility for consumer purchases, improved e-commerce exposure and design.

PRESIDENT/CEO

AVB/BRANDSOURCE TUSTIN, CA

January 1994 to December 2015

Increased revenue from $800M to $14B, expanded locations from 1200 to over 8,000. Developed distribution agreements in Europe, Australia, New Zealand, Canada and Mexico. Created a wholesale finance facility with $800M in receivables, Created a private label retail finance program financing $500M in consumer purchases. Expanded product offerings to furniture, high end electronics, custom integrators, cabinets and floor covering. Created the industry first common store identity program.

DIVISION/BRANCH MANAGER

MAYTAG CO. NEWTON, IA

August 1978 to March 1991

Consistently expanded distribution exceeding goals and projections, Developed personnel for management positions, developed a number of industry first programs, implemented training programs that were adopted by company. Oversaw region/division budget and growth goals working closely with corporate and financial departments.

EDUCATION

MARKETING BBA

NMSU LAS CRUCES, NM - MAY 1978

LAW

WESTERN STATE COLLEGE OF LAW ANAHEIM, CA

BOARDS & AWARDS

Global trustee for Ronald McDonald Charities, EcoRebox, Expert Global
Satellite Industry of Consumer Electronics Industry, Shelter Cove HOA President
Couer Du Lac HOA President, Shavano Park Tree Committee

Dealerscope Hall of Fame. , City of Hope industry honoree
ADL Pioneers award , TWICE Retailer of the Year

Agenda Item & Caption: Discussion and possible action in regard to the process for hiring legal and planning services and scheduling dates for draft ordinance changes and public hearings in connection with implementation of the commercial zoning changes under the Comprehensive Plan.

Submitted by: Council Member Brook Brown

Action Requested: Discussion of the process for and contracting of the professional services to draft the zoning changes recommended in the Comprehensive Plan for the commercial corridor. The budget for the current fiscal year includes $ 40,000 for planning and legal services to draft the changes to the commercial zoning code necessary to implement the recommendations in the Comprehensive Plan.

This agenda item permits the City Council to discuss how these services may be acquired, processes for review by the Planning and Zoning Commission and Council, target deadlines for this work, target dates for workshops and public hearings, and any related matters.

Supporting Documents: City of Rollingwood Comprehensive Plan contains the following recommendations for the Commercial Zone. See Comprehensive Plan, Pages 24-28:

• Allow retail and office uses on commercially zoned properties and encourage restaurant development where a restaurant or retail use would not create a nuisance for adjacent residential properties, except where residential properties are adjacent to office properties today and could be negatively impacted by conversion of that office use to retail uses - extended hours, traffic, noise, smells and related concerns with restaurants, bars, and convenience stores, being the primary concerns.

• On the north side of Bee Caves Road, limit development on commercially zoned lots to two stories and 30 feet in height. On the south side of Bee Caves Road, limit development on commercially zoned lots to 3 stories and 45 feet in height.

• Maintain current Rollingwood Drive frontage setbacks (i.e., setbacks between commercial buildings and Rollingwood Drive).

• Prohibit the clearing of native vegetation within the FEMA floodplain on commercially zoned properties.

• Work with stakeholders to envision and create a safer pedestrian crossing of Bee Caves Road at Edgegrove Drive. (Long-term vision: build a pedestrian bridge across Bee Caves Road within Rollingwood.)

• Replace current setbacks between commercially zoned properties and residentially zoned properties with a 75-foot setback measured from the edge of any residentially zoned lot to the edge of any building on any commercially zoned lot. The clearing of native vegetation shall be prohibited in this 75-foot setback. In addition, the City should require replanting of previously cleared spaces within the 75-foot setback between the edge of any residentially zoned lot and the edge of any building on any commercially zoned lot.

• To reduce the number of ingress/egress points on Bee Caves Road, eliminate any existing code provisions that require a driveway on every commercially zoned lot.

• Encourage the building of walking and biking paths on commercially zoned lots along the south side of Dry Creek (sometimes called Eanes Creek) on the north side of Bee Caves Road.

• Enforcement: The City should require an as-built survey as part of its final permitting and Certificate of Occupancy for all new commercial development. In addition, the City should exercise its full discretion and employ all means to enforce all development rules regulating commercially zoned lots.

• Modify development standards as necessary based on following recommendations:

Front setback: the front setback for commercial properties along the north side of Bee Caves Road be reduced from the current 25-foot setback to a 5-foot setback, where the developer has agreed to: 1) contribute any required right of way to TX DOT, and 2) implement a landscape plan, including appropriate irrigation and maintenance, that provides native species shade trees along sidewalks and rear lot pedestrian paths.

Impervious cover: City should establish commercial impervious cover requirements such that impervious cover shall not exceed 55% provided that no new project development will create any increases to storm water runoff (either volume or rate of flow of runoff).

Incentives: the development code should incentivize permanent low impact development practices such as rainwater harvesting, bio-retention, rain gardens, green roofs, infiltration/filter strips, conservation landscaping using native plants and trees that promote the area's natural habitat including bird-, bee-, butterfly-friendly plants, and natural area preservation over and above required greenbelt setbacks, by development of a schedule of impervious cover limit increases up to an additional 10% for use of such practices: 1) there are no increases to storm water runoff (either volume or rate of flow of runoff), 2) the site plan meets all TCEQ best management practices for water quality, and meets the design elements described below.

Certification: all requirements associated with impervious cover incentives, storm water management and water quality be mandatory, not subject to variance, and enforced by requirements for engineering certification that the design meets all requirements as initially submitted in the permitting process and for engineering certification that the design as built meets all impervious cover, storm water management, and water quality requirements before the issuance of any occupancy permit.

Design requirements to lessen impact of commercial development to adjacent residential properties:

Where roofs are visible from adjacent residential lots, the City should adopt appropriate design requirements that mask and/or eliminate the impact of (i) building mechanical elements (AC units, vents, wireless facilities, etc.) by requiring such elements be located at ground level and not on roofs, or if located on roofs, masked by the roof; (ii) require all solar panels be masked; and (iii) require the site plan to provide a vegetative buffer and safety features between a residential lot and a commercial lot where there is no greenbelt, topographical, or line of sight buffer between the commercial lot and any residential lot.

The City should adopt lighting design criteria to eliminate impact to adjacent residential properties, down-shield night-time lights, and adopt standards consistent with the "Dark Skies" lighting policies of similarly sized Central Texas Hill Country communities, the International Dark Skies communities or other state-certified "Dark Skies" organization.

Review and revise necessary ordinances regarding interior and exterior lighting.

Landscaping/Shade/setback incentives for commercial properties: the City should:

Require that landscaping within the setback along Bee Caves Road, where possible, and along any pedestrian walkways, include sufficient trees to shade sidewalks and pedestrian paths.

Employ a tree ordinance similar to that in residential areas that will preserve heritage trees, that requires replacement of heritage trees with a tree or trees of the same species and having the same total caliper inches, and require replacement of other protected trees so as to maintain current tree canopies.

• Safe harbor: the City should permit the renovation and, if necessary, rebuilding of existing structures on commercially zoned lots provided that such renovation or rebuilding 1) was in compliance with all City ordinances at the time it was built; and 2) is limited to the footprint of the existing structure.

• Update commercial signage regulations as needed to bring rules up to date with modern technology and building needs.

• Post-permit Enforcement and penalties: The zoning ordinance for commercial properties should include provisions sufficient to permit revocation of occupancy permits in the event the owner fails to maintain compliance with any permit requirement including impervious cover incentives, and landscaping, shade, setback requirements, and/or Dark Sky requirements, in addition to use of all fines and other enforcement provisions, including daily financial penalties for non-compliance.

ROLLINGWOOD TEXAS

Date: November 14, 2022

To: Mayor and Council Members of the City of Rollingwood

From: Ashley Wayman, City Administrator

Subject: City Administrator's Report

Financials – Highlights of the financials through the month of October 2022:

- As of October 31, 2022, 8% of the Fiscal Year has passed.
- Property taxes collected were about the same as the amount collected in the same period in FY 21-22.
- Sales taxes collected were up 18% from the amount collected in the same period in FY 21-22.
- The Water Fund balance is currently at $555,119. The General Fund balance is at $1,662,875

We had a successful Trunk-Or-Treat Safe Halloween event last month. Thank you to the Police Department and Public Works Department for their hard work planning that event!

Street Sweeping is scheduled for Tuesday, November 29, Wednesday, November 30 and Friday, December 2, avoiding Monday and Wednesday that week for garbage/recycling collection. We will be sharing a notice via our website, Swift 911 notification system and our social media channels that includes what areas of the city are scheduled for each day.

City Hall will be closed on Thursday, November 24 and Friday, November 25 in observance of the Thanksgiving Holiday. On behalf of the all of us here at City Hall, I want to wish you all a very Happy Thanksgiving! We are thankful year-round to serve the City of Rollingwood.

I am available by email at awayman@rollingwoodtx.gov and cell phone at 737-218-8326. Please let me know if you have any questions or concerns.

Best,
Ashley Wayman
City Administrator

Trunk-Or-Treat 2022

Police Department Report - October 2022

Staffing	
Authorized Staff:	10
Current Staff:	9
Hours Worked For Comp:	12
Comp Hours Spent:	18.5
Vacation Hours Spent:	8
Sick Hours Spent:	98.5
Holiday Hours Worked:	16
Holiday Hours Not Worked :	24
Hours Worked For Overtime:	0
Total Hours Worked:	849

Possible Liabilities (PD Employees Only)	
Comp Pool Liability (Dollars):	$ 14,655
Vacation Pool Liability (Dollars):	$ 35,052
Total Sick Pool Liability (Dollars):	$ 26,465
Total Possible Liabilities:	$ 76,172

Fleet	
Vehicles Authorized:	5
Vehicles Operational:	5
Gasoline Used (gal):	452.298
Total Miles Driven:	4504

Police Activity	
Calls for Service	
Calls Dispatched:	27
Self Assigned Calls:	88
Total Calls for Service:	115
Agency Assists:	34
Criminal Offense Reports:	2
Theft/Burglary Reports:	5
Arrests	
Misdemeanor Arrests:	0
Felony Arrests:	0
Total Arrests:	0
Proactive Citizen Contacts:	4
Vehicle Accidents	
Minor Accidents:	1
Major Accidents:	0
Total Vehicle Accidents:	1

Ordinance Violations	
Construction:	3
Solicitation:	0
Noise:	0
Tree Related:	1
Animal Related:	0
All Others:	0
Total Ordinance Violations:	4

Traffic Initiatives	
Location 1: Nixon	
Time spent (hours):	
Citations/Warnings issued at this Location:	0
Location 2: Hatley	
Time spent (hours):	
Citations/Warnings Issued at this Location:	2
Location 3: Wallis	
Time spent (hours):	
Citations/Warnings Issued at this Location:	0
Location 4: Timberline	
Time spent (hours):	
Citations/Warnings issued at this Location:	4
Total time spent on traffic initiatives (hours):	
Total Citations/Warnings issued during traffic initiatives:	6

Traffic Enforcement	
Total Citations issued:	42
Total Warnings issued:	45
Total Citations and Warnings:	87
Type of Violations:	
Parking Violations:	8
Special Event Parking Violations:	26
Moving Violations:	68
Equipment Violations:	9
Total Violations:	111
Location of Traffic Stops	
City Roadways:	41
Bee Caves Road:	77
Total Traffic Stops:	118

Chief's Blotter

EVENTS - ACL ran smoothly with no major issues. Our Halloween Trunk or Treat was a success. **Training -** Our department attended several Eanes ISD school lock down drills.

Chief of Police Report - 2022

Staffing:

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Authorized Staff:	9	9	9	9	9	9	10	10	10	10		
Current Staff:	8	8	8	9	9	8	9	8	9	9		
Hours Worked For Comp:	34.6	14.5	53.5	25.5	63	18	16	47	35.25	12		
Comp Hours Spent:		10	29.7	15	12	24	82.1	8	6	18.5		
Vacation Hours Spent:		18	105	2	12	3	137.85	206.5		8		
Sick Hours Spent:	44	34	162	12	12	134	20	72	100.5	98.5		
Holiday Hours Worked:	69	16	56	24		16	56		32	16		
Holiday Hours Not Worked :	43	24	32	16		40	44		24	24		
Hours Worked For Overtime:		49	6	4	0.5	33	10	8	6			
Total Hours Worked:	711	829	1145	916		1041	841	879.5	1543.5	849		

Possible Liabilities (PD Employees Only)

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Comp Pool Liability (Dollars):	$ 15,616	$15,777	$16,355	$ 16,887	$ 19,129	$ 18,750	$ 17,077	$ 17,205	$ 14,167	$ 14,655		
Vacation Pool Liability (Dollars):	$ 33,745	$35,625	$35,655	$ 36,935	$ 40,896	$ 43,610	$ 41,538	$ 28,177	$ 29,991	$ 35,052		
Total Sick Pool Liability (Dollars):	$ 58,108	$60,401	$59,024	$ 60,130	$ 61,990	$ 59,123	$ 58,983	$ 46,544	$ 26,538	$ 26,465		
Total Possible Liabilities:	$ 107,469	$111,803	$111,034	$ 113,952	$ 122,015	$ 121,483	$ 117,598	$ 91,926	$ 70,696	$ 76,172		

Fleet:

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Vehicles Authorized:	5	5	5	5	5	5	5	5	5	5		
Vehicles Operational:	5	5	5	5	5	5	5	5	5	5		
Gasoline Used (gal):	304	311	382.3	448.7	449.5	421	362	394.62	491.85	452.298		
Total Miles Driven:	3739	3,358	2990	5216	5216	4603	3831	4,297	5362	4504		

Police Activity:

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Calls for Service												
Call dispatched:	32	44	28	45	65	40	47	29	30	27		
Self assigned calls:	23	37	26	43	71	58	10	68	90	88		
Total Calls for Service:	55	81	54	88	136	98	57	97	120	115		
Total Agency Assists:	42	38	32	52	57	67	59	68	37	34		
Criminal Offense Reports:	8	11	9	16	13	15	17	11		2		
Theft/Burglary Reports:	2	4	2	4	1	6	4	2		5		
Arrests												
Misdemeanor Arrests:			3	2	2			1	1			
Felony Arrests:				1		2	2					
Total Arrests:			3	3	2	2	2	1	1			
Proactive Citizen Contacts:	12							4		4		
Vehicle Accidents												
Minor Accidents:		5	1	4	1	3	2		2	1		
Major Accidents:					3				2			
Total Vehicle Accidents:		5	1	4	4	3	2		4	1		

Ordinance Violations:

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Construction:		1		1		1	1	3	2	3		
Solicitation:												
Noise:												
Tree Related:			2							1		
Animal Related:												
All Others:								1				
Total Ordinance Violations:		1	2	1		1	1	4	2	4		

Traffic Initiatives:

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Total time spent on traffic initiatives (hours):												
Total Citations/Warnings issued during traffic initiatives:	5	32	49	72	74	44	8	15	90	6		

Traffic Enforcement:												
	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Total Citations issued:	5	30	43	59	70	61	36	48	76	42		
Total Warnings issued:		9	11	23	18	20	9	10	30	45		
Total Citations and Warnings:	5	39	54	82	88	81	44	58	106	87		
Type of Violations												
Total Parking Violations:		6	5	17	6	1			1	34		
Moving Violations:	2	33	40	58	46	65	25	42	45	68		
Equipment Violations:	3	6	9	7	36	8	20	16	30	9		
Total Violations:	5	45	54	82	88	74	45	58	76	111		
Location of Traffic Stops												
City Roadways:	1	14	12	24	27	20	9	22	26	41		
Bee Caves Road:	4	25	42	38	45	54	36	26	76	77		
Total Traffic Stops:	5	39	54	62	72	74	45	48	102	118		

City of Rollingwood Monthly Stats - Fiscal Year 2022-2023
Municipal Court

Violations Filed by Date													
	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	58												58
State Law	0												0
City Ordinance	25												25
Parking	2												2
Total Violations	**85**												**85**

Completed Cases													
Paid Fine	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	24												24
State Law	1												1
City Ordinance	7												7
Parking	1												1
Total Paid Fines	**33**												**33**
Before Judge	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	24												24
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total Before Judge	**24**												24
By Jury	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Total	0												**0**
	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Total Completed	**57**												**57**

Other Completed													
Dismissed DSC. Sec. 2	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	16												16
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total	**16**												**16**
Dismissed After Deferred Disp.	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	2												2
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total	**2**												**2**
Dismissed By Presenting Insurance	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	1												1
Total	**1**												**1**
Voided Docket	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Traffic	0												0

CITY OF ROLLINGWOOD MONTHLY STATS

Municipal Court

State Law	0												0
Parking	0												0
City Ordinance	0												0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Dismissed by Judge	**Oct-22**	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Traffic	0												0
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Dismissed/ Compliance	**Oct-22**	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Traffic	9												9
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total	**9**												**9**
Dismissed by Prosecutor	**Oct-22**	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Traffic	0												0
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total	**0**												**0**
	Oct-22	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Total other Completed	**28**												**28**
Grand Total Completed	**85**												**85**

Warrants													
Issued	**Oct-22**	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Traffic	27												27
State Law	1												1
City Ordinance	0												0
Parking	0												0
Total Warrants Issued	**28**												**28**
Cleared	**Oct-22**	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Traffic	13												13
State Law	0												0
City Ordinance	0												0
Parking	0												0
Total Warrants Cleared	13												13
Change in Total Warrants	**15**												**15**

Other Paid Cases													
Paid Fines	**Oct-22**	**Nov-22**	**Dec-22**	**Jan-23**	**Feb-23**	**Mar-23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**	**Total**
Total Other Paid Fines	8												**8**

Municipal Court

Payment Process Methods													
Paid Fines	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Municipal Court Clerk	33												33
Online	42												42
Total	**75**												**75**

Fees and Fines Paid FY 2021-2022													
	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Administrative Fee													$ -
Administrative $20.00													$ -
Arrest Fee	$ 369.68												$ 369.68
Bond Fortfeiture													$ -
CCC04-Consolidated Court Cost													$ -
CS2 Child Safety Fee													$ -
Civil Justice Fee Court													$ -
Civil Justice Fee State													$ -
Court Tech Fund													$ -
DSC Admin Fee	$ 122.24												$ 122.24
Fine	$ 6,920.60												$ 6,920.60
Indigent Defense Fee													$ -
JFCI- Judicial Fee - City													$ -
JFCT2-Judicial Fee-State													$ -
Muni. Court Bldg. Sec.													$ -
State Jury Fee													$ -
State Traffic Fee	$ 2,148.46												$ 2,148.46
TFC	$ 128.91												$ 128.91
Truancy Prevention													$ -
Omni Fees State													$ -
Omni Base Vendor													$ -
Local Munucipal Jury Fund (LMJF)	$ 7.35												$ 7.35
CCC 2020 (CCC20)	$ 4,088.65												$ 4,088.65
Local Court Technology Fund	$ 295.80												$ 295.80
Local Truancy Prevention Fund	$ 369.68												$ 369.68
State Traffic Fee (STF19)													$ -
Local Building Security Fund (LMCBSF)	$ 362.33												$ 362.33
Local Omni Base Fee													$ -
Time Pmt. Plan - Local													$ -
Time Pmt. Plan - Effiency													$ -

Time Pmt. Plan - State													$ -
Warrant Fee	$ 400.00												$ 400.00
Collection Agency Fee													$ -
Total Fees/Fines Paid	**$ 15,213.70**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 15,213.70**
									$ -				

2022-2023

CITY OF ROLLINGWOOD
MONTHLY FINANCIAL ANALYSIS

NOTE: YTD ACTUAL AS OF 10/31/2022; 8.33% OF FISCAL YEAR

REVENUE STATUS & COMPARISON TO PRIOR YEAR

	CURRENT YEAR: EST. REVENUE	YTD	PERCENT	PRIOR YEAR: YTD	CURRENT YR COMPARED TO PY YR
CURRENT PROPERTY TAXES	$ 1,391,320	$ 113	0%	$ 12,360	1%
TELECOM TAXES	$ 20,000	$ 52	0%	$ 6	924%
4-B SALES TAX	$ 200,000	$ 15,633	8%	$ 13,255	118%
CITY SALES TAX	$ 625,000	$ 62,532	10%	$ 53,020	118%
ELECTRIC UTILITY FRANCHISE FEE	$ 90,000	$ 29,451	33%	$ 431	6839%
BUILDING PERMIT FEES	$ 150,000	$ 7,684	5%	$ 18,458	42%
COURT FINES	$ 31,700	$ 8,481	27%	$ 4,053	209%
WATER SALES	$ 1,354,000	$ 184,162	14%	$ 135,093	136%
STREET SALES TAX	$ 200,000	$ 15,633	8%	$ 13,261	118%
PROPERTY TAX-DEBT SERVICE 2014	$ 199,350	$ 23	0%	$ 1,816	1%
PROPERTY TAX-DEBT SERVICE 2012	$ 313,235	$ 27	0%	$ 2,873	1%
PROPERTY TAX-DEBT SERVICE 2019	$ 410,250	$ 47	0%	$ 3,727	1%
PROPERTY TAX-DEBT SERVICE 2020	$ 314,775	$ 36	0%	$ 2,858	1%
WASTEWATER REVENUES	$ 803,500	$ 79,609	10%	$ 59,582	134%
PUD SURCHARGE	$ 98,160	$ 8,180	8%	$ 8,180	100%

BUDGET STATUS & COMPARISON TO PRIOR YEAR

	CURRENT YEAR: BUDGET	YTD	PERCENT	YTD	CURRENT YR COMPARED TO PY YR
GENERAL FUND:					
REVENUE	$ 2,992,294	$ 126,873	4%	$ 102,573	124%
EXPENDITURES	$ 2,900,494	$ 232,271	8%	$ 190,839	226%
WATER FUND:					
REVENUE	$ 1,117,650	$ 184,348	16%	$ 135,101	136%
EXPENDITURES	$ 1,219,992	$ 19,242	2%	$ 10,305	14%
STREET MAINTENANCE FUND:					
REVENUE	$ 150,100	$ 15,663	10%	$ 13,261	118%
EXPENDITURES	$ 95,469	$ -	0%	$ -	0%
COURT SECURITY FUND:					
REVENUE	$ 1,350	$ 362	27%	$ 149	243%
EXPENDITURES	$ 1,000	$ -	0%	$ -	0%
COURT TECHNOLOGY FUND:					
REVENUE	$ 1,000	$ 296	30%	$ 129	229%
EXPENDITURES	$ 2,500	$ 5	0%	$ 1	4%
COURT EFFICIENCY FUND:					
REVENUE	$ 100	$ -	0%	$ -	#DIV/0!
EXPENDITURES	$ 100	$ -	0%	$ -	#DIV/0!
DEBT SERVICE FUND - 2014:					
REVENUE	$ 200,250	$ 23	0%	$ 1,816	1%
EXPENDITURES	$ 199,950	$ -	0%	$ -	0%
DEBT SERVICE FUND - 2012:					
REVENUE	$ 317,135	$ 36	0%	$ 2,873	1%
EXPENDITURES	$ 316,135	$ -	0%	$ -	0%
DEBT SERVICE FUND - 2019:					
REVENUE	$ 410,750	$ 47	0%	$ 3,727	1%
EXPENDITURES	$ 410,050	$ -	0%	$ -	0%
DEBT SERVICE FUND - 2020:					
REVENUE	$ 314,790	$ 36	0%	$ 2,858	1%
EXPENDITURES	$ 314,290	$ -	0%	$ -	0%
DRAINAGE FUND:					
REVENUE	$ 30,000	$ -	0%	$ 20,728	0%
EXPENDITURES	$ 55,000	$ -	0%	$ (24,616)	0%
WASTE WATER FUND:					
REVENUE	$ 883,110	$ 89,738	10%	$ 68,701	131%
EXPENDITURES	$ 1,166,557	$ 20,104	2%	$ 20,038	29%

BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

100-GENERAL FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
100-1000	CLAIM ON POOLED CASH	1,487,305.03		
100-1011	PETTY CASH - COURT	250.00		
100-1014	CASH - TAX NOTES	2,004,934.71		
100-1016	MERCHANT ACCT CASH	0.00		
100-1018	CASH - DEVELOPMENT SERVICES	(1,000.00)		
100-1030	TEX-POOL	175,570.34		
100-1131	NET PENSION ASSET	0.00		
100-1141	DEFERRED OUTFLOWS OF RESOURCES	0.00		
100-1142	DEFERRED OUTFLOWS - OPEB	0.00		
100-1200	ACCOUNTS RECEIVABLE	112.95		
100-1205	ALLOWANCE FOR UNCOLLECTIBLES	0.00		
100-1206	ALLOWANCE FOR DOUBTFUL ACCTS	(1,896.31)		
100-1217	CENCOR PUD RECEIVABLE	0.01		
100-1221	DUE FROM RCDC	39,542.19		
100-1222	DUE FROM WATER FUND	3,169.25		
100-1230	TAXES RECEIVABLE - GENERAL	20,905.97		
100-1250	Due From Vendors	0.00		
100-1350	SALES TAX RECEIVABLE	66,131.46		
			3,795,025.60	
	TOTAL ASSETS			3,795,025.60
LIABILITIES				
100-2000	ACCOUNTS PAYABLE POOLED	0.00		
100-2008	ACCOUNTS PAYABLE - OTHER	8,268.91		
100-2010	HEALTHE INSURANCE PAYABLE	1,742.72		
100-2012	AFLAC INSURANCE PAYABLE	(18.04)		
100-2015	EDC SALES TAX PAYABLE	0.00		
100-2016	EMPLOYEE 457 CONTRIB PAYABLE	7,717.11		
100-2020	FEDERAL WH PAYABLE	118.21		
100-2030	UNEMPLOYMENT TAX PAYABLE	(3,608.63)		
100-2035	SOCIAL SEC/MEDICARE PAYABLE	(2,914.46)		
100-2050	APPEARANCE BOND RESERVE	(1,591.64)		
100-2055	OMNIBASE PAYABLE	(116.69)		
100-2060	RETIREMENT PAYOUT RESERVE	7,977.07		
100-2070	DEFERRED REVENUE	4,281.02		
100-2075	CHILD SUPPORT GARNISHMENT	0.00		
100-2080	TMRS RETIREMENT WITHHELD	12,690.98		
100-2110	COMPENSATED ABSENCE PAY	163.00		
100-2115	WAGES PAYABLE	0.00		
100-2117	UNCLAIMED PROPERTY	153.97		
100-2122	ACCRUED INTEREST PAYABLE	0.00		
100-2132	MY PARK DAY	921.96		
100-2137	PARK PET PAVERS	2,025.57		
100-2138	TAX NOTES PAYABLE-SR 2020	0.00		
100-2139	DEFERRED REV-LEOSE FUNDS	0.00		
100-2140	VEHICLE FINANCING NOTES	196,370.37		
100-2249	DEFERRED REV-FIELD RENTAL	33,660.00		

BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

100-GENERAL FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
100-2250	DEFERRED TAX REV=DELINQUENT TX	19,009.66		
100-2300	DUE TO DRAINAGE FUND	69,387.00		
100-2425	BLDG & MISC DEPOSITS	3,500.00		
100-2600	TRAFFIC FINE RESERVE	27,351.80		
	TOTAL LIABILITIES		387,089.89	
EQUITY				
======				
100-3000	FUND BALANCE-UNAPPROPRATED	4,802,808.73		
100-3030	AMOUNT TO BE PROVIDED FOR	(1,289,474.90)		
	TOTAL BEGINNING EQUITY	3,513,333.83		
	TOTAL REVENUE	126,872.84		
	TOTAL EXPENSES	232,270.96		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	(105,398.12)		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		3,407,935.71	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			3,795,025.60
				==============

CITY OF ROLLINGWOOD
BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

200-WATER FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
200-1000	CLAIM ON POOLED CASH	494,309.41		
200-1016	MERCHANT ACCT CASH	250.00		
200-1018	CASH - DEVELOPMENT SERVICES	1,000.00		
200-1030	TEX-POOL	60,809.65		
200-1131	NET PENSION	(24,642.00)		
200-1141	DEFERRED OUTFLOW OF RESOURCES	21,589.32		
200-1142	DEFERRED OUTFLOWS-OPEB	2,392.00		
200-1200	ACCOUNTS RECEIVABLE	287,029.87		
200-1202	MISC AR -	0.00		
200-1205	ALLOWANCE FOR UNCOLLECTIBLE	(26,191.41)		
200-1210	UNAPPLIED CREDITS	(42,512.91)		
200-1220	REFUNDS PAYABLE	(2,084.47)		
200-1250	ALLOWANCE FOR LOSSES	(4,500.00)		
200-1300	RETURNED CHECKS RECEIVABLE	6,161.73		
200-1600	WATER SYSTEM	1,885,140.74		
200-1601	WATER LINE IMPROVEMENTS	1,799,149.92		
200-1605	W/WW IMP BCR	561,036.56		
200-1606	CAP IMP BACKFLOW	92,420.00		
200-1610	ACCUMULATED DEPRECIATION	(1,972,010.34)		
200-1620	EQUIPMENT	70,196.33		
200-1621	COMPUTER	1,726.00		
200-1628	ACCUM DEPREC MAINT & OFFICE	(45,810.43)		
			3,165,459.97	
	TOTAL ASSETS			3,165,459.97
LIABILITIES				
200-2000	ACCOUNTS PAYABLE POOLED	0.00		
200-2008	ACCOUNTS PAYABLE OTHER	89,873.13		
200-2010	HEALTHE INSURANCE PAYABLE	400.00		
200-2012	AFLAC INSURANCE PAYABLE	0.00		
200-2015	ECONOMIC DEV SALES TAX	0.00		
200-2016	EMPLOYEE 457 CONTRIB PAYABL	0.00		
200-2020	FEDERAL WH PAYABLE	19.24		
200-2030	UNEMPLOYMENT TAX PAYABLE	(198.34)		
200-2035	SOC SEC/MEDICARE PAYABLE	2,879.28		
200-2060	Retirement Payout Reserve	0.00		
200-2080	TMRS RETIREMENT PAYABLE	1,996.50		
200-2100	METER SERVICE DEPOSITS	0.00		
200-2110	COMPENSATED ABSENCE PAYABLE	9,956.26		
200-2115	WAGES PAYABLE	0.00		
200-2120	BONDS PAYABLE-SR2014 WTR IMP	647,325.00		
200-2121	BOND PREMIUM-SR2014 WTR IMPRV	34,459.76		
200-2122	ACCRUED INTEREST PAYABLE	3,651.19		
200-2123	GOVERNMENT CAPITAL LEASE	41,695.07		
200-2128	DUE TO VENDORS	0.00		
200-2140	DEFERRED INFLOWS OF RESOURCES	15,078.00		
200-2142	RES STORM DISCHA PERMIT-ZONE 8	186.00		

CITY OF ROLLINGWOOD
BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

200-WATER FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
200-2145	OPEB LIABILITY	8,889.00		
200-2310	DUE TO MERCHANT ACCOUNT	3,169.25		
200-2400	CUSTOMER DEPOSITS PAYABLE	167,520.00		
200-2425	BLDG & MISC DEPOSITS	1,750.00		
	TOTAL LIABILITIES		1,028,649.34	
EQUITY				
======				
200-3000	FUND BALANCE-UNAPPROPRATED	714,938.40		
200-3600	INVEST IN FA NET RELATED DEBT	1,256,765.70		
	TOTAL BEGINNING EQUITY	1,971,704.10		
	TOTAL REVENUE	184,348.38		
	TOTAL EXPENSES	19,241.85		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	165,106.53		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		2,136,810.63	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			3,165,459.97
				==============

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BALANCE SHEET

AS OF: OCTOBER 31ST, 2022

301-STREET MAINTENANCE

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
301-1000	CLAIM ON POOLED CASH	406,585.61		
301-1350	SALES TAX RECEIVABLE	15,545.66		
			422,131.27	
	TOTAL ASSETS			422,131.27
				==============
LIABILITIES				
===========				
301-2000	ACCOUNTS PAYABLE POOLED	0.00		
301-2060	Retirement Payout Reserve	0.00		
301-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		0.00	
EQUITY				
======				
301-3000	FUND BALANCE-UNAPPROPRATED	406,468.44		
	TOTAL BEGINNING EQUITY	406,468.44		
	TOTAL REVENUE	15,662.83		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	15,662.83		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		422,131.27	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			422,131.27
				==============

BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

310-COURT SECURITY FUND

ACCOUNT # ACCOUNT DESCRIPTION	BALANCE		
ASSETS			
310-1000 CLAIM ON POOLED CASH	10,240.80		
		10,240.80	
TOTAL ASSETS			10,240.80
LIABILITIES			
310-2000 ACCOUNTS PAYABLE POOLED	0.00		
310-2050 APPEARANCE BOND RESERVE	(9.00)		
310-2060 Retirement Payout Reserve	0.00		
310-2140 Vehicle Financing Notes	0.00		
TOTAL LIABILITIES		(9.00)	
EQUITY			
310-3000 UNAPPROPRIATED FUND BALANCE	3,685.92		
310-3450 RESERVE FOR COURT TECHNOLOGY	(9,119.30)		
310-3451 RESERVE FOR COURT SECURITY	15,320.85		
TOTAL BEGINNING EQUITY	9,887.47		
TOTAL REVENUE	362.33		
TOTAL EXPENSES	0.00		
TOTAL REVENUE OVER/(UNDER) EXPENSES	362.33		
TOTAL EQUITY & REV. OVER/(UNDER) EXP.		10,249.80	
TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			10,240.80

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BALANCE SHEET

AS OF: OCTOBER 31ST, 2022

320-COURT TECHNOLOGY FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
320-1000	CLAIM ON POOLED CASH	9,862.57		
			9,862.57	
	TOTAL ASSETS			9,862.57
LIABILITIES				
320-2000	ACCOUNTS PAYABLE POOLED	0.00		
320-2008	ACCOUNTS PAYABLE OTHER	23.33		
320-2050	APPEARANCE BOND RESERVE	(16.00)		
320-2060	Retirement Payout Reserve	0.00		
320-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		7.33	
EQUITY				
320-3450	FUND BALNCE - COURT TECH	9,564.22		
	TOTAL BEGINNING EQUITY	9,564.22		
	TOTAL REVENUE	295.80		
	TOTAL EXPENSES	4.78		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	291.02		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		9,855.24	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			9,862.57

CITY OF ROLLINGWOOD
BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

330-COURT EFFICIENCY FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
330-1000	CLAIM ON POOLED CASH	114.31		
			114.31	
	TOTAL ASSETS			114.31
				==============
LIABILITIES				
===========				
330-2000	ACCOUNTS PAYABLE POOLED	0.00		
330-2060	Retirement Payout Reserve	0.00		
330-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		0.00	
EQUITY				
======				
330-3000	FUND BALANCE-UNAPPROPRATED	114.31		
	TOTAL BEGINNING EQUITY	114.31		
	TOTAL REVENUE	0.00		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	0.00		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		114.31	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			114.31
				==============

BALANCE SHEET

AS OF: OCTOBER 31ST, 2022

430-DEBT SERVICE FUND 2014

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
430-1000	CLAIM ON POOLED CASH	780.63		
430-1007	CASH-DS SR2014 GO STREETS	(1.34)		
430-1009	CASH-DS SR2014 WATER IMPROV	1.34		
430-1206	ALLOWANCE FOR DOUBTFUL COLL	(813.24)		
430-1230	TAXES RECEIVABLE	17,002.26		
			16,969.65	
	TOTAL ASSETS			16,969.65
				==============
LIABILITIES				
===========				
430-2000	ACCOUNTS PAYABLE POOLED	0.00		
430-2060	Retirement Payout Reserve	0.00		
430-2140	Vehicle Financing Notes	0.00		
430-2250	DEFERRED TAX REV-DELINQUENT TX	16,189.02		
	TOTAL LIABILITIES		16,189.02	
EQUITY				
======				
430-3000	FUND BALANCE-UNAPPROPRATED	757.93		
	TOTAL BEGINNING EQUITY	757.93		
	TOTAL REVENUE	22.70		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	22.70		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		780.63	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			16,969.65
				==============

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CITY OF ROLLINGWOOD
BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

440-DEBT SERVICE FUND 2012

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
440-1000	CLAIM ON POOLED CASH	809.69		
			809.69	
	TOTAL ASSETS			809.69
				==============
LIABILITIES				
===========				
440-2000	ACCOUNTS PAYABLE POOLED	0.00		
440-2060	Retirement Payout Reserve	0.00		
440-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		0.00	
EQUITY				
======				
440-3000	FUND BALANCE-UNAPPROPRATED	773.56		
	TOTAL BEGINNING EQUITY	773.56		
	TOTAL REVENUE	36.13		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	36.13		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		809.69	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			809.69
				==============

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BALANCE SHEET

AS OF: OCTOBER 31ST, 2022

450-DEBT SERVICE FUND 2019

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
450-1000	CLAIM ON POOLED CASH	(1,216.73)		
			(1,216.73)	
	TOTAL ASSETS			(1,216.73)
LIABILITIES				
450-2000	ACCOUNTS PAYABLE POOLED	0.00		
450-2060	Retirement Payout Reserve	0.00		
450-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		0.00	
EQUITY				
450-3000	FUND BALANCE-UNAPPROPRATED	(1,263.25)		
	TOTAL BEGINNING EQUITY	(1,263.25)		
	TOTAL REVENUE	46.52		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	46.52		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		(1,216.73)	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			(1,216.73)

CITY OF ROLLINGWOOD
BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

460-DEBT SERVICE FUND 2020

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
460-1000	CLAIM ON POOLED CASH	4,239.07		
			4,239.07	
	TOTAL ASSETS			4,239.07
				==============
LIABILITIES				
===========				
460-2000	ACCOUNTS PAYABLE POOLED	0.00		
460-2060	Retirement Payout Reserve	0.00		
460-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		0.00	
EQUITY				
======				
460-3000	FUND BALANCE-UNAPPROPRATED	4,202.99		
	TOTAL BEGINNING EQUITY	4,202.99		
	TOTAL REVENUE	36.08		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	36.08		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		4,239.07	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			4,239.07
				==============

BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

702-DRAINAGE FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
702-1000	CLAIM ON POOLED CASH	(147,484.10)		
702-1016	MERCHANT ACCT CASH	6,275.00		
702-1200	DUE FROM GENERAL FUND	69,387.00		
			(71,822.10)	
	TOTAL ASSETS			(71,822.10)
LIABILITIES				
702-2000	ACCOUNTS PAYABLE POOLED	0.00		
702-2008	ACCOUNTS PAYABLE - OTHER	0.00		
702-2060	Retirement Payout Reserve	0.00		
702-2140	Vehicle Financing Notes	0.00		
702-2141	RES STORM DISCHA PERMIT-ZONE 7	0.00		
702-2143	RES STORM DISCHA PERMIT-ZONE 1	3,500.00		
702-2144	RES STORM DISCHA PERMIT-ZONE 4	37,384.00		
	TOTAL LIABILITIES		40,884.00	
EQUITY				
702-3000	FUND BALANCE-UNAPPROPRATED	(112,706.10)		
	TOTAL BEGINNING EQUITY	(112,706.10)		
	TOTAL REVENUE	0.00		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	0.00		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		(112,706.10)	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			(71,822.10)

CITY OF ROLLINGWOOD
BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

800-WASTE WATER FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
800-1000	CLAIM ON POOLED CASH	330,312.39		
800-1030	TEX-POOL	304,841.69		
800-1031	NET PENSION	(24,642.00)		
800-1141	DEFERRED OUTFLOW OF RESOURCES	21,589.32		
800-1142	DEFERRED OUTFLOWS-OPEB	2,392.00		
800-1200	ACCOUNTS RECEIVABLE	115,296.34		
800-1205	ALLOWANCE FOR UNCOLLECTIBLE	(9,000.00)		
800-1213	MIRA VISTA PUD LIVE OAK	805.97		
800-1215	OTHER RECEIVABLES (WATER)	4,210.95		
800-1216	MIRA VISTA PUD RECEIVABLE	2,087.90		
800-1217	CENCOR PUD RECEIVABLE	2,292.81		
800-1218	ENDEAVOR PUD RECEIVABLE	13,451.35		
800-1219	RESTITUTION RECEIVABLE	921.33		
800-1611	ACCUM DEPREC - BUILDING	(3,440.00)		
800-1615	LINE IMPROVEMENTS	194,039.50		
800-1616	WASTEWATER SYSTEM	12,262,665.58		
800-1620	EQUIPMENT	99,957.22		
800-1628	ACCUM DEPREC = MAINT & OFFICE	(1,927,247.09)		
800-1630	ACCUM DEPREC - EQUIPMENT	(1,152,338.88)		
800-1721	LAND IMPROVEMENTS	43,000.00		
			10,281,196.38	
	TOTAL ASSETS			10,281,196.38
				==============
LIABILITIES				
===========				
800-2000	ACCOUNTS PAYABLE POOLED	0.00		
800-2008	ACCOUNTS PAYABLE OTHER	21,717.33		
800-2010	HEALTHE INSURANCE PAYABLE	227.54		
800-2012	AFLAC INSURANCE PAYABLE	0.00		
800-2016	EMPLOYEE 457 CONTRIB PAYABL	0.00		
800-2020	FEDERAL WH PAYABLE	(545.09)		
800-2030	UNEMPLOYMENT TAX PAYABLE	(533.69)		
800-2035	SOC SEC/MEDICARE PAYABLE	620.88		
800-2060	Retirement Payout Reserve	0.00		
800-2080	TMRS RETIREMENT PAYABLE	1,346.34		
800-2090	DEPERRED REV- PAVING ASSESS	0.00		
800-2091	DEFERRED REVENUE-PAVING ASSES	323.48		
800-2110	COMPENSATED ABSENCE PAYABLE	9,956.26		
800-2115	WAGES PAYABLE	0.00		
800-2122	ACCRUED INTEREST PAYABLE	53,264.00		
800-2124	BONDS PAYABLE-SR2012A	605,000.00		
800-2135	BONDS PAYABLE-2019 REFUNDING	9,150,000.00		
800-2136	BOND PREMIUM-2019 REFUNDING	500,339.53		
800-2140	DEFERRED INFLOWS OF RESOURCES	15,078.00		
800-2142	RES STORM DISCHA PERMIT-ZONE 8	186.00		
800-2145	OPEB LIABILITY	8,889.00		
	TOTAL LIABILITIES		10,365,869.58	

BALANCE SHEET
AS OF: OCTOBER 31ST, 2022

800-WASTE WATER FUND

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
EQUITY				
======				
800-3000	FUND BALANCE-UNAPPROPRATED	(48,763.74)		
800-3030	AMOUNT TO BE PROVIDED FOR	(105,000.00)		
800-3451	RESERVE FOR COURT SECURITY	(137,476.19)		
800-3600	INVEST IN FA NET RELATED DEBT	136,933.00		
	TOTAL BEGINNING EQUITY	(154,306.93)		
	TOTAL REVENUE	89,738.41		
	TOTAL EXPENSES	20,104.34		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	69,634.07		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		(84,672.86)	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			10,281,196.72
				==============
	*** AMOUNT OUT OF BALANCE ***			0.34-

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

100-GENERAL FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
ADMINISTRATION	2,550,573.00	109,410.88	109,410.88	4.29	2,441,162.12
DEVELOPMENT SERVICES	150,000.00	7,684.25	7,684.25	5.12	142,315.75
UTILITY BILLING	126,000.00	0.00	0.00	0.00	126,000.00
STREETS	256,115.00	0.00	0.00	0.00	256,115.00
POLICE	2,250.00	170.00	170.00	7.56	2,080.00
COURT	33,250.00	8,907.71	8,907.71	26.79	24,342.29
PARK DEPARTMENT	39,200.00	700.00	700.00	1.79	38,500.00
TOTAL REVENUES	3,157,388.00	126,872.84	126,872.84	4.02	3,030,515.16
EXPENDITURE SUMMARY					
ADMINISTRATION	722,145.00	39,444.06	39,444.06	5.46	682,700.94
DEVELOPMENT SERVICES	223,989.00	8,213.83	8,213.83	3.67	215,775.17
SANITATION	148,000.00	0.00	0.00	0.00	148,000.00
UTILITY BILLING	131,207.00	4,147.30	4,147.30	3.16	127,059.70
STREETS	256,115.00	5,394.86	5,394.86	2.11	250,720.14
POLICE	1,430,756.47	161,975.43	161,975.43	11.32	1,268,781.04
COURT	96,715.00	7,648.75	7,648.75	7.91	89,066.25
PARK DEPARTMENT	112,440.00	5,342.63	5,342.63	4.75	107,097.37
PUBLIC WORKS	27,050.00	104.10	104.10	0.38	26,945.90
TOTAL EXPENDITURES	3,148,417.47	232,270.96	232,270.96	7.38	2,916,146.51
REVENUES OVER/(UNDER) EXPENDITURES	8,970.53	(105,398.12)	(105,398.12)		114,368.65

100-GENERAL FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
ADMINISTRATION					
TAXES					
100-4-10-4000 CURRENT PROPERTY TAXES	1,391,320.00	112.91	112.91	0.01	1,391,207.09
100-4-10-4020 PENALTY & INTEREST ON TAXES	6,000.00	37.26	37.26	0.62	5,962.74
100-4-10-4030 GROSS RECEIPTS TAX (GAS)	20,000.00	0.00	0.00	0.00	20,000.00
100-4-10-4035 TELECOMMUNICATIONS TAX	20,000.00	51.75	51.75	0.26	19,948.25
100-4-10-4036 MIXED BEVERAGE TAX	5,000.00	454.26	454.26	9.09	4,545.74
100-4-10-4037 4-B SALES TAX	200,000.00	15,632.87	15,632.87	7.82	184,367.13
100-4-10-4040 CITY SALES TAX	625,000.00	62,531.50	62,531.50	10.01	562,468.50
100-4-10-4050 FRANCHISE TAX (CABLE TV)	5,000.00	403.89	403.89	8.08	4,596.11
100-4-10-4051 ELECT UTIL FRANCHISE FEE	90,000.00	29,451.43	29,451.43	32.72	60,548.57
TOTAL TAXES	2,362,320.00	108,675.87	108,675.87	4.60	2,253,644.13
CHARGE FOR SERVICES					
100-4-10-4209 RCDC ADMINISTRATION FEES	77,000.00	0.00	0.00	0.00	77,000.00
100-4-10-4236 WATER FUND ADMIN FEE	40,000.00	0.00	0.00	0.00	40,000.00
100-4-10-4237 WASTEWATER FD ADMIN FEE	28,000.00	0.00	0.00	0.00	28,000.00
TOTAL CHARGE FOR SERVICES	145,000.00	0.00	0.00	0.00	145,000.00
LICENSE & PERMITS					
100-4-10-4316 SOLICITAION PERMIT FEES	100.00	0.00	0.00	0.00	100.00
TOTAL LICENSE & PERMITS	100.00	0.00	0.00	0.00	100.00
INVESTMENT INCOME					
100-4-10-4400 INTEREST INCOME	400.00	436.35	436.35	109.09	(36.35)
100-4-10-4401 INTEREST INCOME - CHECKING	750.00	128.38	128.38	17.12	621.62
100-4-10-4405 INTEREST INCOME - TAX NOTES	500.00	170.28	170.28	34.06	329.72
TOTAL INVESTMENT INCOME	1,650.00	735.01	735.01	44.55	914.99
MISCELLANEOUS REVENUE					
100-4-10-4540 MISCELLANEOUS RECEIPTS	50.00	0.00	0.00	0.00	50.00
100-4-10-4565 GRANT REVENUES	0.00	0.00	0.00	0.00	0.00
100-4-10-4578 PROCEEDS FROM CAPITAL LEASE	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	50.00	0.00	0.00	0.00	50.00
OTHER REVENUE					
100-4-10-4700 UNEXPENDED BALANCE TRANSFER	41,453.00	0.00	0.00	0.00	41,453.00
TOTAL OTHER REVENUE	41,453.00	0.00	0.00	0.00	41,453.00
TOTAL ADMINISTRATION	2,550,573.00	109,410.88	109,410.88	4.29	2,441,162.12

DEVELOPMENT SERVICES
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100-GENERAL FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
CHARGE FOR SERVICES					
100-4-15-4210 BOARD OF ADJUSTMENT FEES	0.00	0.00	0.00	0.00	0.00
TOTAL CHARGE FOR SERVICES	0.00	0.00	0.00	0.00	0.00
LICENSE & PERMITS					
100-4-15-4301 TREE REMOVAL AND REPLACEMENT	7,500.00	135.00	135.00	1.80	7,365.00
100-4-15-4302 INSPECTIONS	40,000.00	3,375.00	3,375.00	8.44	36,625.00
100-4-15-4303 BUILDING FEES	100,000.00	2,249.25	2,249.25	2.25	97,750.75
100-4-15-4304 ZONING CHANGE	0.00	0.00	0.00	0.00	0.00
100-4-15-4305 SIGN FEES	0.00	125.00	125.00	0.00	(125.00)
100-4-15-4306 EMERGENCY & UTILITIES PERMITS	0.00	0.00	0.00	0.00	0.00
100-4-15-4310 PLAT FEES	2,000.00	1,800.00	1,800.00	90.00	200.00
100-4-15-4311 VARIANCE FEES	500.00	0.00	0.00	0.00	500.00
TOTAL LICENSE & PERMITS	150,000.00	7,684.25	7,684.25	5.12	142,315.75
TOTAL DEVELOPMENT SERVICES	150,000.00	7,684.25	7,684.25	5.12	142,315.75
UTILITY BILLING					
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MISCELLANEOUS REVENUE					
100-4-25-4579 WATER REVENUE-TRANSFER IN	63,000.00	0.00	0.00	0.00	63,000.00
100-4-25-4580 WASTEWATER REV-TRANSFER IN	63,000.00	0.00	0.00	0.00	63,000.00
TOTAL MISCELLANEOUS REVENUE	126,000.00	0.00	0.00	0.00	126,000.00
TOTAL UTILITY BILLING	126,000.00	0.00	0.00	0.00	126,000.00
STREETS					
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OTHER REVENUE					
100-4-30-4721 TRANSFER FROM STREET MAINT	256,115.00	0.00	0.00	0.00	256,115.00
100-4-30-4722 UUNEXPENDED BALANCE TRANSFER	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER REVENUE	256,115.00	0.00	0.00	0.00	256,115.00
TOTAL STREETS	256,115.00	0.00	0.00	0.00	256,115.00
POLICE					
======					
MISCELLANEOUS REVENUE					
100-4-40-4542 POLICE MISCELLANEOUS REVENUE	250.00	10.00	10.00	4.00	240.00
100-4-40-4558 VEHICLE OPERATIONS	1,000.00	160.00	160.00	16.00	840.00
100-4-40-4567 LEOSE FUNDS	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL MISCELLANEOUS REVENUE	2,250.00	170.00	170.00	7.56	2,080.00
TOTAL POLICE	2,250.00	170.00	170.00	7.56	2,080.00

100-GENERAL FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT					
=====					
COURT REVENUE					
100-4-50-4100 COURT FINES	25,000.00	6,950.60	6,950.60	27.80	18,049.40
100-4-50-4101 COLLECTION AGENCY FEES	1,000.00	0.00	0.00	0.00	1,000.00
100-4-50-4105 MUNI COURT BLDG SECURITY	50.00	0.00	0.00	0.00	50.00
100-4-50-4110 ADMINISTRATIVE COURT FEES	2,500.00	1,020.83	1,020.83	40.83	1,479.17
100-4-50-4127 DRIVER SAFETY COURSE ADM FEE	100.00	0.00	0.00	0.00	100.00
100-4-50-4128 TRUANCY PREVENTION FUND	1,000.00	369.68	369.68	36.97	630.32
100-4-50-4155 CHILD SAFETY REVENUE	2,000.00	132.70	132.70	6.64	1,867.30
100-4-50-4190 TRUANCY PREVENTION & DIVERSI	0.00	0.00	0.00	0.00	0.00
100-4-50-4191 MUNICIPAL COURT TECHNOLOGY	0.00	0.00	0.00	0.00	0.00
100-4-50-4192 MUNICIPAL JURY FUND	50.00	7.35	7.35	14.70	42.65
TOTAL COURT REVENUE	31,700.00	8,481.16	8,481.16	26.75	23,218.84
MISCELLANEOUS REVENUE					
100-4-50-4526 CREDIT-DEBIT CARD FEES	1,500.00	426.55	426.55	28.44	1,073.45
100-4-50-4540 MISCELLANEOUS RECEIPTS	50.00	0.00	0.00	0.00	50.00
TOTAL MISCELLANEOUS REVENUE	1,550.00	426.55	426.55	27.52	1,123.45
TOTAL COURT	33,250.00	8,907.71	8,907.71	26.79	24,342.29
PARK DEPARTMENT					
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LICENSE & PERMITS					
100-4-55-4319 COMMERCIAL PARK PERMITS	5,000.00	700.00	700.00	14.00	4,300.00
100-4-55-4320 FIELD LEASE	34,000.00	0.00	0.00	0.00	34,000.00
TOTAL LICENSE & PERMITS	39,000.00	700.00	700.00	1.79	38,300.00
MISCELLANEOUS REVENUE					
100-4-55-4523 DONATIONS-COMM EDUC GARGEN	100.00	0.00	0.00	0.00	100.00
100-4-55-4555 DONATIONS - PARK	100.00	0.00	0.00	0.00	100.00
TOTAL MISCELLANEOUS REVENUE	200.00	0.00	0.00	0.00	200.00
TOTAL PARK DEPARTMENT	39,200.00	700.00	700.00	1.79	38,500.00
TOTAL REVENUES	3,157,388.00	126,872.84	126,872.84	4.02	3,030,515.16
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100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
ADMINISTRATION					
PERSONNEL					
100-5-10-5000 SALARY	107,936.00	6,302.18	6,302.18	5.84	101,633.82
100-5-10-5002 HOLIDAY COMPENSATION	5,000.00	0.00	0.00	0.00	5,000.00
100-5-10-5009 RETIREMENT PAYOUT RESERVE	15,000.00	0.00	0.00	0.00	15,000.00
100-5-10-5010 TRAINING	10,000.00	0.00	0.00	0.00	10,000.00
100-5-10-5020 HEALTH INSURANCE	11,900.00	488.66	488.66	4.11	11,411.34
100-5-10-5030 WORKERS COMP INSURANCE	3,000.00	2,936.82	2,936.82	97.89	63.18
100-5-10-5035 SOCIAL SECURITY/MEDICARE	8,257.00	482.11	482.11	5.84	7,774.89
100-5-10-5040 UNEMPLOYMENT COMP INSUR	100.00	4.62	4.62	4.62	95.38
100-5-10-5050 TX MUNICIPAL RETIREMENT SYS	12,952.00	753.65	753.65	5.82	12,198.35
100-5-10-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	174,145.00	10,968.04	10,968.04	6.30	163,176.96
SUPPLIES & OPERATION EXP					
100-5-10-5101 FAX / COPIER	2,500.00	148.50	148.50	5.94	2,351.50
100-5-10-5103 PRINTING & REPRODUCTION	3,000.00	0.00	0.00	0.00	3,000.00
100-5-10-5110 POSTAGE	2,000.00	0.00	0.00	0.00	2,000.00
100-5-10-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
100-5-10-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-10-5120 SUBSCRIPTIONS & MEMBERSHIPS	5,000.00	0.00	0.00	0.00	5,000.00
100-5-10-5125 TRAVEL	3,000.00	0.00	0.00	0.00	3,000.00
100-5-10-5140 TELEPHONE	3,500.00	81.99	81.99	2.34	3,418.01
100-5-10-5157 RECORDS MANAGEMENT	3,000.00	174.31	174.31	5.81	2,825.69
100-5-10-5158 OFFICE SUPPLIES	6,000.00	385.27	385.27	6.42	5,614.73
100-5-10-5198 Maint & Supplies - Janitorial	6,000.00	380.00	380.00	6.33	5,620.00
TOTAL SUPPLIES & OPERATION EXP	34,000.00	1,170.07	1,170.07	3.44	32,829.93
CONTRACTUAL SERVICES					
100-5-10-5201 COLLECTION AGENCY FEES	0.00	0.00	0.00	0.00	0.00
100-5-10-5204 LEGAL SERVICES - MOPAC	90,000.00	0.00	0.00	0.00	90,000.00
100-5-10-5207 LEGAL SERVICES - CODE REVIEW	0.00	0.00	0.00	0.00	0.00
100-5-10-5210 LEGAL SERVICES	0.00	0.00	0.00	0.00	0.00
100-5-10-5211 LEGAL SERVICES - PPIA	7,500.00	0.00	0.00	0.00	7,500.00
100-5-10-5214 EMERGENCY NOTIFICATION SYS	2,400.00	0.00	0.00	0.00	2,400.00
100-5-10-5217 PAYROLL SERVICES	5,000.00	0.00	0.00	0.00	5,000.00
100-5-10-5226 DRUG TESTING	100.00	0.00	0.00	0.00	100.00
100-5-10-5230 AUDIT	20,000.00	0.00	0.00	0.00	20,000.00
100-5-10-5231 HEALTH FEE / TRAVIS COUNTY	1,500.00	0.00	0.00	0.00	1,500.00
100-5-10-5236 COMMUNICATIONS & OUTREACH	15,000.00	6,000.00	6,000.00	40.00	9,000.00
100-5-10-5237 TAX ASSESSMENT / COLLECTION	2,500.00	0.00	0.00	0.00	2,500.00
100-5-10-5240 INSURANCE - PROP & GEN LIAB	10,650.00	10,489.70	10,489.70	98.49	160.30
100-5-10-5250 INSURANCE - OFFICIAL LIABILITY	4,000.00	3,772.02	3,772.02	94.30	227.98
100-5-10-5258 ACL Event	10,500.00	1,375.00	1,375.00	13.10	9,125.00
100-5-10-5260 APPRAISAL DISTRICT - T/C	10,000.00	0.00	0.00	0.00	10,000.00
100-5-10-5270 ENGINEERING SERVICES	20,000.00	0.00	0.00	0.00	20,000.00
TOTAL CONTRACTUAL SERVICES	199,150.00	21,636.72	21,636.72	10.86	177,513.28

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
MISCELLANEOUS OTHER EXP					
100-5-10-5300 COMPUTER SOFTWARE & SUPP	50,000.00	4,170.35	4,170.35	8.34	45,829.65
100-5-10-5301 PUBLIC MEETINGS TECHNOLOGY	14,000.00	0.00	0.00	0.00	14,000.00
100-5-10-5302 WEBSITE SUPPORT	5,500.00	950.00	950.00	17.27	4,550.00
100-5-10-5309 INCODE SOFTWARE	5,000.00	0.00	0.00	0.00	5,000.00
100-5-10-5311 IT SERVICES TPIA	2,000.00	0.00	0.00	0.00	2,000.00
100-5-10-5325 ELECTION SERVICES	2,000.00	548.88	548.88	27.44	1,451.12
100-5-10-5330 ELECTION PUBLIC NOTICES	1,000.00	0.00	0.00	0.00	1,000.00
100-5-10-5331 ADVERTISING	2,000.00	0.00	0.00	0.00	2,000.00
100-5-10-5332 COMPREHENSIVE LR PLAN	0.00	0.00	0.00	0.00	0.00
100-5-10-5340 MISCELLANEOUS	0.00	0.00	0.00	0.00	0.00
100-5-10-5341 ZILKER CLUBHOUSE	1,350.00	0.00	0.00	0.00	1,350.00
100-5-10-5342 OAK WILT TREATMENT & PREVENTIO	30,000.00	0.00	0.00	0.00	30,000.00
TOTAL MISCELLANEOUS OTHER EXP	112,850.00	5,669.23	5,669.23	5.02	107,180.77
CAPITAL OUTLAY					
100-5-10-5400 TRANSFER TO DRAINAGE FUND	0.00	0.00	0.00	0.00	0.00
100-5-10-5413 FURNITURE	1,000.00	0.00	0.00	0.00	1,000.00
100-5-10-5414 COMPUTERS	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL CAPITAL OUTLAY	2,000.00	0.00	0.00	0.00	2,000.00
OTHER NON-DEPARTMENTAL					
100-5-10-5525 4B SALES TAX ALLOCATION	200,000.00	0.00	0.00	0.00	200,000.00
TOTAL OTHER NON-DEPARTMENTAL	200,000.00	0.00	0.00	0.00	200,000.00
TOTAL ADMINISTRATION	722,145.00	39,444.06	39,444.06	5.46	682,700.94
DEVELOPMENT SERVICES					
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PERSONNEL					
100-5-15-5000 SALARY	91,915.00	5,431.42	5,431.42	5.91	86,483.58
100-5-15-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
100-5-15-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
100-5-15-5010 TRAINING	2,000.00	0.00	0.00	0.00	2,000.00
100-5-15-5020 HEALTH INSURANCE	9,300.00	751.59	751.59	8.08	8,548.41
100-5-15-5030 WORKERS COMP INSURANCE	950.00	929.99	929.99	97.89	20.01
100-5-15-5035 SOCIAL SECURITY/MEDICARE	7,031.00	415.50	415.50	5.91	6,615.50
100-5-15-5040 UNEMPLOYMENT COMP INSUR	113.00	0.00	0.00	0.00	113.00
100-5-15-5050 TX MUNICIPAL RETIREMENT SYS	11,030.00	649.61	649.61	5.89	10,380.39
100-5-15-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	122,339.00	8,178.11	8,178.11	6.68	114,160.89
SUPPLIES & OPERATION EXP					
100-5-15-5101 FAX / COPIER	100.00	0.00	0.00	0.00	100.00
100-5-15-5103 PRINTING & REPRODUCTION	350.00	0.00	0.00	0.00	350.00
100-5-15-5110 POSTAGE	700.00	0.00	0.00	0.00	700.00
100-5-15-5114 COVID-19	0.00	0.00	0.00	0.00	0.00

100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
100-5-15-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-15-5120 SUBSCRIPTIONS & MEMBERSHIPS	500.00	0.00	0.00	0.00	500.00
100-5-15-5125 TRAVEL	1,000.00	0.00	0.00	0.00	1,000.00
100-5-15-5140 TELEPHONE	1,000.00	27.33	27.33	2.73	972.67
100-5-15-5157 RECORDS MANAGEMENT	0.00	0.00	0.00	0.00	0.00
100-5-15-5158 OFFICE SUPPLIES	200.00	4.56	4.56	2.28	195.44
100-5-15-5161 Tree Services	0.00	0.00	0.00	0.00	0.00
100-5-15-5180 Signs and Barricades	800.00	0.00	0.00	0.00	800.00
100-5-15-5198 Office Supplies	0.00	0.00	0.00	0.00	0.00
TOTAL SUPPLIES & OPERATION EXP	4,650.00	31.89	31.89	0.69	4,618.11
CONTRACTUAL SERVICES					
100-5-15-5200 BUILDING INSPECTION SERVICE	40,000.00	0.00	0.00	0.00	40,000.00
100-5-15-5210 LEGAL SERVICES	6,500.00	0.00	0.00	0.00	6,500.00
100-5-15-5251 BUILDING PLAN REVIEWS	10,000.00	0.00	0.00	0.00	10,000.00
100-5-15-5252 ZONING REVIEWS	20,000.00	0.00	0.00	0.00	20,000.00
100-5-15-5253 ARBORIST REVIEWS	2,500.00	0.00	0.00	0.00	2,500.00
100-5-15-5257 MY PERMIT NOW	6,000.00	0.00	0.00	0.00	6,000.00
100-5-15-5270 ENGINEERING SERVICES	7,000.00	0.00	0.00	0.00	7,000.00
100-5-15-5271 INTERIM DEVELOPMENT SERVICES	0.00	0.00	0.00	0.00	0.00
TOTAL CONTRACTUAL SERVICES	92,000.00	0.00	0.00	0.00	92,000.00
MISCELLANEOUS OTHER EXP					
100-5-15-5300 COMPUTER SOFTWARE & SUPPORT	4,000.00	3.83	3.83	0.10	3,996.17
100-5-15-5331 ADVERTISING	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL MISCELLANEOUS OTHER EXP	5,000.00	3.83	3.83	0.08	4,996.17
TOTAL DEVELOPMENT SERVICES	223,989.00	8,213.83	8,213.83	3.67	215,775.17
SANITATION ==========					
CONTRACTUAL SERVICES					
100-5-20-5270 ENGINEERING SERVICES	0.00	0.00	0.00	0.00	0.00
100-5-20-5286 SPRING CLEAN-UP	1,000.00	0.00	0.00	0.00	1,000.00
100-5-20-5287 STORM DEBRIS AND CLEAN-UP	3,000.00	0.00	0.00	0.00	3,000.00
TOTAL CONTRACTUAL SERVICES	4,000.00	0.00	0.00	0.00	4,000.00
MISCELLANEOUS OTHER EXP					
100-5-20-5370 WASTE & DISPOSAL SERVICE	144,000.00	0.00	0.00	0.00	144,000.00
TOTAL MISCELLANEOUS OTHER EXP	144,000.00	0.00	0.00	0.00	144,000.00
TOTAL SANITATION	148,000.00	0.00	0.00	0.00	148,000.00

UTILITY BILLING
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100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
PERSONNEL					
100-5-25-5000 SALARY	79,040.00	2,307.69	2,307.69	2.92	76,732.31
100-5-25-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
100-5-25-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
100-5-25-5010 TRAINING	1,000.00	0.00	0.00	0.00	1,000.00
100-5-25-5020 HEALTH INSURANCE	9,422.00	407.89	407.89	4.33	9,014.11
100-5-25-5030 WORKERS COMP INSURANCE	950.00	929.99	929.99	97.89	20.01
100-5-25-5035 SOCIAL SECURITY/MEDICARE	6,047.00	176.54	176.54	2.92	5,870.46
100-5-25-5040 UNEMPLOYMENT COMP INSUR	113.00	0.00	0.00	0.00	113.00
100-5-25-5050 TX MUNICIPAL RETIREMENT SYS	9,485.00	276.00	276.00	2.91	9,209.00
100-5-25-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	106,057.00	4,098.11	4,098.11	3.86	101,958.89
SUPPLIES & OPERATION EXP					
100-5-25-5101 FAX / COPIER	100.00	0.00	0.00	0.00	100.00
100-5-25-5103 PRINTING & REPRODUCTION	4,000.00	0.00	0.00	0.00	4,000.00
100-5-25-5110 POSTAGE	2,500.00	0.00	0.00	0.00	2,500.00
100-5-25-5120 SUBSCRIPTIONS & MEMBERSHIPS	500.00	0.00	0.00	0.00	500.00
100-5-25-5125 TRAVEL	500.00	0.00	0.00	0.00	500.00
100-5-25-5140 TELEPHONE	750.00	20.50	20.50	2.73	729.50
100-5-25-5158 OFFICE SUPPLIES	600.00	0.00	0.00	0.00	600.00
TOTAL SUPPLIES & OPERATION EXP	8,950.00	20.50	20.50	0.23	8,929.50
CONTRACTUAL SERVICES					
100-5-25-5202 T TECH FEES	200.00	0.00	0.00	0.00	200.00
100-5-25-5210 LEGAL SERVICES	500.00	0.00	0.00	0.00	500.00
TOTAL CONTRACTUAL SERVICES	700.00	0.00	0.00	0.00	700.00
MISCELLANEOUS OTHER EXP					
100-5-25-5300 COMPUTER SOFTWARE/SUPPORT	15,000.00	28.69	28.69	0.19	14,971.31
100-5-25-5331 ADVERTISING	500.00	0.00	0.00	0.00	500.00
TOTAL MISCELLANEOUS OTHER EXP	15,500.00	28.69	28.69	0.19	15,471.31
TOTAL UTILITY BILLING	131,207.00	4,147.30	4,147.30	3.16	127,059.70
STREETS					
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PERSONNEL					
100-5-30-5000 SALARY	56,819.00	2,911.09	2,911.09	5.12	53,907.91
100-5-30-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
100-5-30-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
100-5-30-5010 TRAINING	1,000.00	0.00	0.00	0.00	1,000.00
100-5-30-5020 HEALTH INSURANCE	7,765.00	215.12	215.12	2.77	7,549.88
100-5-30-5030 WORKERS COMP INSURANCE	1,400.00	1,370.52	1,370.52	97.89	29.48
100-5-30-5035 SOCIAL SECURITY/MEDICARE	4,347.00	222.70	222.70	5.12	4,124.30
100-5-30-5040 UNEMPLOYMENT COMP INSUR	81.00	0.00	0.00	0.00	81.00
100-5-30-5050 TX MUNICIPAL RETIREMENT SYS	6,818.00	411.24	411.24	6.03	6,406.76

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
100-5-30-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	78,230.00	5,130.67	5,130.67	6.56	73,099.33
SUPPLIES & OPERATION EXP					
100-5-30-5101 FAX / COPIER	0.00	0.00	0.00	0.00	0.00
100-5-30-5103 PRINTING & REPRODUCTION	0.00	0.00	0.00	0.00	0.00
100-5-30-5110 POSTAGE	0.00	0.00	0.00	0.00	0.00
100-5-30-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
100-5-30-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-30-5120 SUBSCRIPTIONS & MEMBERSHIPS	0.00	0.00	0.00	0.00	0.00
100-5-30-5125 TRAVEL	0.00	0.00	0.00	0.00	0.00
100-5-30-5130 UTILITIES	2,200.00	0.00	0.00	0.00	2,200.00
100-5-30-5140 TELEPHONE	1,000.00	13.67	13.67	1.37	986.33
100-5-30-5145 UNIFORMS & ACCESSORIES	1,500.00	0.00	0.00	0.00	1,500.00
100-5-30-5157 RECORDS MANAGEMENT	0.00	0.00	0.00	0.00	0.00
100-5-30-5158 OFFICE SUPPLIES	0.00	0.00	0.00	0.00	0.00
100-5-30-5161 TREE TRIMMING SERVICE	21,500.00	0.00	0.00	0.00	21,500.00
100-5-30-5162 STREET SWEEPING	0.00	0.00	0.00	0.00	0.00
100-5-30-5171 EQUIPMENT	15,000.00	0.00	0.00	0.00	15,000.00
100-5-30-5180 SIGNS & BARRICADES	2,500.00	0.00	0.00	0.00	2,500.00
100-5-30-5181 EQUIPMENT RENTAL	5,000.00	0.00	0.00	0.00	5,000.00
100-5-30-5190 MATERIALS	2,500.00	0.00	0.00	0.00	2,500.00
100-5-30-5195 VEHICLE OPERATIONS	4,000.00	0.00	0.00	0.00	4,000.00
100-5-30-5196 VEHICLE MAINT & REPAIRS	750.00	0.00	0.00	0.00	750.00
TOTAL SUPPLIES & OPERATION EXP	55,950.00	13.67	13.67	0.02	55,936.33
CONTRACTUAL SERVICES					
100-5-30-5255 VEHICLE INSURANCE	250.00	250.52	250.52	100.21	(0.52)
100-5-30-5270 ENGINEERING	23,000.00	0.00	0.00	0.00	23,000.00
100-5-30-5276 PAYING AGENT FEES	200.00	0.00	0.00	0.00	200.00
TOTAL CONTRACTUAL SERVICES	23,450.00	250.52	250.52	1.07	23,199.48
MISCELLANEOUS OTHER EXP					
100-5-30-5350 TOOLS/EQUIPMENT & REPAIR	5,000.00	0.00	0.00	0.00	5,000.00
100-5-30-5355 STREET MAINT & REPAIRS	90,000.00	0.00	0.00	0.00	90,000.00
TOTAL MISCELLANEOUS OTHER EXP	95,000.00	0.00	0.00	0.00	95,000.00
CAPITAL OUTLAY					
100-5-30-5494 Veh Fin Note - Debt Service	785.00	0.00	0.00	0.00	785.00
100-5-30-5495 NEW VEHICLE & OUTFITTING	2,700.00	0.00	0.00	0.00	2,700.00
TOTAL CAPITAL OUTLAY	3,485.00	0.00	0.00	0.00	3,485.00
TOTAL STREETS	256,115.00	5,394.86	5,394.86	2.11	250,720.14

POLICE
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CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
PERSONNEL					
100-5-40-5000 SALARY	804,351.00	65,356.44	65,356.44	8.13	738,994.56
100-5-40-5002 HOLIDAY COMPENSATION	27,000.00	0.00	0.00	0.00	27,000.00
100-5-40-5006 OVERTIME	13,000.00	368.64	368.64	2.84	12,631.36
100-5-40-5007 STIPEND	15,000.00	400.00	400.00	2.67	14,600.00
100-5-40-5009 RETIREMENT PAYOUT RESERVE	15,000.00	0.00	0.00	0.00	15,000.00
100-5-40-5010 TRAINING	10,000.00	263.01	263.01	2.63	9,736.99
100-5-40-5011 RESERVE OFFICER PAY	15,000.00	0.00	0.00	0.00	15,000.00
100-5-40-5012 LEOSE Training	897.00	0.00	0.00	0.00	897.00
100-5-40-5020 HEALTH INSURANCE	91,000.00	8,737.72	8,737.72	9.60	82,262.28
100-5-40-5030 WORKERS COMP INSURANCE	23,600.00	21,634.59	21,634.59	91.67	1,965.41
100-5-40-5035 SOCIAL SECURITY/MEDICARE	65,740.35	4,892.80	4,892.80	7.44	60,847.55
100-5-40-5040 UNEMPLOYMENT COMP INSUR	1,000.00	1.96	1.96	0.20	998.04
100-5-40-5050 TX MUNICIPAL RETIREMENT SYS	103,122.12	7,845.56	7,845.56	7.61	95,276.56
100-5-40-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
100-5-40-5070 POLICE PROFESSIONAL LIABILITY	8,500.00	7,829.22	7,829.22	92.11	670.78
TOTAL PERSONNEL	1,193,210.47	117,329.94	117,329.94	9.83	1,075,880.53
SUPPLIES & OPERATION EXP					
100-5-40-5101 FAX / COPIER	0.00	0.00	0.00	0.00	0.00
100-5-40-5103 PRINTING & REPRODUCTION	1,600.00	0.00	0.00	0.00	1,600.00
100-5-40-5105 TICKET WRITERS	0.00	0.00	0.00	0.00	0.00
100-5-40-5106 TICKET WRITER FEES	2,500.00	0.00	0.00	0.00	2,500.00
100-5-40-5107 POLICE QUALIFICATIONS	3,000.00	0.00	0.00	0.00	3,000.00
100-5-40-5108 PROPERTY & EVIDENCE	1,000.00	0.00	0.00	0.00	1,000.00
100-5-40-5109 BICYCLE MAINTENANCE	250.00	0.00	0.00	0.00	250.00
100-5-40-5110 POSTAGE	250.00	0.00	0.00	0.00	250.00
100-5-40-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
100-5-40-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-40-5120 SUBSCRIPTIONS & MEMBERSHIPS	0.00	0.00	0.00	0.00	0.00
100-5-40-5125 TRAVEL	0.00	0.00	0.00	0.00	0.00
100-5-40-5130 LEOSE FUNDS	0.00	0.00	0.00	0.00	0.00
100-5-40-5140 TELEPHONE	9,000.00	218.65	218.65	2.43	8,781.35
100-5-40-5143 POLICE CAR & ACCESSORIES	4,000.00	0.00	0.00	0.00	4,000.00
100-5-40-5144 POLICE SUPPLIES	3,000.00	0.00	0.00	0.00	3,000.00
100-5-40-5145 UNIFORMS & ACCESSORIES	7,500.00	0.00	0.00	0.00	7,500.00
100-5-40-5157 RECORDS MANAGEMENT	5,800.00	0.00	0.00	0.00	5,800.00
100-5-40-5158 OFFICE SUPPLIES	1,000.00	45.58	45.58	4.56	954.42
100-5-40-5159 NATIONAL NIGHT OUT SUPPLIES	2,500.00	0.00	0.00	0.00	2,500.00
100-5-40-5185 COMMUNICATION EQUIP MAINT	1,000.00	0.00	0.00	0.00	1,000.00
100-5-40-5186 RADAR CERTIFICATION	250.00	0.00	0.00	0.00	250.00
100-5-40-5195 VEHICLE OPERATION	28,000.00	0.00	0.00	0.00	28,000.00
100-5-40-5196 VEHICLE MAINT & REPAIRS	5,000.00	0.00	0.00	0.00	5,000.00
TOTAL SUPPLIES & OPERATION EXP	75,650.00	264.23	264.23	0.35	75,385.77
CONTRACTUAL SERVICES					
100-5-40-5211 RADIO SERVICES	5,600.00	0.00	0.00	0.00	5,600.00
100-5-40-5216 DISPATCH SERVICES	29,979.00	0.00	0.00	0.00	29,979.00
100-5-40-5226 DRUG TESTING	200.00	0.00	0.00	0.00	200.00

100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
100-5-40-5238 APPLICANT TESTING	1,000.00	0.00	0.00	0.00	1,000.00
100-5-40-5239 LABORATORY SERVICES	1,000.00	0.00	0.00	0.00	1,000.00
100-5-40-5255 VEHICLE INSURANCE	5,250.00	5,209.40	5,209.40	99.23	40.60
100-5-40-5258 ACL EVENT	34,000.00	39,089.61	39,089.61	114.97	(5,089.61)
TOTAL CONTRACTUAL SERVICES	77,029.00	44,299.01	44,299.01	57.51	32,729.99
MISCELLANEOUS OTHER EXP					
100-5-40-5300 COMPUTER SOFTWARE & SUPPORT	46,865.00	82.25	82.25	0.18	46,782.75
TOTAL MISCELLANEOUS OTHER EXP	46,865.00	82.25	82.25	0.18	46,782.75
CAPITAL OUTLAY					
100-5-40-5404 PD RADIOS	0.00	0.00	0.00	0.00	0.00
100-5-40-5411 VIDEO CAMERS & MICROPHONES	1,000.00	0.00	0.00	0.00	1,000.00
100-5-40-5414 COMPUTERS	3,000.00	0.00	0.00	0.00	3,000.00
100-5-40-5494 Vehicle Financing Note Debt Sv	34,002.00	0.00	0.00	0.00	34,002.00
100-5-40-5495 NEW VEHICLE & OUTFITTING	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	38,002.00	0.00	0.00	0.00	38,002.00
TOTAL POLICE	1,430,756.47	161,975.43	161,975.43	11.32	1,268,781.04
COURT					
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PERSONNEL					
100-5-50-5000 SALARY	45,228.00	2,809.80	2,809.80	6.21	42,418.20
100-5-50-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
100-5-50-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
100-5-50-5010 TRAINING	1,000.00	0.00	0.00	0.00	1,000.00
100-5-50-5020 HEALTH INSURANCE	900.00	79.12	79.12	8.79	820.88
100-5-50-5030 WORKERS COMP INSURANCE	500.00	1,957.88	1,957.88	391.58	(1,457.88)
100-5-50-5035 SOCIAL SECURITY/MEDICARE	3,460.00	329.70	329.70	9.53	3,130.30
100-5-50-5040 UNEMPLOYMENT COMP INSUR	200.00	0.00	0.00	0.00	200.00
100-5-50-5050 TX MUNICIPAL RETIREMENT SYS	5,427.00	336.05	336.05	6.19	5,090.95
100-5-50-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	56,715.00	5,512.55	5,512.55	9.72	51,202.45
SUPPLIES & OPERATION EXP					
100-5-50-5101 FAX / COPIER	0.00	0.00	0.00	0.00	0.00
100-5-50-5103 PRINTING & REPRODUCTION	1,100.00	0.00	0.00	0.00	1,100.00
100-5-50-5110 POSTAGE	250.00	34.76	34.76	13.90	215.24
100-5-50-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
100-5-50-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-50-5120 SUBSCRIPTIONS & MEMBERSHIPS	100.00	0.00	0.00	0.00	100.00
100-5-50-5125 TRAVEL	100.00	0.00	0.00	0.00	100.00
100-5-50-5140 TELEPHONE	1,500.00	41.00	41.00	2.73	1,459.00
100-5-50-5157 RECORDS MANAGEMENT	0.00	0.00	0.00	0.00	0.00
100-5-50-5158 OFFICE SUPPLIES	250.00	9.12	9.12	3.65	240.88
TOTAL SUPPLIES & OPERATION EXP	3,300.00	84.88	84.88	2.57	3,215.12

100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
CONTRACTUAL SERVICES					
100-5-50-5201 COLLECTION AGENCY FEES	1,000.00	0.00	0.00	0.00	1,000.00
100-5-50-5206 INCODE ONLINE PMT PROCESSING	5,000.00	424.79	424.79	8.50	4,575.21
100-5-50-5210 LEGAL SERVICES	10,000.00	0.00	0.00	0.00	10,000.00
100-5-50-5212 PRESIDING JUDGE EXPENSE	18,000.00	1,500.00	1,500.00	8.33	16,500.00
100-5-50-5213 INTERPRETER FEES	1,100.00	0.00	0.00	0.00	1,100.00
TOTAL CONTRACTUAL SERVICES	35,100.00	1,924.79	1,924.79	5.48	33,175.21
MISCELLANEOUS OTHER EXP					
100-5-50-5300 COMPUTER SOFTWARE & SUPPORT	1,600.00	126.53	126.53	7.91	1,473.47
TOTAL MISCELLANEOUS OTHER EXP	1,600.00	126.53	126.53	7.91	1,473.47
TOTAL COURT	96,715.00	7,648.75	7,648.75	7.91	89,066.25
PARK DEPARTMENT					
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PERSONNEL					
100-5-55-5000 SALARY	36,930.00	1,676.15	1,676.15	4.54	35,253.85
100-5-55-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
100-5-55-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
100-5-55-5010 TRAINING	3,000.00	0.00	0.00	0.00	3,000.00
100-5-55-5020 HEALTH INSURANCE	4,853.00	123.33	123.33	2.54	4,729.67
100-5-55-5030 WORKERS COMP INSURANCE	1,020.00	978.94	978.94	95.97	41.06
100-5-55-5035 SOCIAL SECURITY/MEDICARE	2,825.00	128.23	128.23	4.54	2,696.77
100-5-55-5040 UNEMPLOYMENT COMP INSUR	45.00	0.00	0.00	0.00	45.00
100-5-55-5050 TX MUNICIPAL RETIREMENT SYS	4,432.00	200.46	200.46	4.52	4,231.54
100-5-55-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	53,105.00	3,107.11	3,107.11	5.85	49,997.89
SUPPLIES & OPERATION EXP					
100-5-55-5101 FAX / COPIER	0.00	0.00	0.00	0.00	0.00
100-5-55-5103 PRINTING & REPRODUCTION	500.00	0.00	0.00	0.00	500.00
100-5-55-5110 POSTAGE	0.00	0.00	0.00	0.00	0.00
100-5-55-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
100-5-55-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-55-5120 SUBSCRIPTIONS & MEMBERSHIPS	0.00	0.00	0.00	0.00	0.00
100-5-55-5125 TRAVEL	0.00	0.00	0.00	0.00	0.00
100-5-55-5130 UTILITIES	2,500.00	0.00	0.00	0.00	2,500.00
100-5-55-5140 TELEPHONE	0.00	0.00	0.00	0.00	0.00
100-5-55-5157 RECORDS MANAGEMENT	0.00	0.00	0.00	0.00	0.00
100-5-55-5158 OFFICE SUPPLIES	250.00	4.56	4.56	1.82	245.44
100-5-55-5164 EQUIPMENT MAINT & REPAIRS	3,000.00	0.00	0.00	0.00	3,000.00
100-5-55-5171 EQUIPMENT	8,000.00	0.00	0.00	0.00	8,000.00
100-5-55-5190 MATERIALS	6,500.00	0.00	0.00	0.00	6,500.00
100-5-55-5191 MAINTENANCE	8,000.00	0.00	0.00	0.00	8,000.00
100-5-55-5195 VEHICLE OPERATIONS	2,000.00	0.00	0.00	0.00	2,000.00
100-5-55-5196 VEHICLE MAINT & REPAIRS	1,000.00	0.00	0.00	0.00	1,000.00

100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
100-5-55-5198 FIELDHOUSE SUP & MAINT-JANITOR	9,000.00	380.00	380.00	4.22	8,620.00
TOTAL SUPPLIES & OPERATION EXP	40,750.00	384.56	384.56	0.94	40,365.44
CONTRACTUAL SERVICES					
100-5-55-5255 VEHICLE INSURANCE	600.00	0.00	0.00	0.00	600.00
TOTAL CONTRACTUAL SERVICES	600.00	0.00	0.00	0.00	600.00
MISCELLANEOUS OTHER EXP					
100-5-55-5300 COMPUTER SOFTWARE & SUPPORT	500.00	0.96	0.96	0.19	499.04
100-5-55-5350 TOOLS/EQUIPMENT & REPAIR	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL MISCELLANEOUS OTHER EXP	1,500.00	0.96	0.96	0.06	1,499.04
CAPITAL OUTLAY					
100-5-55-5455 IMPROV TO EXISTING PARK ASSETS	5,000.00	1,850.00	1,850.00	37.00	3,150.00
100-5-55-5456 PLANTS FOR WALKING TRAIL	0.00	0.00	0.00	0.00	0.00
100-5-55-5494 Veh Fin Note - Debt Service	785.00	0.00	0.00	0.00	785.00
100-5-55-5495 NEW VEHICLE & OUTFITTING	2,700.00	0.00	0.00	0.00	2,700.00
TOTAL CAPITAL OUTLAY	8,485.00	1,850.00	1,850.00	21.80	6,635.00
OTHER NON-DEPARTMENTAL					
100-5-55-5512 PLAYGROUND MULCH & MAINT	8,000.00	0.00	0.00	0.00	8,000.00
100-5-55-5515 MAINTENANCE BUILDING	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER NON-DEPARTMENTAL	8,000.00	0.00	0.00	0.00	8,000.00
TOTAL PARK DEPARTMENT	112,440.00	5,342.63	5,342.63	4.75	107,097.37
PUBLIC WORKS					
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SUPPLIES & OPERATION EXP					
100-5-65-5101 FAX / COPIER	0.00	0.00	0.00	0.00	0.00
100-5-65-5103 PRINTING & REPRODUCTION	0.00	0.00	0.00	0.00	0.00
100-5-65-5110 POSTAGE	0.00	0.00	0.00	0.00	0.00
100-5-65-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
100-5-65-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
100-5-65-5120 SUBSCRIPTIONS & MEMBERSHIPS	0.00	0.00	0.00	0.00	0.00
100-5-65-5125 TRAVEL	0.00	0.00	0.00	0.00	0.00
100-5-65-5130 UTILITIES	6,000.00	0.00	0.00	0.00	6,000.00
100-5-65-5140 TELEPHONE	300.00	8.50	8.50	2.83	291.50
100-5-65-5157 RECORDS MANAGEMENT	0.00	0.00	0.00	0.00	0.00
100-5-65-5158 OFFICE SUPPLIES	1,000.00	95.60	95.60	9.56	904.40
100-5-65-5191 MAINTENANCE	0.00	0.00	0.00	0.00	0.00
TOTAL SUPPLIES & OPERATION EXP	7,300.00	104.10	104.10	1.43	7,195.90
CONTRACTUAL SERVICES					
100-5-65-5258 ACL EVENT	10,500.00	0.00	0.00	0.00	10,500.00
TOTAL CONTRACTUAL SERVICES	10,500.00	0.00	0.00	0.00	10,500.00

100-GENERAL FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
MISCELLANEOUS OTHER EXP					
100-5-65-5381 ANIMAL CONTROL/DISPOSAL	250.00	0.00	0.00	0.00	250.00
TOTAL MISCELLANEOUS OTHER EXP	250.00	0.00	0.00	0.00	250.00
CAPITAL OUTLAY					
100-5-65-5495 NEW VEHICLE & OUTFITTING	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
OTHER NON-DEPARTMENTAL					
100-5-65-5515 MAINTENANCE BUILDING	9,000.00	0.00	0.00	0.00	9,000.00
TOTAL OTHER NON-DEPARTMENTAL	9,000.00	0.00	0.00	0.00	9,000.00
TOTAL PUBLIC WORKS	27,050.00	104.10	104.10	0.38	26,945.90
TOTAL EXPENDITURES	3,148,417.47	232,270.96	232,270.96	7.38	2,916,146.51
REVENUES OVER/(UNDER) EXPENDITURES	8,970.53	(105,398.12)	(105,398.12)		114,368.65

200-WATER FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	1,354,350.00	184,348.38	184,348.38	13.61	1,170,001.62
TOTAL REVENUES	1,354,350.00	184,348.38	184,348.38	13.61	1,170,001.62
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	1,271,047.00	19,241.85	19,241.85	1.51	1,251,805.15
TOTAL EXPENDITURES	1,271,047.00	19,241.85	19,241.85	1.51	1,251,805.15
REVENUES OVER/(UNDER) EXPENDITURES	83,303.00	165,106.53	165,106.53		(81,803.53)

200-WATER FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
INVESTMENT INCOME					
200-4-60-4400 INTEREST INCOME	150.00	151.13	151.13	100.75	(1.13)
200-4-60-4401 INTEREST INCOME-CHECKING	200.00	34.89	34.89	17.45	165.11
TOTAL INVESTMENT INCOME	350.00	186.02	186.02	53.15	163.98
MISCELLANEOUS REVENUE					
200-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	0.00	0.00	0.00	0.00	0.00
UTILITY REVENUE					
200-4-60-4600 WATER SALES	1,350,000.00	184,162.36	184,162.36	13.64	1,165,837.64
200-4-60-4610 LATE CHARGES	3,000.00	0.00	0.00	0.00	3,000.00
200-4-60-4628 CONNECT FEE	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL UTILITY REVENUE	1,354,000.00	184,162.36	184,162.36	13.60	1,169,837.64
OTHER REVENUE					
200-4-60-4700 Fund Balance Transfer In	0.00	0.00	0.00	0.00	0.00
200-4-60-4718 TRANSFER FROM SR2014 DEBT SERV	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER REVENUE	0.00	0.00	0.00	0.00	0.00
TOTAL NON-DEPARTMENTAL	1,354,350.00	184,348.38	184,348.38	13.61	1,170,001.62
TOTAL REVENUES	1,354,350.00	184,348.38	184,348.38	13.61	1,170,001.62

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
PERSONNEL					
200-5-60-5000 SALARY	214,195.00	10,402.60	10,402.60	4.86	203,792.40
200-5-60-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
200-5-60-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
200-5-60-5010 TRAINING	3,000.00	0.00	0.00	0.00	3,000.00
200-5-60-5020 HEALTH INSURANCE	29,900.00	749.84	749.84	2.51	29,150.16
200-5-60-5030 WORKERS COMP INSURANCE	4,640.00	4,503.13	4,503.13	97.05	136.87
200-5-60-5035 SOCIAL SECURITY/MEDICARE	16,386.00	795.80	795.80	4.86	15,590.20
200-5-60-5040 UNEMPLOYMENT COMP INSUR	300.00	0.00	0.00	0.00	300.00
200-5-60-5050 TX MUNICIPAL RETIREMENT SYS	25,703.00	1,244.15	1,244.15	4.84	24,458.85
200-5-60-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	294,124.00	17,695.52	17,695.52	6.02	276,428.48
SUPPLIES & OPERATION EXP					
200-5-60-5101 FAX / COPIER	0.00	0.00	0.00	0.00	0.00
200-5-60-5103 PRINTING & REPRODUCTION	250.00	0.00	0.00	0.00	250.00
200-5-60-5105 TOOLS & SUPPLIES	2,500.00	0.00	0.00	0.00	2,500.00
200-5-60-5110 POSTAGE	100.00	0.00	0.00	0.00	100.00
200-5-60-5114 COVID-19	0.00	0.00	0.00	0.00	0.00
200-5-60-5115 STORM RELATED EXPENSES	0.00	0.00	0.00	0.00	0.00
200-5-60-5120 SUBSCRIPTIONS & MEMBERSHIPS	0.00	0.00	0.00	0.00	0.00
200-5-60-5125 TRAVEL	2,000.00	0.00	0.00	0.00	2,000.00
200-5-60-5140 TELEPHONE	700.00	13.37	13.37	1.91	686.63
200-5-60-5145 UNIFORMS & ACCESSORIES	2,000.00	0.00	0.00	0.00	2,000.00
200-5-60-5153 CREDIT CARD SERVICES	0.00	0.00	0.00	0.00	0.00
200-5-60-5157 RECORDS MANAGEMENT	0.00	0.00	0.00	0.00	0.00
200-5-60-5158 OFFICE SUPPLIES	300.00	9.10	9.10	3.03	290.90
200-5-60-5166 MAINTENANCE & REPAIRS	40,000.00	2,333.96	2,333.96	5.83	37,666.04
200-5-60-5167 ADMINISTRATIVE FEES	35,000.00	0.00	0.00	0.00	35,000.00
200-5-60-5168 Transfer to Utility Billing	63,785.00	0.00	0.00	0.00	63,785.00
200-5-60-5171 EQUIPMENT	30,500.00	0.00	0.00	0.00	30,500.00
200-5-60-5181 EQUIPMENT RENTAL	1,500.00	0.00	0.00	0.00	1,500.00
200-5-60-5190 MATERIALS	1,500.00	0.00	0.00	0.00	1,500.00
200-5-60-5193 METER REPLACEMENT	34,500.00	(1,775.00)	(1,775.00)	5.14-	36,275.00
200-5-60-5194 Fire Hydrant Maint and Replace	20,000.00	0.00	0.00	0.00	20,000.00
200-5-60-5195 VEHICLE OPERATIONS	4,000.00	0.00	0.00	0.00	4,000.00
200-5-60-5196 VEHICLE MAINT & REPAIRS	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL SUPPLIES & OPERATION EXP	239,635.00	581.43	581.43	0.24	239,053.57
CONTRACTUAL SERVICES					
200-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
200-5-60-5210 LEGAL SERVICES	2,000.00	0.00	0.00	0.00	2,000.00
200-5-60-5219 UTILITY BILLING/COLLECTION	0.00	0.00	0.00	0.00	0.00
200-5-60-5232 UTILITY BILLING/COLLECT ADDNL	0.00	0.00	0.00	0.00	0.00
200-5-60-5233 Crossroads Contract	81,000.00	0.00	0.00	0.00	81,000.00

200-WATER FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
200-5-60-5234 Crossroads Emerg/M&O Repairs	60,000.00	0.00	0.00	0.00	60,000.00
200-5-60-5241 EASEMENT IDENT & MAPPING	0.00	0.00	0.00	0.00	0.00
200-5-60-5255 VEHICLE INSURANCE	1,000.00	963.47	963.47	96.35	36.53
200-5-60-5270 ENGINEERING SERVICES	25,000.00	0.00	0.00	0.00	25,000.00
200-5-60-5271 RATE CONSULTING SERVICES	4,000.00	0.00	0.00	0.00	4,000.00
200-5-60-5272 Water CIP	0.00	0.00	0.00	0.00	0.00
200-5-60-5276 PAYING AGENT FEES	200.00	0.00	0.00	0.00	200.00
200-5-60-5280 WATER PURCHASED	550,000.00	0.00	0.00	0.00	550,000.00
200-5-60-5296 TCEQ	3,000.00	0.00	0.00	0.00	3,000.00
200-5-60-5299 BOND INTEREST-SERIES 2014	0.00	0.00	0.00	0.00	0.00
TOTAL CONTRACTUAL SERVICES	726,200.00	963.47	963.47	0.13	725,236.53
MISCELLANEOUS OTHER EXP					
200-5-60-5300 COMPUTER SOFTWARE & SUPPORT	750.00	1.43	1.43	0.19	748.57
200-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
200-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
200-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	750.00	1.43	1.43	0.19	748.57
CAPITAL OUTLAY					
200-5-60-5494 Veh Fin Note - Debt Service	3,138.00	0.00	0.00	0.00	3,138.00
200-5-60-5495 NEW VEHICLE & OUTFITTING	7,200.00	0.00	0.00	0.00	7,200.00
TOTAL CAPITAL OUTLAY	10,338.00	0.00	0.00	0.00	10,338.00
TOTAL NON-DEPARTMENTAL	1,271,047.00	19,241.85	19,241.85	1.51	1,251,805.15
TOTAL EXPENDITURES	1,271,047.00	19,241.85	19,241.85	1.51	1,251,805.15
REVENUES OVER/(UNDER) EXPENDITURES	83,303.00	165,106.53	165,106.53		(81,803.53)

301-STREET MAINTENANCE
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	256,115.00	15,662.83	15,662.83	6.12	240,452.17
TOTAL REVENUES	256,115.00	15,662.83	15,662.83	6.12	240,452.17
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	256,115.00	0.00	0.00	0.00	256,115.00
TOTAL EXPENDITURES	256,115.00	0.00	0.00	0.00	256,115.00
REVENUES OVER/(UNDER) EXPENDITURES	0.00	15,662.83	15,662.83		(15,662.83)

301-STREET MAINTENANCE

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
TAXES					
301-4-60-4039 STREET SALES TAX	200,000.00	15,632.88	15,632.88	7.82	184,367.12
TOTAL TAXES	200,000.00	15,632.88	15,632.88	7.82	184,367.12
INVESTMENT INCOME					
301-4-60-4400 INTEREST INCOME	100.00	29.95	29.95	29.95	70.05
TOTAL INVESTMENT INCOME	100.00	29.95	29.95	29.95	70.05
MISCELLANEOUS REVENUE					
301-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	0.00	0.00	0.00	0.00	0.00
OTHER REVENUE					
301-4-60-4700 UNEXPENDED BALANCE TRANSFER	56,015.00	0.00	0.00	0.00	56,015.00
TOTAL OTHER REVENUE	56,015.00	0.00	0.00	0.00	56,015.00
TOTAL NON-DEPARTMENTAL	256,115.00	15,662.83	15,662.83	6.12	240,452.17
TOTAL REVENUES	256,115.00	15,662.83	15,662.83	6.12	240,452.17

301-STREET MAINTENANCE

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
CONTRACTUAL SERVICES					
301-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
TOTAL CONTRACTUAL SERVICES	0.00	0.00	0.00	0.00	0.00
MISCELLANEOUS OTHER EXP					
301-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
301-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
301-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	0.00	0.00	0.00	0.00	0.00
CAPITAL OUTLAY					
301-5-60-5469 TRANSFER TO STREET DEPARTMENT	256,115.00	0.00	0.00	0.00	256,115.00
TOTAL CAPITAL OUTLAY	256,115.00	0.00	0.00	0.00	256,115.00
TOTAL NON-DEPARTMENTAL	256,115.00	0.00	0.00	0.00	256,115.00
TOTAL EXPENDITURES	256,115.00	0.00	0.00	0.00	256,115.00
REVENUES OVER/(UNDER) EXPENDITURES	0.00	15,662.83	15,662.83		(15,662.83)

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

310-COURT SECURITY FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
COURT	1,600.00	362.33	362.33	22.65	1,237.67
TOTAL REVENUES	1,600.00	362.33	362.33	22.65	1,237.67
EXPENDITURE SUMMARY					
COURT	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL EXPENDITURES	1,000.00	0.00	0.00	0.00	1,000.00
REVENUES OVER/(UNDER) EXPENDITURES	600.00	362.33	362.33		237.67

REVENUE & EXPENSE REPORT (UNAUDITED)

AS OF: OCTOBER 31ST, 2022

310-COURT SECURITY FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT					
=====					
COURT REVENUE					
310-4-50-4104 COURT SECURITY FEE	1,500.00	362.33	362.33	24.16	1,137.67
310-4-50-4105 MUNI COURT BLDG SECURITY	100.00	0.00	0.00	0.00	100.00
TOTAL COURT REVENUE	1,600.00	362.33	362.33	22.65	1,237.67
INVESTMENT INCOME					
310-4-50-4491 MUNI CT TECHNOLOGY	0.00	0.00	0.00	0.00	0.00
TOTAL INVESTMENT INCOME	0.00	0.00	0.00	0.00	0.00
TOTAL COURT	1,600.00	362.33	362.33	22.65	1,237.67
TOTAL REVENUES	1,600.00	362.33	362.33	22.65	1,237.67
	==============	==============	==============	=======	==============

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

310-COURT SECURITY FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT					
=====					
MISCELLANEOUS OTHER EXP					
310-5-50-5311 OFFICE SECURITY	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL MISCELLANEOUS OTHER EXP	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL COURT	1,000.00	0.00	0.00	0.00	1,000.00
TOTAL EXPENDITURES	1,000.00	0.00	0.00	0.00	1,000.00
REVENUES OVER/(UNDER) EXPENDITURES	600.00	362.33	362.33		237.67

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

320-COURT TECHNOLOGY FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
COURT	1,600.00	295.80	295.80	18.49	1,304.20
TOTAL REVENUES	1,600.00	295.80	295.80	18.49	1,304.20
EXPENDITURE SUMMARY					
COURT	2,500.00	4.78	4.78	0.19	2,495.22
TOTAL EXPENDITURES	2,500.00	4.78	4.78	0.19	2,495.22
REVENUES OVER/(UNDER) EXPENDITURES	(900.00)	291.02	291.02		(1,191.02)

320-COURT TECHNOLOGY FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT					
=====					
COURT REVENUE					
320-4-50-4102 COURT TECHNOLOGY FEE	1,500.00	295.80	295.80	19.72	1,204.20
320-4-50-4191 MUNI COURT TECHNOLOGY	100.00	0.00	0.00	0.00	100.00
TOTAL COURT REVENUE	1,600.00	295.80	295.80	18.49	1,304.20
TOTAL COURT	1,600.00	295.80	295.80	18.49	1,304.20
TOTAL REVENUES	1,600.00	295.80	295.80	18.49	1,304.20
	==============	==============	==============	=======	==============

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

320-COURT TECHNOLOGY FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT					
=====					
MISCELLANEOUS OTHER EXP					
320-5-50-5300 COMPUTER SOFTWARE & SUPPORT	2,500.00	4.78	4.78	0.19	2,495.22
TOTAL MISCELLANEOUS OTHER EXP	2,500.00	4.78	4.78	0.19	2,495.22
CAPITAL OUTLAY					
320-5-50-5414 COMPUTERS	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
TOTAL COURT	2,500.00	4.78	4.78	0.19	2,495.22
TOTAL EXPENDITURES	2,500.00	4.78	4.78	0.19	2,495.22
	==============	==============	==============	=======	==============
REVENUES OVER/(UNDER) EXPENDITURES	(900.00)	291.02	291.02		(1,191.02)

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

330-COURT EFFICIENCY FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
COURT	100.00	0.00	0.00	0.00	100.00
TOTAL REVENUES	100.00	0.00	0.00	0.00	100.00
EXPENDITURE SUMMARY					
COURT	100.00	0.00	0.00	0.00	100.00
TOTAL EXPENDITURES	100.00	0.00	0.00	0.00	100.00
REVENUES OVER/(UNDER) EXPENDITURES	0.00	0.00	0.00		0.00

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

330-COURT EFFICIENCY FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT					
=====					
COURT REVENUE					
330-4-50-4110 ADMINISTRATIVE COURT FEES	100.00	0.00	0.00	0.00	100.00
TOTAL COURT REVENUE	100.00	0.00	0.00	0.00	100.00
TOTAL COURT	100.00	0.00	0.00	0.00	100.00
TOTAL REVENUES	100.00	0.00	0.00	0.00	100.00
	==============	==============	==============	=======	==============

330-COURT EFFICIENCY FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
COURT =====					
SUPPLIES & OPERATION EXP					
330-5-50-5158 OFFICE SUPPLIES	100.00	0.00	0.00	0.00	100.00
TOTAL SUPPLIES & OPERATION EXP	100.00	0.00	0.00	0.00	100.00
TOTAL COURT	100.00	0.00	0.00	0.00	100.00
TOTAL EXPENDITURES	100.00	0.00	0.00	0.00	100.00
	==============	==============	==============	=======	==============
REVENUES OVER/(UNDER) EXPENDITURES	0.00	0.00	0.00		0.00

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

430-DEBT SERVICE FUND 2014
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	200,250.00	22.70	22.70	0.01	200,227.30
TOTAL REVENUES	200,250.00	22.70	22.70	0.01	200,227.30
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	199,350.00	0.00	0.00	0.00	199,350.00
TOTAL EXPENDITURES	199,350.00	0.00	0.00	0.00	199,350.00
REVENUES OVER/(UNDER) EXPENDITURES	900.00	22.70	22.70		877.30

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

430-DEBT SERVICE FUND 2014

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
TAXES					
430-4-60-4020 PENALTY & INTEREST ON TAXES	500.00	5.63	5.63	1.13	494.37
430-4-60-4031 PROPERTY TAX-DEBT SERVICE FD	199,350.00	17.07	17.07	0.01	199,332.93
TOTAL TAXES	199,850.00	22.70	22.70	0.01	199,827.30
MISCELLANEOUS REVENUE					
430-4-60-4577 TRSF FROM STREETS-PAYING AGENT	400.00	0.00	0.00	0.00	400.00
430-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	400.00	0.00	0.00	0.00	400.00
TOTAL NON-DEPARTMENTAL	200,250.00	22.70	22.70	0.01	200,227.30
TOTAL REVENUES	200,250.00	22.70	22.70	0.01	200,227.30

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

430-DEBT SERVICE FUND 2014

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
CONTRACTUAL SERVICES					
430-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
430-5-60-5276 PAYING AGENT FEES	400.00	0.00	0.00	0.00	400.00
430-5-60-5298 BOND PRINCIPAL - SERIES 2014	140,000.00	0.00	0.00	0.00	140,000.00
430-5-60-5299 BOND INTEREST - SERIES 2014	58,950.00	0.00	0.00	0.00	58,950.00
TOTAL CONTRACTUAL SERVICES	199,350.00	0.00	0.00	0.00	199,350.00
MISCELLANEOUS OTHER EXP					
430-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
430-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
430-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	0.00	0.00	0.00	0.00	0.00
CAPITAL OUTLAY					
430-5-60-5461 TRANSFER TO WATER FUND	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
TOTAL NON-DEPARTMENTAL	199,350.00	0.00	0.00	0.00	199,350.00
TOTAL EXPENDITURES	199,350.00	0.00	0.00	0.00	199,350.00
REVENUES OVER/(UNDER) EXPENDITURES	900.00	22.70	22.70		877.30

440-DEBT SERVICE FUND 2012
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	314,635.00	36.13	36.13	0.01	314,598.87
TOTAL REVENUES	314,635.00	36.13	36.13	0.01	314,598.87
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	313,635.00	0.00	0.00	0.00	313,635.00
TOTAL EXPENDITURES	313,635.00	0.00	0.00	0.00	313,635.00
REVENUES OVER/(UNDER) EXPENDITURES	1,000.00	36.13	36.13		963.87

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

440-DEBT SERVICE FUND 2012

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
================					
TAXES					
440-4-60-4020 PENALTY & INTEREST ON TAXES	1,000.00	8.96	8.96	0.90	991.04
440-4-60-4031 PROPERTY TAX-DEBT SERVICE FD	313,235.00	27.17	27.17	0.01	313,207.83
TOTAL TAXES	314,235.00	36.13	36.13	0.01	314,198.87
MISCELLANEOUS REVENUE					
440-4-60-4573 TRSF FROM WASTEWATER-PAY AGENT	400.00	0.00	0.00	0.00	400.00
440-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	400.00	0.00	0.00	0.00	400.00
TOTAL NON-DEPARTMENTAL	314,635.00	36.13	36.13	0.01	314,598.87
TOTAL REVENUES	314,635.00	36.13	36.13	0.01	314,598.87
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440-DEBT SERVICE FUND 2012

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
CONTRACTUAL SERVICES					
440-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
440-5-60-5242 DEBT SERVICE-2012A INTEREST	8,235.00	0.00	0.00	0.00	8,235.00
440-5-60-5243 DEBT SERVICE-PRINCIPAL 2012A	305,000.00	0.00	0.00	0.00	305,000.00
440-5-60-5276 PAYING AGENT FEES	400.00	0.00	0.00	0.00	400.00
TOTAL CONTRACTUAL SERVICES	313,635.00	0.00	0.00	0.00	313,635.00
MISCELLANEOUS OTHER EXP					
440-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
440-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
440-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	0.00	0.00	0.00	0.00	0.00
CAPITAL OUTLAY					
440-5-60-5486 TRANSFER OUT TO WASTEWATER FD	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
TOTAL NON-DEPARTMENTAL	313,635.00	0.00	0.00	0.00	313,635.00
TOTAL EXPENDITURES	313,635.00	0.00	0.00	0.00	313,635.00
REVENUES OVER/(UNDER) EXPENDITURES	1,000.00	36.13	36.13		963.87

450 VICE FUND 2019
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	411,650.00	46.52	46.52	0.01	411,603.48
TOTAL REVENUES	411,650.00	46.52	46.52	0.01	411,603.48
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	410,650.00	0.00	0.00	0.00	410,650.00
TOTAL EXPENDITURES	410,650.00	0.00	0.00	0.00	410,650.00
REVENUES OVER/(UNDER) EXPENDITURES	1,000.00	46.52	46.52		953.48

450 ICE FUND 2019

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
TAXES					
450-4-60-4020 PENALTY & INTEREST ON TAXES	1,000.00	11.54	11.54	1.15	988.46
450-4-60-4031 PROPERTY TAX-DEBT SERVICE FD	410,250.00	34.98	34.98	0.01	410,215.02
TOTAL TAXES	411,250.00	46.52	46.52	0.01	411,203.48
MISCELLANEOUS REVENUE					
450-4-60-4573 TRSF FROM WASTEWATER-PAY AGENT	400.00	0.00	0.00	0.00	400.00
450-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	400.00	0.00	0.00	0.00	400.00
TOTAL NON-DEPARTMENTAL	411,650.00	46.52	46.52	0.01	411,603.48
TOTAL REVENUES	411,650.00	46.52	46.52	0.01	411,603.48

450-DEBT SERVICE FUND 2019

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
CONTRACTUAL SERVICES					
450-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
450-5-60-5207 BOND PRINCIPAL-SERIES 2019	115,000.00	0.00	0.00	0.00	115,000.00
450-5-60-5208 BOND INTEREST - SERIES 2019	295,250.00	0.00	0.00	0.00	295,250.00
450-5-60-5276 PAYING AGENT FEES	400.00	0.00	0.00	0.00	400.00
TOTAL CONTRACTUAL SERVICES	410,650.00	0.00	0.00	0.00	410,650.00
MISCELLANEOUS OTHER EXP					
450-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
450-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
450-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	0.00	0.00	0.00	0.00	0.00
CAPITAL OUTLAY					
450-5-60-5462 TRANSFER OUT	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
TOTAL NON-DEPARTMENTAL	410,650.00	0.00	0.00	0.00	410,650.00
TOTAL EXPENDITURES	410,650.00	0.00	0.00	0.00	410,650.00
REVENUES OVER/(UNDER) EXPENDITURES	1,000.00	46.52	46.52		953.48

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

460-DEBT SERVICE FUND 2020
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	315,515.00	36.08	36.08	0.01	315,478.92
TOTAL REVENUES	315,515.00	36.08	36.08	0.01	315,478.92
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	315,015.00	0.00	0.00	0.00	315,015.00
TOTAL EXPENDITURES	315,015.00	0.00	0.00	0.00	315,015.00
REVENUES OVER/(UNDER) EXPENDITURES	500.00	36.08	36.08		463.92

460-DEBT SERVICE FUND 2020

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
TAXES					
460-4-60-4020 PENALTY & INTEREST ON TAXES	500.00	8.95	8.95	1.79	491.05
460-4-60-4031 PROPERTY TAX-DEBT SERVICE FD	314,775.00	27.13	27.13	0.01	314,747.87
TOTAL TAXES	315,275.00	36.08	36.08	0.01	315,238.92
MISCELLANEOUS REVENUE					
460-4-60-4573 TRSF FROM WASTEWATER-PAY AGENT	240.00	0.00	0.00	0.00	240.00
460-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	240.00	0.00	0.00	0.00	240.00
TOTAL NON-DEPARTMENTAL	315,515.00	36.08	36.08	0.01	315,478.92
TOTAL REVENUES	315,515.00	36.08	36.08	0.01	315,478.92

460-DEBT SERVICE FUND 2020

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
================					
CONTRACTUAL SERVICES					
460-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
460-5-60-5248 DEBT SERVICE INTEREST TAX NOTE	24,775.00	0.00	0.00	0.00	24,775.00
460-5-60-5249 DEBT SERVICE PRINCIPAL TAX NTS	290,000.00	0.00	0.00	0.00	290,000.00
460-5-60-5276 PAYING AGENT FEES	240.00	0.00	0.00	0.00	240.00
TOTAL CONTRACTUAL SERVICES	315,015.00	0.00	0.00	0.00	315,015.00
MISCELLANEOUS OTHER EXP					
460-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
460-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
460-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	0.00	0.00	0.00	0.00	0.00
TOTAL NON-DEPARTMENTAL	315,015.00	0.00	0.00	0.00	315,015.00
TOTAL EXPENDITURES	315,015.00	0.00	0.00	0.00	315,015.00
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REVENUES OVER/(UNDER) EXPENDITURES	500.00	36.08	36.08		463.92

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

702-DRAINAGE FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
CAPITAL IMPROVEMENTS	30,900.00	0.00	0.00	0.00	30,900.00
TOTAL REVENUES	30,900.00	0.00	0.00	0.00	30,900.00
EXPENDITURE SUMMARY					
CAPITAL IMPROVEMENTS	58,000.00	0.00	0.00	0.00	58,000.00
TOTAL EXPENDITURES	58,000.00	0.00	0.00	0.00	58,000.00
REVENUES OVER/(UNDER) EXPENDITURES	(27,100.00)	0.00	0.00		(27,100.00)

702-DRAINAGE FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
CAPITAL IMPROVEMENTS					
====================					
CHARGE FOR SERVICES					
702-4-35-4221 RSDP Zone 7	100.00	0.00	0.00	0.00	100.00
702-4-35-4222 RSDP Zone 1	100.00	0.00	0.00	0.00	100.00
702-4-35-4223 RSDP Zone 5	100.00	0.00	0.00	0.00	100.00
702-4-35-4224 RCDP Zone 8	100.00	0.00	0.00	0.00	100.00
702-4-35-4225 RSDP ZONE 5	100.00	0.00	0.00	0.00	100.00
702-4-35-4226 RSDP ZONE 3	100.00	0.00	0.00	0.00	100.00
702-4-35-4227 RSDP ZONE4	100.00	0.00	0.00	0.00	100.00
702-4-35-4228 RSDP ZONE 6	100.00	0.00	0.00	0.00	100.00
702-4-35-4229 RSDP ZONE 9	100.00	0.00	0.00	0.00	100.00
TOTAL CHARGE FOR SERVICES	900.00	0.00	0.00	0.00	900.00
LICENSE & PERMITS					
702-4-35-4360 DRAINAGE REVIEW REVENUE	30,000.00	0.00	0.00	0.00	30,000.00
TOTAL LICENSE & PERMITS	30,000.00	0.00	0.00	0.00	30,000.00
MISCELLANEOUS REVENUE					
702-4-35-4500 TRANSFER FROM GENERAL FUND	0.00	0.00	0.00	0.00	0.00
702-4-35-4578 FUND BALANCE TRANSFER-IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL IMPROVEMENTS	30,900.00	0.00	0.00	0.00	30,900.00
TOTAL REVENUES	30,900.00	0.00	0.00	0.00	30,900.00
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702-DRAINAGE FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
CAPITAL IMPROVEMENTS					
CONTRACTUAL SERVICES					
702-5-35-5221 NIXON PLEASANT DRAINAGE IMPROV	0.00	0.00	0.00	0.00	0.00
702-5-35-5222 HUBBARD-HATLEY-PICKWICK DRAIN	0.00	0.00	0.00	0.00	0.00
702-5-35-5270 ENGINEERING SERVICES	50,000.00	0.00	0.00	0.00	50,000.00
702-5-35-5274 NIXON PLEASANT DRAINAGE IMPROV	0.00	0.00	0.00	0.00	0.00
TOTAL CONTRACTUAL SERVICES	50,000.00	0.00	0.00	0.00	50,000.00
CAPITAL OUTLAY					
702-5-35-5407 DRAINAGE EXPENDITURES ZONE 7	0.00	0.00	0.00	0.00	0.00
702-5-35-5485 MS-4 EXPENDITURES	8,000.00	0.00	0.00	0.00	8,000.00
TOTAL CAPITAL OUTLAY	8,000.00	0.00	0.00	0.00	8,000.00
TOTAL CAPITAL IMPROVEMENTS	58,000.00	0.00	0.00	0.00	58,000.00
TOTAL EXPENDITURES	58,000.00	0.00	0.00	0.00	58,000.00
REVENUES OVER/(UNDER) EXPENDITURES	(27,100.00)	0.00	0.00		(27,100.00)

800-WASTE WATER FUND
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-DEPARTMENTAL	974,576.00	89,738.41	89,738.41	9.21	884,837.59
TOTAL REVENUES	974,576.00	89,738.41	89,738.41	9.21	884,837.59
EXPENDITURE SUMMARY					
NON-DEPARTMENTAL	974,576.00	20,104.34	20,104.34	2.06	954,471.66
TOTAL EXPENDITURES	974,576.00	20,104.34	20,104.34	2.06	954,471.66
REVENUES OVER/(UNDER) EXPENDITURES	0.00	69,634.07	69,634.07		(69,634.07)

800-WASTE WATER FUND

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
INVESTMENT INCOME					
800-4-60-4400 INTEREST INCOME	250.00	757.63	757.63	303.05	(507.63)
800-4-60-4401 INTEREST INCOME-CHECKING	150.00	23.72	23.72	15.81	126.28
TOTAL INVESTMENT INCOME	400.00	781.35	781.35	195.34	(381.35)
MISCELLANEOUS REVENUE					
800-4-60-4565 Grant Revenues	0.00	0.00	0.00	0.00	0.00
800-4-60-4578 FUND BALANCE TRANSFER IN	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS REVENUE	0.00	0.00	0.00	0.00	0.00
UTILITY REVENUE					
800-4-60-4620 WASTEWATER	800,000.00	79,608.80	79,608.80	9.95	720,391.20
800-4-60-4628 CONNECT FEE	3,500.00	0.00	0.00	0.00	3,500.00
TOTAL UTILITY REVENUE	803,500.00	79,608.80	79,608.80	9.91	723,891.20
OTHER REVENUE					
800-4-60-4700 UNEXPENDED BALANCE TRANSFER	61,516.00	0.00	0.00	0.00	61,516.00
800-4-60-4706 INDUSTRIAL WASTE SURCHARGE	11,000.00	1,168.74	1,168.74	10.62	9,831.26
800-4-60-4709 PUD WASTEWATER SURCHARGE	98,160.00	8,179.52	8,179.52	8.33	89,980.48
800-4-60-4732 TRANSFER FROM 2012 DEBT SVC-FD	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER REVENUE	170,676.00	9,348.26	9,348.26	5.48	161,327.74
TOTAL NON-DEPARTMENTAL	974,576.00	89,738.41	89,738.41	9.21	884,837.59
TOTAL REVENUES	974,576.00	89,738.41	89,738.41	9.21	884,837.59

800-WASTE WATER FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-DEPARTMENTAL					
PERSONNEL					
800-5-60-5000 SALARY	214,195.00	10,402.60	10,402.60	4.86	203,792.40
800-5-60-5002 HOLIDAY COMPENSATION	0.00	0.00	0.00	0.00	0.00
800-5-60-5009 RETIREMENT PAYOUT RESERVE	0.00	0.00	0.00	0.00	0.00
800-5-60-5010 TRAINING	2,500.00	0.00	0.00	0.00	2,500.00
800-5-60-5020 HEALTH INSURANCE	29,900.00	749.84	749.84	2.51	29,150.16
800-5-60-5030 WORKERS COMP INSURANCE	4,640.00	4,601.02	4,601.02	99.16	38.98
800-5-60-5035 SOCIAL SECURITY/MEDICARE	16,386.00	795.80	795.80	4.86	15,590.20
800-5-60-5040 UNEMPLOYMENT COMP INSUR	300.00	0.00	0.00	0.00	300.00
800-5-60-5050 TX MUNICIPAL RETIREMENT SYS	25,703.00	1,244.15	1,244.15	4.84	24,458.85
800-5-60-5060 STORM RELATED PAYROLL	0.00	0.00	0.00	0.00	0.00
TOTAL PERSONNEL	293,624.00	17,793.41	17,793.41	6.06	275,830.59
SUPPLIES & OPERATION EXP					
800-5-60-5103 PRINTING & REPRODUCTION	100.00	0.00	0.00	0.00	100.00
800-5-60-5125 TRAVEL	2,500.00	0.00	0.00	0.00	2,500.00
800-5-60-5130 UTILITIES	0.00	0.00	0.00	0.00	0.00
800-5-60-5145 UNIFORMS & ACCESSORIES	1,500.00	0.00	0.00	0.00	1,500.00
800-5-60-5163 GRINDER PUMP MAINT/REPLACEMENT	25,000.00	0.00	0.00	0.00	25,000.00
800-5-60-5166 MAINTENANCE & REPAIRS	47,000.00	598.36	598.36	1.27	46,401.64
800-5-60-5167 ADMINISTRATIVE FEES	28,000.00	0.00	0.00	0.00	28,000.00
800-5-60-5168 Transfer to Utility Billing	63,785.00	0.00	0.00	0.00	63,785.00
800-5-60-5171 EQUIPMENT	30,100.00	0.00	0.00	0.00	30,100.00
800-5-60-5193 METER REPLACEMENT	34,500.00	0.00	0.00	0.00	34,500.00
800-5-60-5195 VEHICLE OPERATIONS	2,000.00	0.00	0.00	0.00	2,000.00
TOTAL SUPPLIES & OPERATION EXP	234,485.00	598.36	598.36	0.26	233,886.64
CONTRACTUAL SERVICES					
800-5-60-5200 BAD DEBT EXPENSE	0.00	0.00	0.00	0.00	0.00
800-5-60-5210 LEGAL SERVICES	2,000.00	0.00	0.00	0.00	2,000.00
800-5-60-5218 ANNUAL TELEVISING/SMOKE TEST	32,500.00	0.00	0.00	0.00	32,500.00
800-5-60-5219 UTILITY BILLING/COLLECTIONE	0.00	0.00	0.00	0.00	0.00
800-5-60-5232 UTILITY BILLING-COLLECT ADDNL	0.00	0.00	0.00	0.00	0.00
800-5-60-5233 Crossroads Contract	97,980.00	0.00	0.00	0.00	97,980.00
800-5-60-5234 Crossroads Emerg/M&O Repairs	40,000.00	0.00	0.00	0.00	40,000.00
800-5-60-5240 INSURANCE - PROP & GEN LIAB	1,450.00	425.32	425.32	29.33	1,024.68
800-5-60-5255 VEHICLE INSURANCE	1,000.00	1,287.25	1,287.25	128.73	(287.25)
800-5-60-5270 ENGINEERING SERVICES	20,000.00	0.00	0.00	0.00	20,000.00
800-5-60-5271 RATE CONSULTING SERVICES	0.00	0.00	0.00	0.00	0.00
800-5-60-5290 WASTEWATER FEES	230,000.00	0.00	0.00	0.00	230,000.00
800-5-60-5292 INDUSTRIAL WASTE SURCHARGES	12,000.00	0.00	0.00	0.00	12,000.00
TOTAL CONTRACTUAL SERVICES	436,930.00	1,712.57	1,712.57	0.39	435,217.43

800-WASTE WATER FUND

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
MISCELLANEOUS OTHER EXP					
800-5-60-5300 COMPUTER SOFTWARE & SUPPORT	1,000.00	0.00	0.00	0.00	1,000.00
800-5-60-5323 LIFT STATION INSPECT, EMERGENC	0.00	0.00	0.00	0.00	0.00
800-5-60-5324 VALVE MANHOLE GPS MAPPING PROG	0.00	0.00	0.00	0.00	0.00
800-5-60-5325 CCTV INSPECTION AND PIPE CLEAN	0.00	0.00	0.00	0.00	0.00
800-5-60-5342 DEBT SERVICE - 2012A INTEREST	0.00	0.00	0.00	0.00	0.00
800-5-60-5345 Depreciation Expense	0.00	0.00	0.00	0.00	0.00
TOTAL MISCELLANEOUS OTHER EXP	1,000.00	0.00	0.00	0.00	1,000.00
CAPITAL OUTLAY					
800-5-60-5494 Veh Fin Note - Debt Service	3,137.00	0.00	0.00	0.00	3,137.00
800-5-60-5495 NEW VEHICLE & OUTFITTING	5,400.00	0.00	0.00	0.00	5,400.00
800-5-60-5496 LIFT STATION AUTOMATION	0.00	0.00	0.00	0.00	0.00
800-5-60-5497 LIFT STATION EMERGENCY POWER	0.00	0.00	0.00	0.00	0.00
TOTAL CAPITAL OUTLAY	8,537.00	0.00	0.00	0.00	8,537.00
TOTAL NON-DEPARTMENTAL	974,576.00	20,104.34	20,104.34	2.06	954,471.66
TOTAL EXPENDITURES	974,576.00	20,104.34	20,104.34	2.06	954,471.66
REVENUES OVER/(UNDER) EXPENDITURES	0.00	69,634.07	69,634.07		(69,634.07)

2021-2022

RCDC

MONTHLY FINANCIAL ANALYSIS

NOTE: YTD ACTUAL AS OF 10/31/2021; 8.33% OF FISCAL YEAR

REVENUE STATUS & COMPARISON TO PRIOR YEAR

	CURRENT YEAR: EST. REVENUE	YTD	PERCENT	PRIOR YEAR: YTD	CURRENT YR COMPARED TO PY YR
SALES TAX REVENUE	$ 200,000	$ 15,964	8%	$ 13,261	120%

BUDGET STATUS & COMPARISON TO PRIOR YEAR

	CURRENT YEAR: BUDGET	YTD	PERCENT	PRIOR YEAR: YTD	CURRENT YR COMPARED TO PY YR
ECONOMIC DEVELOPMENT:					
REVENUE	$ -	$ -	#DIV/0!	$ -	#DIV/0!
EXPENDITURES	$ 20,000	$ -	0%	$ -	#DIV/0!
NON-PROJECTED RELATED:					
REVENUE	$ 200,000	$ 15,964	8%	$ 13,261	120%
EXPENDITURES	$ 77,000	$ -	0%	$ -	#DIV/0!

RECAP:	CURRENT YEAR: BUDGET	YTD	PERCENT	PRIOR YEAR: YTD	CURRENT YR COMPARED TO PY YR
REVENUE	$ 200,000	$ 15,964	8%	$ 13,261	120%
EXPENDITURES	$ 97,000	$ -	0%	$ -	#DIV/0!

BALANCE SHEET

AS OF: OCTOBER 31ST, 2022

500-RCDC

ACCOUNT #	ACCOUNT DESCRIPTION	BALANCE		
ASSETS				
======				
500-1000	RCDC OPERATING CASH	300,337.94		
500-1005	TEXPOOL	127,690.64		
500-1100	DUE FROM CITY	30,515.08		
500-1350	SALES TAX RECEIVABLE	0.00		
			458,543.66	
	TOTAL ASSETS			458,543.66
				==============
LIABILITIES				
===========				
500-2000	ACCOUNTS PAYABLE	0.00		
500-2020	ACCOUNTS PAYABLE RCDC	6,833.98		
500-2030	PAYABLE TO CITY	24,542.19		
500-2060	Retirement Payout Reserve	0.00		
500-2140	Vehicle Financing Notes	0.00		
	TOTAL LIABILITIES		31,376.17	
EQUITY				
======				
500-3000	FUND BALANCE-UNAPPROPRATED	411,203.27		
500-3001	XXFUND BALANCE	0.00		
500-3010	OTHER FUND BALANCE	0.00		
	TOTAL BEGINNING EQUITY	411,203.27		
	TOTAL REVENUE	15,964.22		
	TOTAL EXPENSES	0.00		
	TOTAL REVENUE OVER/(UNDER) EXPENSES	15,964.22		
	TOTAL EQUITY & REV. OVER/(UNDER) EXP.		427,167.49	
	TOTAL LIABILITIES, EQUITY & REV.OVER/(UNDER) EXP.			458,543.66
				==============

CITY OF ROLLINGWOOD
REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

500-RCDC
FINANCIAL SUMMARY

08.33% OF FISCAL YEAR

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
REVENUE SUMMARY					
NON-PROJECT RELATED	200,000.00	15,964.22	15,964.22	7.98	184,035.78
TOTAL REVENUES	200,000.00	15,964.22	15,964.22	7.98	184,035.78
EXPENDITURE SUMMARY					
ECONOMIC DEVELOPMENT	20,000.00	0.00	0.00	0.00	20,000.00
NON-PROJECT RELATED	77,000.00	0.00	0.00	0.00	77,000.00
ADDITIONAL NEW PROJECTS	125,000.00	0.00	0.00	0.00	125,000.00
TOTAL EXPENDITURES	222,000.00	0.00	0.00	0.00	222,000.00
REVENUES OVER/(UNDER) EXPENDITURES	(22,000.00)	15,964.22	15,964.22		(37,964.22)

500-RCDC

08.33% OF FISCAL YEAR

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
NON-PROJECT RELATED					
TAXES					
500-4-90-4000 SALES TAX REVENUE	200,000.00	15,632.87	15,632.87	7.82	184,367.13
TOTAL TAXES	200,000.00	15,632.87	15,632.87	7.82	184,367.13
INVESTMENT INCOME					
500-4-90-4400 INTEREST INCOME	0.00	317.33	317.33	0.00	(317.33)
500-4-90-4401 INTEREST INCOME - CHECKING	0.00	14.02	14.02	0.00	(14.02)
TOTAL INVESTMENT INCOME	0.00	331.35	331.35	0.00	(331.35)
TOTAL NON-PROJECT RELATED	200,000.00	15,964.22	15,964.22	7.98	184,035.78
TOTAL REVENUES	200,000.00	15,964.22	15,964.22	7.98	184,035.78

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: OCTOBER 31ST, 2022

500-RCDC

08.33% OF FISCAL YEAR

DEPARTMENTAL EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	% OF BUDGET	BUDGET BALANCE
ECONOMIC DEVELOPMENT					
OTHER NON-DEPARTMENTAL					
500-5-80-5524 ROLLINGWOOD BUS PROMOTION	20,000.00	0.00	0.00	0.00	20,000.00
500-5-80-5527 COVID-19 RELIEF PROGRAM	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER NON-DEPARTMENTAL	20,000.00	0.00	0.00	0.00	20,000.00
TOTAL ECONOMIC DEVELOPMENT	20,000.00	0.00	0.00	0.00	20,000.00
NON-PROJECT RELATED					
CONTRACTUAL SERVICES					
500-5-90-5275 ADMIN SERVICES AGREEMENT	72,000.00	0.00	0.00	0.00	72,000.00
TOTAL CONTRACTUAL SERVICES	72,000.00	0.00	0.00	0.00	72,000.00
MISCELLANEOUS OTHER EXP					
500-5-90-5380 LEGAL EXPENSES	5,000.00	0.00	0.00	0.00	5,000.00
TOTAL MISCELLANEOUS OTHER EXP	5,000.00	0.00	0.00	0.00	5,000.00
TOTAL NON-PROJECT RELATED	77,000.00	0.00	0.00	0.00	77,000.00
ADDITIONAL NEW PROJECTS					
MISCELLANEOUS OTHER EXP					
500-5-95-5387 MOPAC LEGAL EXPENSES	40,000.00	0.00	0.00	0.00	40,000.00
500-5-95-5388 PARK IMPROVEMENT PROJECT	0.00	0.00	0.00	0.00	0.00
500-5-95-5389 COMPREHENSIVE PLAN	0.00	0.00	0.00	0.00	0.00
500-5-95-5390 COMMERCIAL CODES UPDATES COMP	30,000.00	0.00	0.00	0.00	30,000.00
500-5-95-5391 MOBILITY, CONNECTIVITY & SAFET	55,000.00	0.00	0.00	0.00	55,000.00
TOTAL MISCELLANEOUS OTHER EXP	125,000.00	0.00	0.00	0.00	125,000.00
TOTAL ADDITIONAL NEW PROJECTS	125,000.00	0.00	0.00	0.00	125,000.00
TOTAL EXPENDITURES	222,000.00	0.00	0.00	0.00	222,000.00
REVENUES OVER/(UNDER) EXPENDITURES	(22,000.00)	15,964.22	15,964.22		(37,964.22)

CITY OF ROLLINGWOOD MONTHLY STATS

Sales Tax Revenue

FY 2022-2023	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total	Current Average
	82,262.51												**82,263**	82,263

FY 2021-2022	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Total	12 Month Average
	72,380.73	79,529.64	84,255.00	81,958.78	82,911.62	128,709.17	65,708.05	76,333.56	76,333.56	86,675.43	89,293.24	173,811.51	**1,097,900**	**91,492**

Comparison by Month	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Total To Date
Total Increase or Decrease	9,882	-79,530	-84,255	-81,959	-82,912	-128,709	-65,708	-76,334	-76,334	-86,675	-89,293	-173,812	**-$1,015,638**
Total % Increase or Decrease	13.65%	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%	-194.65%	**-253.25%**

Sales Tax Revenues FY 2020-2021 Total: **$908,657** 12 Mo. Avg. **$75,721.44**

Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21
70,776.65	74,920.30	79,286.51	77,436.97	65,213.56	69,320.28	61,788.83	97,371.56	80,219.56	70,604.82	78,433.91	83,284.29

Sales Tax Revenues FY 2019-2020 Total: **$953,312** 12 Mo. Avg. **$79,442.63**

Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20
91,077	74,497	81,278	83,217	100,946	83,922	69,958	96,980	52,200	65,591	76,475	77169.25

Sales Tax Revenues FY 2018-2019 Total: **$869,629** 12 Mo. Avg. **$72,469**

Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
67,571	73,123	77,158	71,452	80,971	72,136	96,237	79,896	91,090	72,701	87,223	70.733

Sales Tax Revenues FY 2017-2018 Total: **$846,033** 12 Mo. Avg. **$70,503**

Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18
70,733	72,033	70,289	55,644	57,445	57,218	60,690	58,942	82,731	131,881	71,529	56,898

Sales Tax Revenues FY 2016-2017 Total: **$636,653** 12 Mo. Avg. **$53,054**

Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17
60,763	52,993	50,776	58,251	58,466	48,582	57,935	53,949	50,885	53,050	58,131	58,131

Sales Tax Revenues FY 2015-2016 Total: **$636,653** 12 Mo. Avg. **$53,054**

Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	April-16	May-16	June-16	July-16	Aug-16	Sept-16
47,352	60,770	52,993	50,776	58,251	58,466	48,582	57,935	53,949	50,885	53,050	43,645

Sales Tax Revenues FY 2014-2015 Total: **$661,044** 12 Mo. Avg. **$55,087**

Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	April-15	May-15	June-15	July-15	Aug-15	Sept-15
52,711	53,417	60,449	55,382	70,179	60,870	43,543	51,854	60,473	48,865	51,030	52,271

Sales Tax Revenues FY 2013-2014 Total: **$637,361** 12 Mo. Avg. **$53,113**

Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	June-14	July-14	Aug-14	Sept-14
55,277	49,054	61,523	58,436	62,246	49,770	48,155	52,803	50,076	50,043	50,828	49,150

CITY OF ROLLINGWOOD, TEXAS

PAYMENT AUTHORIZATION

Date: 9/2/2022

Budget Code: See below

Vendor: Crossroads Utility Services
2601 Forest Creek Drive
Round Rock, TX 78665

Invoice No. 8638
Invoice Date 8/10/2022
Acct No. Rollingwood

Vendor Code: Crossroads

Nature of Expense/Expenditure:

Justification of Expense/Expenditure:

Description			Quantity	Unit Cost	Extended Cost
Basic Service		See Below	1	$14,982.37	$ 14,982.37
Lift Station		800-5-60-5234	1	$ -	$ -
Grinder Pump Maintenance		800-5-60-5163	1	$ 4,032.15	$ 4,032.15
Water Distribution		200-5-60-5234	1	$ 9,892.12	$ 9,892.12
Wastewater Distribution		800-5-60-5234	1	$13,597.54	$ 13,597.54
Administrative			1	$ -	$ -
Taps and Meters		200-5-60-5234	1	$ -	$ -
	Basic Svc	Admin		$ -	$ -
200-5-60-5233	$ 6,783.68	$ -			$ -
800-5-60-5233	$ 8,198.69	$ -			
	$14,982.37	$ -			
				Total	$ 42,504.18

Received By: Date:

City Secretary: Date:

Finance Dept: Date: 9/2/2022

City Administrator: AW Date: 9/9/22

Crossroads
utility services

Invoice 8638

Date: August 10, 2022

2601 Forest Creek Dr.
Round Rock, TX 78665
512-246-1400
www.crossroadsus.com

Bill To:

City of Rollingwood
403 Nixon Avenue
Rollingwood, TX 78746

	Jul-22
	Operations & Maintenance
DESCRIPTION	AMOUNT
Basic Service	$ 14,915.00
Grinder Pump Issues	$ 18.44
Lift Station	$ 13,597.54
Water Distribution	$ 9,892.12
Wastewater Collection	$ 4,013.71
Fuel Surcharge	$ 67.37
Total	$ 42,504.18

BILLED - SERVICE ORDER SUMMARY
BILLING CYCLE: JULY 2022
CITY OF ROLLINGWOOD

S/O #	SVC DATE	COMP	ADDRESS	NOTES	LABOR	EQUIP	MAT'L	SUBCON	TOTAL
BASIC SERVICE									
354358A	07/29/22	07/29/22	403 NIXON AVENUE	BASIC SERVICE	0.00	0.00	14,915.00	0.00	14,915.00
						BASIC SERVICE SUBTOTAL			**14,915.00**
GRINDER PUMP ISSUES									
352250A	07/09/22	07/12/22	2404 ROLLINGWOOD DRIVE	GRINDER PUMP PROBLEM. VENT CAP BROKEN AND WANTED FIXED SENT INFO TO EFRAM TO REPLACE GASKET.	11.09	7.35	0.00	0.00	18.44
						GRINDER PUMP ISSUES SUBTOTAL			**18.44**
LIFT STATION									
347464A	05/25/22	07/06/22	CORW - LS1 - DELLANA LN	CHECKED PUMP. OPERATOR SAID PUMP 2 IS NOT WORKING. WATCHED PUMPS CYCLE; BOTH PUMPS ALTERNATED AND RAN NORMAL. WET WELL NEEDS CLEANED.	117.15	76.34	0.00	0.00	193.49
347740A	05/27/22	07/06/22	CORW - LS3 - ALMARION WAY	CHECKED PUMP. PULLED PUMP 2 AND REMOVED RAGS. REINSTALLED PUMP AND TESTED : ALL OKAY.	384.03	229.02	0.90	0.00	613.95
348400A	06/03/22	07/06/22	CORW - LS7 - NIXON DRIVE	ELEC TECH WORK COMPLETED. TESTED FUNCTIONS OF AUTO DIALER ALARMS, FOUND THAT HIGH LEVEL ONLY CALLS OUT FROM TRANSDUCER IN PRIMARY OF FLOAT IN SECONDARY MODE.	428.01	305.36	0.00	0.00	733.37
349155A	06/10/22	07/13/22	CORW - LS1 - DELLANA LN	SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WWTS CLEAN THE WET WELL	66.56	44.10	0.00	2,330.20	2,440.86
349156A	06/10/22	07/13/22	CORW - LS2 - HATLEY DR	SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL	33.28	22.05	0.00	1,398.12	1,453.45

BILLED - SERVICE ORDER SUMMARY

BILLING CYCLE: JULY 2022

CITY OF ROLLINGWOOD

S/O #	SVC DATE	COMP	ADDRESS	NOTES	LABOR	EQUIP	MAT'L	SUBCON	TOTAL
LIFT STATION									
				CLEANING					
349158A	06/10/22	07/13/22	CORW - LS3 - ALMARION WAY	SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING	33.28	22.05	0.00	1,398.12	1,453.45
349160A	06/10/22	07/13/22	CORW - LS4 - ROCKWAY COVE	SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WWTS CLEAN THE WET WELL	33.28	22.05	0.00	1,398.12	1,453.45
349163A	06/10/22	07/13/22	CORW - LS5 - VALE DR	SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING	33.28	22.05	0.00	1,398.12	1,453.45
349167A	06/10/22	07/13/22	CORW - LS7 - NIXON DRIVE	SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING	44.37	29.40	0.00	1,398.12	1,471.89
350922A	06/27/22	07/05/22	CORW - LS4 - ROCKWAY COVE	RMS REPORTED PROBLEM -- POWER FAILURE - CALLED MAINT TO BRING GENERATOR TIL POWER CAME BACK ON	62.02	22.05	0.00	0.00	84.07
350934A	06/27/22	07/12/22	CORW - LS4 - ROCKWAY COVE	CONTACTED POWER COMPANY.FACILITY LOST POWER CAUSING HIGH LEVEL. USED TOW-BEHIND GENERATOR TO KEEP LEVELS DOWN IN WET WELL.	780.76	687.06	0.00	0.00	1,467.82
351007A	06/28/22	07/12/22	CORW - LS4 - ROCKWAY COVE	CHECKED CONTROL PANEL. POWER OUTAGE DURING STORM EVENT. MAINTENANCE PULLED GENERATOR TO RUN STATION DURING OUTAGE. TALKED WITH MAINTENANCE THROUGH GENERATOR CONNECTION. FOUND THAT STATION HAS COMM ERROR PREVENTING PRIMARY FUNCTION. SWITCHED TO SECONDARY MODE.	284.94	76.34	0.00	0.00	361.28

BILLED - SERVICE ORDER SUMMARY

BILLING CYCLE: JULY 2022

CITY OF ROLLINGWOOD

S/O #	SVC DATE	COMP	ADDRESS	NOTES	LABOR	EQUIP	MAT'L	SUBCON	TOTAL
LIFT STATION									
351629A	06/23/22	07/18/22	CORW - LS7 - NIXON DRIVE	POWER FAIL ALARM. STORMS IN AREA. ALARM CLEARED. MONITORED REMOTELY.	24.73	7.35	0.00	0.00	32.08
351636A	06/27/22	07/18/22	CORW - LS4 - ROCKWAY COVE	POWER FAIL ALARM. STORMS IN AREA KNOCKED OUT POWER. DISPATCHED AN OPERATOR AND MAINTENANCE TO HOOK UP TEMP GENERATOR. TROUBLE SHOOTING OVER THE PHONE WITH OPERATOR. CALLED AUSTIN ENERGY. DIALER CALLED OUT ALL NIGHT. COORDINATED WITH MAINTENANCE TO KEEP WET WELL PUMPED DOWN.	148.36	44.10	0.00	0.00	192.46
351644A	06/28/22	07/18/22	CORW - LS4 - ROCKWAY COVE	NEED POWER ALARM. HIGH E LEVEL ALARM. PHASE FAIL. MAINTENANCE SET UP ORTHOEPY GENERATOR TO PUMP DOWN LS. COORDINATED WITH THEM WHEN ALARM CAME IN FOR HIGH LEVEL.	148.37	44.10	0.00	0.00	192.47
						LIFT STATION SUBTOTAL			**13,597.54**
WATER DISTRIBUTION									
343452A	04/14/22	07/06/22	2612 ROLLINGWOOD DRIVE	DUG AND EXPOSED THE MAIN LINE THAT WAS LEAKING FROM COUPLING. WE REMOVED 10 FT OF PVC LINE TO MAKE REPAIR. MADE THE REPAIR AND BACKFILLED. (ROLLINGWOOD INVENTORY).	1,443.34	1,184.91	336.38	0.00	2,964.63
343950A	04/20/22	07/06/22	2810 PICKWICK LN	ASPHALT AFTER REPAIR. PREPPED FOR NEW ASPHALT FOR NEXT DAY WORK.	363.27	152.68	27.58	0.00	543.53
345059A	05/02/22	07/06/22	2810 PICKWICK LN	EXCAVATION WORK COMPLETED. EXPOSED MAIN LINE AND CAPPED THE	558.87	167.40	51.67	0.00	777.94

BILLED - SERVICE ORDER SUMMARY
BILLING CYCLE: JULY 2022
CITY OF ROLLINGWOOD

S/O #	SVC DATE	COMP	ADDRESS	NOTES	LABOR	EQUIP	MAT'L	SUBCON	TOTAL
WATER DISTRIBUTION									
				LINE OFF. BACKFILLED HOLE AND CLEANED.					
346522A	05/13/22	07/06/22	2810 PICKWICK LN	ASPHALT AFTER REPAIR.	495.13	376.84	134.84	0.00	1,006.81
350743A	06/24/22	07/12/22	2800 HUBBARD CIR	EXCAVATED & REPAIRED WATER MAIN. FOUND WATER MAIN LEAK IN CUSTOMERS BACKYARD. EXPOSED 4" MAIN, FOUND A PINHOLE ON LINE, CLEANED THE PIPE AND USED A CIRCLE CLAMP FOR REPAIR. BACKFILLED HOLE.	1,957.28	1,758.20	200.39	0.00	3,915.87
350794A	06/25/22	07/12/22	4 INWOOD COVE	SPOKE WITH CUSTOMER. WAS ABLE TO WALK HIM THROUGH TURNING HIS WATER OFF. CUSTOMER HAD A WATER LEAK IN THE HOUSE.	16.48	7.35	0.00	0.00	23.83
350810A	06/24/22	07/08/22	2800 HUBBARD CIR	TOOK SPECIAL SAMPLE -- TOOK SAMPLE 6//24 DIDN'T MAKE IT TO LAB UNTIL THE NEXT DAY	179.17	95.55	0.00	0.00	274.72
351511A	06/29/22	07/08/22	302 RILEY RD	TOOK SPECIAL SAMPLE FROM REPAIR MADE ON CITY OF ROLLINGWOOD WATER LINE	110.26	58.80	0.00	0.00	169.06
351674A	06/30/22	07/18/22	2810 ROLLINGWOOD DRIVE	PASSER BY REPORTED A LEAK AT THIS ADDRESS. SPOKE WITH PASSER BY. SENT ALL INFO OVER TO ROLLINGWOOD STAFF. CUSTOMER PROBLEM .	24.73	7.35	0.00	0.00	32.08
352343A	05/12/22	07/11/22	1003 EWING CIR	WATER SYSTEM WORK COMPLETE. VERIFIED SERVICE LINE SIZE AND CONFIRMED SIZE WAS 1".	107.31	76.34	0.00	0.00	183.65
							WATER DISTRIBUTION SUBTOTAL		9,892.12

WASTEWATER COLLECTION

BILLED - SERVICE ORDER SUMMARY
BILLING CYCLE: JULY 2022
CITY OF ROLLINGWOOD

S/O #	SVC DATE	COMP	ADDRESS	NOTES	LABOR	EQUIP	MAT'L	SUBCON	TOTAL
WASTEWATER COLLECTION									
344807A	04/29/22	07/06/22	3 WESTGATE CIR	GRINDER PUMP PROBLEM. HASTING CONTACTED CUTOMER AT 7:30 AM ON 3/9. ON-CALL DISPATCHED TO CITY STAFF INSTEAD OF MAKING A SPECIAL TRIP. CITY ASSESSED AND REQUESTED HYDRO SOURCE. HYDRO SOURCE: STATION FULL, TRANSFERED TO TRASH CANS. PUMP WAS IN OVERPRESSURE; CABLE BAD, PULLED NEW CABLE AND SWITCH PUMP WIOTH SPARE PUMP. INSTALLED NEW VENT CAP ON LID.	9.51	0.00	0.00	3,443.10	3,452.61
349305A	06/12/22	07/06/22	13 TREEMONT DR	GRINDER PUMP PROBLEM. DUG UP BROKEN DISCHARGE AND REPAIRED THE 2" LINE. CLEANED SITE. ROLLINGWOOD HAD ALL PARTS FOR REPAIR.	376.34	152.68	0.00	0.00	529.02
351673A	06/30/22	07/19/22	100 KRISTY DR	SEWER BACK UP CALL. SPOKE WITH CUSTOMER. WALKED HIM THROUGH CHECKING CLEAN OUTS. DISTRICT LINE CLEAR. ADVISED CUSTOMER TO CALL PLUMBER.	24.73	7.35	0.00	0.00	32.08
					WASTEWATER COLLECTION SUBTOTAL				**4,013.71**
				LABOR/EQUIPMENT/MATERIAL/SUBCON TOTALS	8,299.93	5,706.22	15,666.76	12,763.90	

GRAND TOTAL	**42,436.81**

Crossroads
utility services
2601 Forest Creek Dr
Round Rock, TX 78665-1232

Statement #: 8638

Statement

Month: JULY 2022
Client: CITY OF ROLLINGWOOD
Statement Date: 08/10/22

Work Category	Amount
BASIC SERVICE	$14,915.00
GRINDER PUMP ISSUES	$18.44
LIFT STATION	$13,597.54
WATER DISTRIBUTION	$9,892.12
WASTEWATER COLLECTION	$4,013.71
Total This Statement:	$42,436.81

Invoice for Basic Service

Crossroads Utility Services
2601 Forest Creek Dr.
Round Rock, TX 78665
Phone: 281-620-3986
Fax:

Client:
CITY OF ROLLINGWOOD

Billing Cycle:
JULY 2022

Operations Fee - Wastewater System	$8,165.00
Operations Fee - Water System	$6,750.00
Total BASIC SERVICE	**$14,915.00**

Crossroads Utility Services

Inv # 8638-3
BCycle JULY 2022
SvrOrd# 349155
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-OPER
District: CITY OF ROLLINGWOOD
Location: CORW - LS1 - DELLANA LN

Reported By:

Telephone Number:
LIFT STATION

Date Completed: 07/13/22

Description of Work Performed:

SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WWTS CLEAN THE WET WELL

Description	Qty	Price	Amount
Subcontract			
WWTS -11117976	1.00	2,330.1990	2,330.20
Subcontract			**2,330.20**
Service Order Total:			**2,330.20**

Invoice
11117976
6/9/2022

826 Linger Ln
Austin TX 78721
(512) 973-8484

Bill To:

Crossroads Utility Services
2601 Forest Creek Drive
Round Rock TX 78665
United States

Service Location:

CORW Lift Station # 1
2500 Bee Caves Road
Rollingwood TX 78746
United States

Terms	Due Date	PO #	Sales Rep
Net 60	8/22/2022	24136	House

Service Date	Manifest	Quantity	Item	Rate	Amount
6/9/2022	Cleaning lift station to the floor to remove solids, rags, grease, grit and debris.				
6/9/2022		1.75	Service (hrs): Vactor Truck Unit: 6138	$185.00	$323.75
6/9/2022	RM	1.75	Labor (hrs): Vactor Truck Operator	$60.00	$105.00
6/9/2022	JM/AG	1.75	Labor (hrs): Additional Personnel/Equipment	$50.00	$87.50
6/9/2022	Assist cleaning, by pumping wastewater, offloading Vactor and transportation of waste to disposal site.				
6/9/2022		1.75	Service (hrs): Bobtail Vacuum Truck Unit: 2101	$125.00	$218.75
6/9/2022	NB	1.75	Labor (hrs): Vacuum Truck Operator	$60.00	$105.00
6/9/2022	1214422 NB	2,000	Disposal (gal): Wastewater with heavy solids, grease, grit, rags and debris requiring solidification and screening. Austin WW Processing Facility	$0.48	$960.00
		1	Environmental & Energy Recovery Fee		$154.26
		1	Fuel Surcharge		$72.00

Pay your bill online at:

www.wastewaterts.com

Customer ID: 132877

Remit To: 826 Linger Ln, Austin, TX 78721

For more information on fees and surcharges click here.

Invoice Total	$2,026.26
Invoice Balance	$2,026.26

Thank you for doing business with us!
We know the world is full of choices.
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AMERICAN ALLWASTE

Crossroads Utility Services

Inv # 8638-4
BCycle JULY 2022
SvrOrd# 349156
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-OPER
District: CITY OF ROLLINGWOOD
Location: CORW - LS2 - HATLEY DR

Reported By:

Telephone Number:
LIFT STATION

Date Completed: 07/13/22

Description of Work Performed:
SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING

Description	Qty	Price	Amount
Subcontract			
WWTS - 11117970	1.00	1,398.1240	1,398.12
Subcontract			**1,398.12**
Service Order Total:			**1,398.12**

Invoice
11117970
6/9/2022

826 Linger Ln
Austin TX 78721
(512) 973-8484

Bill To:

Crossroads Utility Services
2601 Forest Creek Drive
Round Rock TX 78665
United States

Service Location:

CORW Lift Station # 2
2501 Hatley Drive
Rollingwood TX 78746
United States

Terms	Due Date	PO #	Sales Rep
Net 60	8/22/2022	24137	House

Service Date	Manifest	Quantity	Item	Rate	Amount
6/9/2022	Cleaning lift station to remove solids, rags, grease, grit and debris.				
6/9/2022		1.75	Service (hrs): Vactor Truck Unit: 6138	$185.00	$323.75
6/9/2022	RM	1.75	Labor (hrs): Vactor Truck Operator	$60.00	$105.00
6/9/2022	JM/AG	1.75	Labor (hrs): Additional Personnel/Equipment	$50.00	$87.50
6/9/2022	Assist cleaning, by pumping wastewater, offloading Vactor and transportation of waste to disposal site.				
6/9/2022		1.75	Service (hrs): Bobtail Vacuum Truck Unit: 2101	$125.00	$218.75
6/9/2022	NB	1.75	Labor (hrs): Vacuum Truck Operator	$60.00	$105.00
6/9/2022	1214416 NB	500	Disposal (gal): Wastewater with heavy solids, grease, grit, rags and debris requiring solidification and screening. Austin WW Processing Facility	$0.48	$240.00
		1	Environmental & Energy Recovery Fee		$92.56
		1	Fuel Surcharge		$43.20

Pay your bill online at:

www.wastewaterts.com

Customer ID: 132872

Remit To: 826 Linger Ln, Austin, TX 78721

For more information on fees and surcharges click here.

Invoice Total	$1,215.76
Invoice Balance	$1,215.76

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Crossroads Utility Services

Inv # 8638-5
BCycle JULY 2022
SvrOrd# 349158
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-OPER
District: CITY OF ROLLINGWOOD
Location: CORW - LS3 - ALMARION WAY
Reported By:
Telephone Number:
LIFT STATION
Date Completed: 07/13/22

Description of Work Performed:

SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING

Description	Qty	Price	Amount
Subcontract			
WWTS -11117975	1.00	1,398.1240	1,398.12
Subcontract			**1,398.12**
	Service Order Total:		**1,398.12**

Invoice
11117975
6/9/2022

826 Linger Ln
Austin TX 78721
(512) 973-8484

Bill To:

Crossroads Utility Services
2601 Forest Creek Drive
Round Rock TX 78665
United States

Service Location:

CORW Lift Station # 3
205 Almarion Way
Austin TX 78746
United States

Terms	Due Date	PO #	Sales Rep
Net 60	8/22/2022	24138	House

Service Date	Manifest	Quantity	Item	Rate	Amount
6/9/2022	Cleaning lift station to remove solids, rags, grease, grit and debris.				
6/9/2022		1.75	Service (hrs): Vactor Truck Unit: 6138	$185.00	$323.75
6/9/2022	RM	1.75	Labor (hrs): Vactor Truck Operator	$60.00	$105.00
6/9/2022	JM/AG	1.75	Labor (hrs): Additional Personnel/Equipment	$50.00	$87.50
6/9/2022	Assist cleaning, by pumping wastewater, offloading Vactor and transportation of waste to disposal site.				
6/9/2022		1.75	Service (hrs): Bobtail Vacuum Truck Unit: 2101	$125.00	$218.75
6/9/2022	NB	1.75	Labor (hrs): Vacuum Truck Operator	$60.00	$105.00
6/9/2022	1214421 NB	500	Disposal (gal): Wastewater with heavy solids, grease, grit, rags and debris requiring solidification and screening. Austin WW Processing Facility	$0.48	$240.00
		1	Environmental & Energy Recovery Fee		$92.56
		1	Fuel Surcharge		$43.20

Pay your bill online at:

www.wastewaterts.com

Customer ID: 128279

Remit To: 826 Linger Ln, Austin, TX 78721

For more information on fees and surcharges click here.

Invoice Total	$1,215.76
Invoice Balance	$1,215.76

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Crossroads Utility Services

Inv # 8638-6
BCycle JULY 2022
SvrOrd# 349160
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-OPER
District: CITY OF ROLLINGWOOD
Location: CORW - LS4 - ROCKWAY COVE
Reported By:
Telephone Number:
LIFT STATION
Date Completed: 07/13/22
Description of Work Performed:
SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WWTS CLEAN THE WET WELL

Description	Qty	Price	Amount
Subcontract			
WWTS - 11117974	1.00	1,398.1240	1,398.12
Subcontract			**1,398.12**
Service Order Total:			**1,398.12**

Invoice
11117974
6/9/2022

826 Linger Ln
Austin TX 78721
(512) 973-8484

Bill To:

Crossroads Utility Services
2601 Forest Creek Drive
Round Rock TX 78665
United States

Service Location:

CORW Lift Station # 4
7 Rock Way Cove
Rollingwood TX 78746
United States

Terms	Due Date	PO #	Sales Rep
Net 60	8/22/2022	24139	House

Service Date	Manifest	Quantity	Item	Rate	Amount
6/9/2022	Cleaning lift station to remove solids, rags, grease, grit and debris.				
6/9/2022		1.75	Service (hrs): Vactor Truck Unit: 6138	$185.00	$323.75
6/9/2022	RM	1.75	Labor (hrs): Vactor Truck Operator	$60.00	$105.00
6/9/2022	JM/AG	1.75	Labor (hrs): Additional Personnel/Equipment	$50.00	$87.50
6/9/2022	Assist cleaning, by pumping wastewater, offloading Vactor and transportation of waste to disposal site.				
6/9/2022		1.75	Service (hrs): Bobtail Vacuum Truck Unit: 2101	$125.00	$218.75
6/9/2022	NB	1.75	Labor (hrs): Vacuum Truck Operator	$60.00	$105.00
6/9/2022	1214420 NB	500	Disposal (gal): Wastewater with heavy solids, grease, grit, rags and debris requiring solidification and screening. Austin WW Processing Facility	$0.48	$240.00
		1	Environmental & Energy Recovery Fee		$92.56
		1	Fuel Surcharge		$43.20

Pay your bill online at:

www.wastewaterts.com

Customer ID: 132874

Remit To: 826 Linger Ln, Austin, TX 78721

For more information on fees and surcharges click here.

Invoice Total	$1,215.76
Invoice Balance	$1,215.76

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Crossroads Utility Services

Inv #	8638-7
BCycle	JULY 2022
SvrOrd#	349163
Page #	1

Invoice Date: 08/10/22 **Department:** SUB-OPER

District: CITY OF ROLLINGWOOD

Location: CORW - LS5 - VALE DR

Reported By:

Telephone Number:

LIFT STATION

Date Completed: 07/13/22

Description of Work Performed:

SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING

Description	Qty	Price	Amount
Subcontract			
WWTS -11117971	1.00	1,398.1240	1,398.12
Subcontract			**1,398.12**
Service Order Total:			**1,398.12**

WASTEWATER WWTS TRANSPORT SERVICES

826 Linger Ln
Austin TX 78721
(512) 973-8484

Invoice
11117971
6/9/2022

Bill To:

Crossroads Utility Services
2601 Forest Creek Drive
Round Rock TX 78665
United States

Service Location:

CORW Lift Station # 5
101 Vale Street
Rollingwood TX 78746
United States

Terms	Due Date	PO #	Sales Rep
Net 60	8/22/2022	24140	House

Service Date	Manifest	Quantity	Item	Rate	Amount
6/9/2022	Cleaning lift station to remove solids, rags, grease, grit and debris.				
6/9/2022		1.75	Service (hrs): Vactor Truck Unit: 6138	$185.00	$323.75
6/9/2022	RM	1.75	Labor (hrs): Vactor Truck Operator	$60.00	$105.00
6/9/2022	JM/AG	1.75	Labor (hrs): Additional Personnel/Equipment	$50.00	$87.50
6/9/2022	Assist cleaning, by pumping wastewater, offloading Vactor and transportation of waste to disposal site.				
6/9/2022		1.75	Service (hrs): Bobtail Vacuum Truck Unit: 2101	$125.00	$218.75
6/9/2022	NB	1.75	Labor (hrs): Vacuum Truck Operator	$60.00	$105.00
6/9/2022	1214417 NB	500	Disposal (gal): Wastewater with heavy solids, grease, grit, rags and debris requiring solidification and screening. Austin WW Processing Facility	$0.48	$240.00
		1	Environmental & Energy Recovery Fee		$92.56
		1	Fuel Surcharge		$43.20

Pay your bill online at:

www.wastewaterts.com

Customer ID: 132876

Remit To: 826 Linger Ln, Austin, TX 78721

For more information on fees and surcharges click here.

Invoice Total	$1,215.76
Invoice Balance	$1,215.76

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Crossroads Utility Services

Inv # 8638-8
BCycle JULY 2022
SvrOrd# 349167
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-OPER
District: CITY OF ROLLINGWOOD
Location: CORW - LS7 - NIXON DRIVE
Reported By:
Telephone Number:
LIFT STATION
Date Completed: 07/13/22
Description of Work Performed:
SUBCONTRACT WORK COMPLETED AT FACILITY - MONITORED WET WELL CLEANING

Description	Qty	Price	Amount
Subcontract			
WWTS -11117972	1.00	1,398.1240	1,398.12
Subcontract			**1,398.12**
Service Order Total:			**1,398.12**

32.

Invoice
11117972
6/9/2022

826 Linger Ln
Austin TX 78721
(512) 973-8484

Bill To:

Crossroads Utility Services
2601 Forest Creek Drive
Round Rock TX 78665
United States

Service Location:

CORW Lift Station # 7
312 Nixon Drive
Rollingwood TX 78746
United States

Terms	Due Date	PO #	Sales Rep
Net 60	8/22/2022	24142	House

Service Date	Manifest	Quantity	Item	Rate	Amount
6/9/2022	Cleaning lift station to remove solids, rags, grease, grit and debris.				
6/9/2022		1.75	Service (hrs): Vactor Truck Unit: 6138	$185.00	$323.75
6/9/2022	RM	1.75	Labor (hrs): Vactor Truck Operator	$60.00	$105.00
6/9/2022	JM/AG	1.75	Labor (hrs): Additional Personnel/Equipment	$50.00	$87.50
6/9/2022	Assist cleaning, by pumping wastewater, offloading Vactor and transportation of waste to disposal site.				
6/9/2022		1.75	Service (hrs): Bobtail Vacuum Truck Unit: 2101	$125.00	$218.75
6/9/2022	NB	1.75	Labor (hrs): Vacuum Truck Operator	$60.00	$105.00
6/9/2022	1214418 NB	500	Disposal (gal): Wastewater with heavy solids, grease, grit, rags and debris requiring solidification and screening. Austin WW Processing Facility	$0.48	$240.00
		1	Environmental & Energy Recovery Fee		$92.56
		1	Fuel Surcharge		$43.20

Pay your bill online at:

www.wastewaterts.com

Customer ID: 132875

Remit To: 826 Linger Ln, Austin, TX 78721

For more information on fees and surcharges click here.

Invoice Total	$1,215.76
Invoice Balance	$1,215.76

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Crossroads Utility Services

Inv # 8638-9
BCycle JULY 2022
SvrOrd# 343452
Page # 1

Invoice Date: 08/10/22 **Department:** LEAKS
District: CITY OF ROLLINGWOOD
Location: 2612 ROLLINGWOOD DRIVE
Reported By: ATTAL JR SAM A **Telephone Number:**
WATER DISTRIBUTION
Date Completed: 07/06/22

Description of Work Performed:

DUG AND EXPOSED THE MAIN LINE THAT WAS LEAKING FROM COUPLING. WE REMOVED 10 FT OF PVC LINE TO MAKE REPAIR. MADE THE REPAIR AND BACKFILLED. (ROLLINGWOOD INVENTORY).

	Description	Qty	Price	Amount
Material				
	GRAVEL 211540	1.00	140.7600	140.76
	6" C900 020614B	1.00	195.6150	195.62
	Material			**336.38**
	Service Order Total:			**336.38**

Crossroads Utility Services

Inv # 8638-10
BCycle JULY 2022
SvrOrd# 343950
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-MAINT
District: CITY OF ROLLINGWOOD
Location: 2810 PICKWICK LN
Reported By: HASSO, RONALD **Telephone Number:**
WATER DISTRIBUTION
Date Completed: 07/06/22

Description of Work Performed:

ASPHALT AFTER REPAIR. PREPPED FOR NEW ASPHALT FOR NEXT DAY WORK.

	Description	Qty	Price	Amount
Material				
	RED TRU FUEL 301027210180	1.00	27.5770	27.58
	Material			**27.58**
		Service Order Total:		**27.58**

Crossroads Utility Services

Inv # 8638-11
BCycle JULY 2022
SvrOrd# 345059
Page # 1

Invoice Date: 08/10/22 **Department:** EXCAVATIONS
District: CITY OF ROLLINGWOOD
Location: 2810 PICKWICK LN
Reported By: HASSO, RONALD **Telephone Number:**
WATER DISTRIBUTION
Date Completed: 07/06/22

Description of Work Performed:

EXCAVATION WORK COMPLETED. EXPOSED MAIN LINE AND CAPPED THE LINE OFF. BACKFILLED HOLE AND CLEANED.

	Description	Qty	Price	Amount
Material				
	LOWE'S 02981	1.00	51.6695	51.67
	Material			**51.67**
	Service Order Total:			**51.67**

LOWE'S

LOWE'S HOME CENTERS, LLC
12611 SUITE 100 SHOPS PKWY
BEE CAVE, TX 78738 (512) 634-4432

- SALE -

SALES#: S1948RL3 1467981 TRANS#: 2512588 05-02-22

10437 QUIKRETE 50-LB FAST-SET C		28.35
5.97	DISCOUNT EACH	-0.30
	5 @ 5.67	
23927 4-IN PVC DWV CAP		13.58
14.28	DISCOUNT EACH	-0.70
	SUBTOTAL:	41.93
	TAX:	3.46
INVOICE 02981	TOTAL:	45.39
	LAR:	45.39

TOTAL DISCOUNT: 2.20

LAR:XXXXXXXXXXXX6889 AMOUNT:45.39 AUTHCD:000855
KEYED REFID:090041 05/02/22 12:30:19
LAR PO: PICKWICK
ACCOUNT NAME:
CROSSROADS UTILITY SERVICE
AUTH BUYER: DUNCAN ADRIAN

ACCOUNT WILL BE BILLED UPON MERCHANDISE TRANSACTION DATE FOR STOCK MERCHANDISE AND NO LATER THAN 90 DAYS FROM TRANSACTION DATE FOR SOS OR DIRECT DELIVERY MERCHANDISE.

STORE: 1948 TERMINAL: 02 05/02/22 12:30:26
OF ITEMS PURCHASED: 6
EXCLUDES FEES, SERVICES AND SPECIAL ORDER ITEMS

THANK YOU FOR SHOPPING LOWE'S.

FOR DETAILS ON OUR RETURN POLICY, VISIT
LOWES.COM/RETURNS
A WRITTEN COPY OF THE RETURN POLICY IS AVAILABLE
AT OUR CUSTOMER SERVICE DESK

STORE MANAGER: MOE IDELBI

LOWE'S PRICE PROMISE
FOR MORE DETAILS, VISIT LOWES.COM/PRICEPROMISE

SHARE YOUR FEEDBACK!
ENTER FOR A CHANCE TO BE
ONE OF FIVE ... WINNERS DRAWN MONTHLY

Crossroads Utility Services

Inv # 8638-12
BCycle JULY 2022
SvrOrd# 346522
Page # 1

Invoice Date: 08/10/22 **Department:** SUB-MAINT
District: CITY OF ROLLINGWOOD
Location: 2810 PICKWICK LN
Reported By: HASSO, RONALD
Telephone Number:
WATER DISTRIBUTION
Date Completed: 07/06/22
Description of Work Performed:
ASPHALT AFTER REPAIR.

	Description	Qty	Price	Amount
Material				
	TEXAS MATERIALS 265544	1.00	134.8375	134.84
	Material			**134.84**
		Service Order Total:		**134.84**

A CRH COMPANY

Date:	05/13/2022 10:16:04 am		
Location:	**04267 - Manor Plant**	Tax:	TX227659 - Manor Tax
Customer:	**104267 COD 04267 Manor Plant**	Pay:	Cash
Order:	**65363814 - IRONHORSE ASPHALT FOB**	Job:	CROSSROADS UTILI'
Vehicle:	**1 - 1**	P.O.:	CC ONF ILE
Carrier:	**IND - Independent Haul**	Disp.:	75200
Product:	**213015 - D MIX R 64-22**	Quant.:	**4.69 Ton**

Picked Up

	Pounds	Tons
Gross	23140	11.57
Tare	13760	6.88
Net	9380	4.69

CROSSROADS UTILITIES Pickwood Rollingwood
S.O # 346236
S.O # 346238
S.O # 343949

	Today
Loads:	2
Received:	12.89

Pricing

Price:	75.00	351 75
Freight:	0.00	0.00
ESC:		0.00
Tax:	TX227659	29.02
Total:		380.77

Received: ____________________

Dispatch: 1 4.69

Weighmaster: Jonathan Garcia

This is to certify that the material herein described meets the applicable contract specifications and requirements

CUSTOMER COPY

TEXAS MATERIALS A CRH COMPANY

Manor Plant

Thank you for your business!

265544

Date:	05/13/2022 10:16:04 am		
Location:	**04267 - Manor Plant**	Tax:	TX227659 - Manor Tax
Customer:	**104267 COD 04267 Manor Plant**	Pay:	Cash
Order:	**65363814 - IRONHORSE ASPHALT FOB**	Job:	CROSSROADS UTILI'
Vehicle:	**1 - 1**	P.O.:	CC ONF ILE
Carrier:	**IND - Independent Haul**	Disp.:	75200
Product:	**213015 - D MIX R 64-22**	Quant.:	**4.69 Ton**

Picked Up

	Pounds	Tons
Gross	23140	11.57
Tare	13760	6.88
Net	9380	4.69

CROSSROADS UTILITIES

	Today
Loads:	2
Received:	12.89

Pricing

Price:	75.00	351.75
Freight:	0.00	0.00
ESC:		0.00
Tax:	TX227659	29.02
Total:		380.77

Received: ____________________

Dispatch: 1 4.69

Weighmaster: Jonathan Garcia

This is to certify that the material herein described meets the applicable contract specifications and requirements.

CUSTOMER COPY

Crossroads Utility Services

Inv # 8638-13
BCycle JULY 2022
SvrOrd# 350743
Page # 1

Invoice Date: 08/10/22 **Department:** EXCAVATIONS
District: CITY OF ROLLINGWOOD
Location: 2800 HUBBARD CIR
Reported By: ANDREWS JOHN **Telephone Number:**
WATER DISTRIBUTION
Date Completed: 07/12/22

Description of Work Performed:

EXCAVATED & REPAIRED WATER MAIN. FOUND WATER MAIN LEAK IN CUSTOMERS BACKYARD. EXPOSED 4" MAIN, FOUND A PINHOLE ON LINE, CLEANED THE PIPE AND USED A CIRCLE CLAMP FOR REPAIR. BACKFILLED HOLE.

	Description	Qty	Price	Amount
Material				
	4" CIRCLE CLAMP 2226050007	1.00	196.7995	196.80
	RAGS 509267	1.00	3.5880	3.59
	Material			**200.39**
		Service Order Total:		**200.39**

Crossroads Utility Services

Inv # 8638-14
BCycle JULY 2022
SvrOrd# 344807
Page # 1

Invoice Date: 08/10/22 **Department:** SANITARY

District: CITY OF ROLLINGWOOD

Location: 3 WESTGATE CIR

Reported By: BYRNE, CLAY **Telephone Number:**

WASTEWATER COLLECTION

Date Completed: 07/06/22

Description of Work Performed:

GRINDER PUMP PROBLEM. HASTING CONTACTED CUTOMER AT 7:30 AM ON 3/9. ON-CALL DISPATCHED TO CITY STAFF INSTEAD OF MAKING A SPECIAL TRIP. CITY ASSESSED AND REQUESTED HYDRO SOURCE. HYDRO SOURCE: STATION FULL, TRANSFERED TO TRASH CANS. PUMP WAS IN OVERPRESSURE; CABLE BAD, PULLED NEW CABLE AND SWITCH PUMP WIOTH SPARE PUMP. INSTALLED NEW VENT CAP ON LID.

Description	Qty	Price	Amount
Subcontract			
HYDRO SOURCE 5149	1.00	3,443.1000	3,443.10
Subcontract			**3,443.10**
Service Order Total:			**3,443.10**

Hydro Source Services, Inc.
14 Applegate Cir
Round Rock, TX 78665 US
+1 5129144298
accounting@hydrosourcetx.com

INVOICE

BILL TO	SHIP TO	
CROSSROADS UTILITY SERVICES, LLC 2601 FOREST CREEK DRIVE ROUND ROCK, TX 78665 USA	ROLLINGWOOD 2601 FOREST CREEK DRIVE ROUND ROCK, TX 78665 USA	**INVOICE #** 5149 **DATE** 05/04/2022 **TERMS** Net 30

PO
23543

ITEM	DESCRIPTION	QTY	EACH	EXTENDED
LABOR	CERTIFIED SERVICE TECHNICIAN 3 Westgate Cir, Austin, TX 78746 PO#23543 IN: GH583446 OUT: 2000's(DECOM) Replaced w/ WH774814 03/10/2022, 12:57 PM Station was over full on arrival, had to transfer east to trash cans to access the discharge found the pump was goin in over pressure, 26.8 amps it's a 2000 series pump , cable megged bad , tried to pull new PSC in but in able to so ran on top of the ground , pulled pump N dropped rolling wood spare in , tested station 240 v 5.8 amps installed a new mushroom cap transferred east back to station Last Thursday, 4:00 PM Pump replaced with new. Ready as Rollingwood spare.	4	125.00	500.00
PARTS	CTV2 - MUSHROOM VENT WITH ACTIVATED CARBON 1 unit $71.00 ND0036G06 - SUPPLY CABLE, 32' LENGTH 1 unit $173.00	1	244.00	244.00T
U200A08AAA	SD-UH, 48" FLEX, NO SC W/ WARRANTY	1	2,250.00	2,250.00T

Thank you for your business. Please contact us with any questions or concerns.

SUBTOTAL	2,994.00
TAX	0.00
TOTAL	2,994.00
BALANCE DUE	**$2,994.00**

CITY OF ROLLINGWOOD

PAYMENT AUTHORIZATION

Date: 9/7/2022

Vendor: ATS Engineers/Inspectors/Surveyors
4910 West Hwy 290
Austin, TX 78735

Vendor ID: ATS

Budget Code: See below

Invoice #: See below

Invoice Date: See below

Account No. Rollingwood

Nature of expense/expenditure:

Justification of expense/expenditure:

MIP		Description		INCODE	Quanity		Extended Cost
Inv #402228	100/5200/15	Building Plan Reviews	7/1/2022	100-5-15-5251	1	$0.00	$0.00
Inv #I-1111584	100/5251/15	Inspections	8/31/2022	100-5-15-5200	1	$2,625.00	$2,625.00
					1	$0.00	$0.00
					1	$0.00	$0.00
					1	$0.00	$0.00
					1	$0.00	$0.00
					1	$0.00	$0.00
						0	
						TOTAL COST	$2,625.00

Approved by:

Department Supervisor: Date:

Finance Dept: Date: 09/07/22

City Secretary: Date:

City Administrator: AW Date: 9/9/22

32.

ATS
Engineers | Inspectors | Surveyors

DATE	INVOICE
8/31/2022	I-1111584

City of Rollingwood
Attn: City Administrator
403 Nixon Drive
Rollingwood, TX 78746

P.O. #:	DUE DATE
	9/30/2022

DESCRIPTION	AMOUNT
Frame Inspection (Failed - 8/23/2022) at 1003 Ewing Cir, Rollingwood	65.00
Pool Steel Bonding nspection (Passed - 8/10/2022) at 104 Laura Lane, Rollingwood	65.00
Water-Sewer Inspection (Passed - 8/19/2022) at 205 Ashworth, Rollingwood	65.00
Meeting Inspection (Completed - 8/2/2022) at 208 Ashworth, Rollingwood	95.00
Water Line Inspection (Passed - 8/12/2022) at 208 Ashwood Dr, Rollingwood	65.00
Electrical Rough Inspection (Passed - 8/18/2022) at 2785 #325 Bee Caves Rd, Rollingwood (Commercial)	75.00
Final Inspection (Passed - 8/25/2022) at 2785 Ste 325 Bee Cave Rd, Rollingwood	75.00
Water-Sewer Inspection (Passed - 8/23/2022) at 2801 Hubbard, Rollingwood	65.00
Frame Inspection (Failed - 8/23/2022) at 2801 Hubbard, Rollingwood	65.00
Frame Inspection (Passed - 8/3/2022) at 2802 Bee Caves Rd, Rollingwood	75.00
Wallboard Inspection (Partial Passed - 8/23/2022) at 2802 Bee Cave Rd, Rollingwood	65.00
Plumbing Topout Inspection (Failed - 8/10/2022) at 3020 Hatley Drive, Rollingwood	65.00
Frame-Mechanical Inspection (Correct and Proceed - 8/16/2022) at 3020 Hatley Drive, Rollingwood	65.00
Plumbing Topout Reinspection (Passed - 8/16/2022) at 3020 Hatley Drive, Rollingwood	65.00
Mechanical Inspection (Passed - 8/16/2022) at 3101 Bldg 260 Fl 2 Bee Caves Rd, Rollingwood	75.00
Electrical Rough Inspection (Passed - 8/17/2022) at 3101 Ste 260 Fl 2 Bee Cave Rd, Rollingwood	75.00
	Payments/Credits

Balance Due

32.

ATS

Engineers | Inspectors | Surveyors

DATE	INVOICE
8/31/2022	I-1111584

City of Rollingwood
Attn: City Administrator
403 Nixon Drive
Rollingwood, TX 78746

P.O. #:	DUE DATE
	9/30/2022

DESCRIPTION	AMOUNT
T Bar Inspection (Passed - 8/17/2022) at 3101 Ste 260 Fl 2 Bee Cave Rd, Rollingwood	75.00
Post Demo Inspection (Passed - 8/8/2022) at 3202 Pick Wick, Rollingwood	65.00
Mechanical, Electrical and/or Plumbing Inspection (Failed - 8/24/2022) at 3207 Park Hills, Rollingwood	65.00
Mechanical, Electrical and/or Plumbing Inspection (Correct and Proceed - 8/26/2022) at 3207 Park Hills, Rollingwood	65.00
Sheathing Inspection (Passed - 8/9/2022) at 3220 Park Hills Drive, Rollingwood	65.00
Mechanical, Electrical and/or Plumbing Inspection (Partial Passed - 8/31/2022) at 3220 Park Hills Drive, Rollingwood	65.00
Yardline Inspection (Passed - 8/31/2022) at 3220 Park Hills Drive, Rollingwood	65.00
Post Demo Inspection (Passed - 8/31/2022) at 4 Westgate Circle, Rollingwood	65.00
Inspection (Passed - 8/26/2022) at 401 Vale St, Rollingwood	65.00
Rain Collection Inspection (Passed - 8/2/2022) at 404 Inwood, Rollingwood	65.00
Post Demo Inspection (Passed - 8/11/2022) at 404 Inwood, Rollingwood	65.00
Copper Inspection (Passed - 8/9/2022) at 4826 Rollingwood Dr., Rollingwood	65.00
Driveway Inspection (Passed - 8/29/2022) at 4904 Rollingwood Dr., Rollingwood	65.00
Gas Inspection (Passed - 8/1/2022) at 5 Randolph Pl, Rollingwood	65.00
Fence Inspection (Passed - 8/15/2022) at 5008 Rollingwood Dr., Rollingwood	65.00
Sheathing Inspection (Failed - 8/3/2022) at 5014 Timberline Drive, Rollingwood	65.00
Sheathing Reinspection (Passed - 8/11/2022) at 5014 Timberline Drive, Rollingwood	65.00
	Payments/Credits

	Balance Due

ATS

Engineers | Inspectors | Surveyors

DATE	INVOICE
8/31/2022	I-1111584

City of Rollingwood
Attn: City Administrator
403 Nixon Drive
Rollingwood, TX 78746

P.O. #:	DUE DATE
	9/30/2022

DESCRIPTION	AMOUNT
Stucco and Lath Inspection (Completed - 8/4/2022) at 601 Riley Road, Rollingwood	65.00
Frame-Mechanical-Electrical-Plumbing Inspection (Passed - 8/5/2022) at 601 Riley Road, Rollingwood	65.00
Stucco and Lath Inspection (Passed - 8/5/2022) at 601 Riley Road, Rollingwood	65.00
Frame-Mechanical-Electrical-Plumbing Inspection (Passed - 8/5/2022) at 601 Riley Road, Rollingwood	65.00
Mechanical Inspection (Passed - 8/10/2022) at 601 Riley Road, Rollingwood	65.00
Copper Inspection (Passed - 8/1/2022) at 603 Riley Road, Rollingwood	65.00
Sales Tax	0.00
	Payments/Credits $0.00

We accept cash, checks, Visa, Master Card, American Express, and Discover. You may call 512.328.6995 to charge by phone. A late fee will be added to the invoice total for $15.00 or 10% of the invoice balance, whichever the greater, if payment is not received immediately.

Balance Due	$2,625.00

CITY OF ROLLINGWOOD, TEXAS

PAYMENT AUTHORIZATION

Date: 9/2/2022

Budget Code: See Below

Vendor: K Friese & Associates, Inc.
1120 South Capital of Texas Hwy
City View 2, Suite 100
Austin, TX 78746

Invoice No. See Below
Invoice Date See Below
Acct No. City of Rollingwood

Vendor Code: K Friese

Nature of Expense/Expenditure: Engineering Services

Justification of Expense/Expenditure:

	MIP	INCODE	Description	Quantity	Unit Cost	Extended Cost
Inv #2207061	100/5270/10	100-5-10-5270	General Engineering	1	$ 2,452.50	$ 2,452.50
(08/09/2022)	100/5332/10	100-5-10-5332	RLWD Infrastructure Improve. Plan	1	$ -	$ -
	702/5485/35	702-5-35-5485	Rollingwood MS4	1	$ 135.00	$ 135.00
	100/5252/15	100-5-15-5252	Zoning Reviews	1	$ 3,622.50	$ 3,622.50
	702/5270/35	702-5-35-5270	Drainage	1	$ 5,551.38	$ 5,551.38
	702/5321/35	702-5-35-5221	Nixon-Pleasant Dainage Improv	1	$ -	$ -
	702/5322/35	702-5-35-5222	Hubbard-Hatley-Pickwick Drainage Improv	1	$ -	$ -
		702-5-35-5270	StormwaterGIS	1	$ 510.00	$ 510.00
		200-5-60-5270	General Engineering	1	$ 835.00	$ 835.00
		800-5-60-5270	General Engineering	1	$ -	$ -
		100-5-15-5270	General Engineering	1	$ 6,357.50	$ 6,357.50
		100-5-30-5270	General Engineering	1	$ -	$ -
		100-5-15-5010	Training	1	$ -	$ -
Inv #2204096		100-2008	ACCOUNTS PAYABLE	1	$ -	$ -
(05/12/2022)		200-2008	ACCOUNTS PAYABLE	1	$ -	$ -
		702-2008	ACCOUNTS PAYABLE	1	$ -	$ -
		800-2008	ACCOUNTS PAYABLE	1	$ -	$ -
Inv #2112075		200-5-60-5272	Water CIP	1	$ -	$ -
Inv #		702-5-35-5221	Nixon-Pleasant Dainage Improv	1	$ -	$ -
					Total	$ 19,463.88

Received By: Date:

City Secretary: Date:

Finance Dept: Date: 9/2/2022

City Administrator: AW Date: 9/9/22

Inv. Date 8/9/2022
Inv No. 2207061

100-5-30-5270	100-5-15-5252	702-5-35-548	200-5-60-527	800-5-60-5	100-5-10-5270	100-5-15-5270	702-5-35-5270	702-5-35-5270	702-5-35-5221	702-5-35-5222	200-5-60-5272	
Streets	Zoning Review	MS4	W	WW	General Eng.	Dev Svcs	Drainage Rev	Stormwater GIS	Nixon/Pleasant - S	Hubbard/Hat/Pick	Water CIP	Total
	$ 270.00	$ 135.00	$ 835.00		$ 2,452.50	$ 6,332.50	$ 1,891.38	$ 510.00				$ 19,463.88
	$ 425.00					$ 25.00	$ 135.00					$ (19,463.88)
	$ 90.00						$ 45.00					$ -
	$ 90.00						$ 90.00					
	$ 285.00						$ 45.00					
	$ 240.00						$ 90.00					
	$ 90.00						$ 200.00					
	$ 277.50						$ 145.00					
	$ 297.50						$ 355.00					
	$ 180.00						$ 855.00					
	$ 475.00						$ 90.00					
	$ 360.00						$ 145.00					
	$ 542.50						$ 317.50					
							$ 755.00					
							$ 392.50					
$ -	$ 3,622.50	$ 135.00	$ 835.00	$ -	$ 2,452.50	$ 6,357.50	$ 5,551.38	$ 510.00	$ -	$ -	$ -	

100-5-30-5270	Streets	$ -
100-5-15-5252	Zoning Review	$ 3,622.50
702-5-35-5485	MS4	$ 135.00
200-5-60-5270	W	$ 835.00
800-5-60-5270	WW	$ -
100-5-10-5270	General Eng.	$ 2,452.50
100-5-15-5270	Dev Svcs	$ 6,357.50
702-5-35-5270	Drainage Rev	$ 5,551.38
702-5-35-5270	Stormwater GIS	$ 510.00
702-5-35-5221	Nixon/Pleasant	$ -
702-5-35-5222	Hub/Hat/Pick	$ -
200-5-60-5272	Water CIP	$ -
100-5-15-5010	Training	$ 3,000.00
		$ 22,463.88

K•FRIESE
+ ASSOCIATES
PUBLIC PROJECT ENGINEERING

City of Rollingwood
ATTN: Ashley Wayman
403 Nixon
Rollingwood, Texas 78746

Invoice Date August 9, 2022
Invoice No. 2207061

Project Name:	KFA Project No.	Current Invoice Amount	Period Covered
Rollingwood General Engineering Services	0764	$ 19,463.88	July 2022
	Total this Invoice	$ 19,463.88	

Rollingwood General Engineering Services
Monthly Progress Report

K Friese & Associates, Inc.

1120 S. Capital of Texas Highway, CityView 2, Suite 100, Austin, Texas 78746

Client: City of Rollingwood
Invoice No.: 2207061
Project Description: General Engineering Services
Project Reporting Period: July 1, 2022 – July 31, 2022
Project Manager: Lauren Winek, PE

Project	Project Summary	Status	Next steps
WA03 Hubbard, Hatley, Drainage Improvements PS&E	Preparation of plans, specifications and estimates for the development of a construction bid package. Option 2 from the PER has been selected as the preferred option which proposes to construct a storm drain system from the creek at Almarion Way extending upstream to Hatley, Hubbard and Pickwick.	Intention will be to bid this package together with the Nixon/Pleasant project. Easement coordination, design, coordination with City staff. .	Final design in Progress. Easement/homeowner coordination.
WA04 Nixon/Pleasant Drainage Improvements PS&E	Preparation of plans, specifications and estimates for the development of a construction bid package. This will include channel improvements and Segment 1 of the storm sewer improvements.	Intention will be to bid this package together with the Hubbard/Hatley project. Easement coordination with City staff and property owners. Marking easement and improvement location in the field Addressing property owner concerns.	Easement coordination.
General	Coordination with City staff regarding on-going development review services, engineering services, monthly report preparation and attendance of meetings at City's request.	On-Going. Bi-weekly meetings. City timeline of occurring activities.	Regular recurring activities

Project	Project Summary	Status	Next steps
Development Services	Coordination with City staff regarding on-going development services, MyPermitNow Support, and meeting with staff and applicants as requested.	Building and development services and coordination with staff. MyPermitNow (MPN) support and coordination with Development Services Manager. Entering permits into MPN.	Continued coordination and support.
Water/Wastewater System Modeling & Mapping Updates	Data gathering and review of water/wastewater system infrastructure mapping. Develop/update wastewater and water system model updates to evaluate current and future system capacity needs. Utilize model to plan for infrastructure repairs, upgrades, and future growth needs.	Ongoing GIS quarterly update. Reviewing water model and low-pressure concerns.	Updating models as needed.
Water/Wastewater System	Coordination/support with Crossroads regarding infrastructure such as valves, pressure planes, and infrastructure.	On-going data collection. Water emergency preparedness plan (EPP) preparation and submittal. Raw water contract discussion with LCRA.	Continue coordination to support mapping and KFA modeling efforts.
Stratford Drive / Riley Road Traffic Reconfiguration	Reconfigure City of Austin intersection at Stratford and Riley to prevent traffic from Zilker Park cutting across neighborhood. Explore potential traffic calming solutions. City/KFA coordination with City of Austin on design solution.	Approval and Implementation by City of Austin.	None.
GIS	KFA to send quarterly updates for the City GIS layers.	On-going Third party infrastructure layer.	GIS exhibits and mapping updates as needed. Quarterly Update September 2022.
MS4 Compliance	Coordination with City staff on compliance with the Storm Water Management Permit for the 2022 calendar year.	On-going Continue coordination and compliance efforts for permit compliance.	Continue compliance coordination for 2022. Council presentation.

K Friese & Associates, Inc.
1120 South Capital of Texas Highway
CityView 2, Suite 100
Austin, Texas 78746
(512) 338-1704

August 9, 2022
Project No: 0764
Invoice No: 2207061

Ashley Wayman
City of Rollingwood
403 Nixon
Rollingwood, TX 78746

Project 0764 Rollingwood General Engineering Services

Professional Services from July 1, 2022 to July 31, 2022

Task 100 General Engineering

Professional Personnel

	Hours	Rate	Amount	
Aguilar, Javier	.75	90.00	67.50	
Winek, Lauren	13.25	180.00	2,385.00	
Totals	14.00		2,452.50	
Total Labor				**2,452.50**
		Total this Task		**$2,452.50**

Task 101 Development Services

Professional Personnel

	Hours	Rate	Amount	
Angel, Selina	5.00	100.00	500.00	
Melland, Brandon	24.25	170.00	4,122.50	
Winek, Lauren	9.50	180.00	1,710.00	
Totals	38.75		6,332.50	
Total Labor				**6,332.50**
		Total this Task		**$6,332.50**

Task 102 Water

Professional Personnel

	Hours	Rate	Amount	
Blackburn, Gregory	1.50	180.00	270.00	
Densler, Allison	1.00	145.00	145.00	
Murphy, Dale	2.00	210.00	420.00	
Totals	4.50		835.00	
Total Labor				**835.00**
		Total this Task		**$835.00**

Task 105 MS4

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.75	180.00	135.00	
Totals	.75		135.00	
Total Labor				**135.00**

Total this Task		$135.00

Task 106 Drainage

Professional Personnel

	Hours	Rate	Amount	
Ballard, Anna	2.25	110.00	247.50	
Salinas, III, Abelardo	5.00	220.00	1,100.00	
Winek, Lauren	3.00	180.00	540.00	
Totals	10.25		1,887.50	
Total Labor				**1,887.50**

Reimbursable Expenses

Mileage	3.88	
Total Reimbursables	**3.88**	**3.88**
Total this Task		**$1,891.38**

Task 107 GIS

Professional Personnel

	Hours	Rate	Amount	
Stotts, Matthew	3.00	125.00	375.00	
Winek, Lauren	.75	180.00	135.00	
Totals	3.75		510.00	
Total Labor				**510.00**
Total this Task				**$510.00**

Task 300 Drainage Reviews General

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.75	180.00	135.00	
Totals	.75		135.00	
Total Labor				**135.00**
Total this Task				**$135.00**

Task 337 DR-08 South Peak

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.25	180.00	45.00	
Totals	.25		45.00	
Total Labor				**45.00**
Total this Task				**$45.00**

Task 352 DR-601 Riley

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.50	180.00	90.00	
Totals	.50		90.00	
Total Labor				**90.00**
Total this Task				**$90.00**

Task 355 DR-3220 Park Hills Drive

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.25	180.00	45.00	
Totals	.25		45.00	
Total Labor				**45.00**
			Total this Task	**$45.00**

Task 360 DR-3202 Pickwick Lane

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.50	180.00	90.00	
Totals	.50		90.00	
Total Labor				**90.00**
			Total this Task	**$90.00**

Task 374 DR-4 Michele Circle

Professional Personnel

	Hours	Rate	Amount	
Williams, Philip	1.00	110.00	110.00	
Winek, Lauren	.50	180.00	90.00	
Totals	1.50		200.00	
Total Labor				**200.00**
			Total this Task	**$200.00**

Task 377 DR-5015 Timberline

Professional Personnel

	Hours	Rate	Amount	
Williams, Philip	.50	110.00	55.00	
Winek, Lauren	.50	180.00	90.00	
Totals	1.00		145.00	
Total Labor				**145.00**
			Total this Task	**$145.00**

Task 378 DR-108 Kristi Drive

Professional Personnel

	Hours	Rate	Amount	
Hernandez, Aldo	2.00	110.00	220.00	
Winek, Lauren	.75	180.00	135.00	
Totals	2.75		355.00	
Total Labor				**355.00**
			Total this Task	**$355.00**

Task 382 DR-301 Pleasant Drive

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	4.75	180.00	855.00	
Totals	4.75		855.00	
Total Labor				**855.00**
			Total this Task	**$855.00**

Task 385 DR-4904 Rollingwood Drive

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	.50	180.00	90.00	
Totals	.50		90.00	
Total Labor				**90.00**
		Total this Task		**$90.00**

Task 390 DR – 2803 Pickwick

Professional Personnel

	Hours	Rate	Amount	
Williams, Philip	.50	110.00	55.00	
Winek, Lauren	.50	180.00	90.00	
Totals	1.00		145.00	
Total Labor				**145.00**
		Total this Task		**$145.00**

Task 391 DR – 3210 Pickwick

Professional Personnel

	Hours	Rate	Amount	
Hernandez, Aldo	1.25	110.00	137.50	
Winek, Lauren	1.00	180.00	180.00	
Totals	2.25		317.50	
Total Labor				**317.50**
		Total this Task		**$317.50**

Task 393 DR-301 Pleasant

Professional Personnel

	Hours	Rate	Amount	
Salinas, III, Abelardo	2.00	220.00	440.00	
Winek, Lauren	1.75	180.00	315.00	
Totals	3.75		755.00	
Total Labor				**755.00**
		Total this Task		**$755.00**

Task 394 DR – 400 Farley

Professional Personnel

	Hours	Rate	Amount	
Hernandez, Aldo	2.75	110.00	302.50	
Winek, Lauren	.50	180.00	90.00	
Totals	3.25		392.50	
Total Labor				**392.50**
		Total this Task		**$392.50**

Task 600 Zoning Review General

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	1.50	180.00	270.00	
Totals	1.50		270.00	
Total Labor				**270.00**

Total this Task **$270.00**

Task 625 625 - ZR-Western Hills Athletic Club

Professional Personnel

		Hours	Rate	Amount	
Melland, Brandon		2.50	170.00	425.00	
	Totals	2.50		425.00	
	Total Labor				**425.00**

Total this Task **$425.00**

Task 640 ZR-601 Riley Rd

Professional Personnel

		Hours	Rate	Amount	
Winek, Lauren		.50	180.00	90.00	
	Totals	.50		90.00	
	Total Labor				**90.00**

Total this Task **$90.00**

Task 641 ZR-3220 Park Hills Drive

Professional Personnel

		Hours	Rate	Amount	
Winek, Lauren		.50	180.00	90.00	
	Totals	.50		90.00	
	Total Labor				**90.00**

Total this Task **$90.00**

Task 644 ZR-3202 Pickwick Lane

Professional Personnel

		Hours	Rate	Amount	
Angel, Selina		1.50	100.00	150.00	
Winek, Lauren		.75	180.00	135.00	
	Totals	2.25		285.00	
	Total Labor				**285.00**

Total this Task **$285.00**

Task 657 ZR-4 Michele Circle

Professional Personnel

		Hours	Rate	Amount	
Angel, Selina		1.50	100.00	150.00	
Winek, Lauren		.50	180.00	90.00	
	Totals	2.00		240.00	
	Total Labor				**240.00**

Total this Task **$240.00**

Task 660 ZR-5015 Timberline

Professional Personnel

		Hours	Rate	Amount	
Winek, Lauren		.50	180.00	90.00	
	Totals	.50		90.00	
	Total Labor				**90.00**

Total this Task $90.00

Task 661 ZR-108 Kristi Drive

Professional Personnel

	Hours	Rate	Amount	
Hernandez, Aldo	1.75	110.00	192.50	
Melland, Brandon	.50	170.00	85.00	
Totals	2.25		277.50	
Total Labor				**277.50**
Total this Task				**$277.50**

Task 664 ZR-301 Pleasant Drive

Professional Personnel

	Hours	Rate	Amount	
Melland, Brandon	1.75	170.00	297.50	
Totals	1.75		297.50	
Total Labor				**297.50**
Total this Task				**$297.50**

Task 665 ZR-4904 Rollingwood Drive

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	1.00	180.00	180.00	
Totals	1.00		180.00	
Total Labor				**180.00**
Total this Task				**$180.00**

Task 670 ZR – 2803 Pickwick

Professional Personnel

	Hours	Rate	Amount	
Melland, Brandon	2.00	170.00	340.00	
Winek, Lauren	.75	180.00	135.00	
Totals	2.75		475.00	
Total Labor				**475.00**
Total this Task				**$475.00**

Task 673 ZR-301 Pleasant

Professional Personnel

	Hours	Rate	Amount	
Winek, Lauren	2.00	180.00	360.00	
Totals	2.00		360.00	
Total Labor				**360.00**
Total this Task				**$360.00**

Task 674 ZR – 400 Farley

Professional Personnel

	Hours	Rate	Amount
Hernandez, Aldo	2.50	110.00	275.00

		Hours	Rate	Amount	
Melland, Brandon		.25	170.00	42.50	
Winek, Lauren		1.25	180.00	225.00	
	Totals	4.00		542.50	
	Total Labor				**542.50**
			Total this Task		**$542.50**

Task 851 Plat Review General

Professional Personnel

		Hours	**Rate**	**Amount**	
Angel, Selina		.25	100.00	25.00	
	Totals	.25		25.00	
	Total Labor				**25.00**
			Total this Task		**$25.00**

Total this Invoice **$19,463.88**

	Current	**Prior**	**Total**
Billings to Date	**19,463.88**	**484,847.43**	**504,311.31**

Billing Backup

K Friese & Associates, Inc. Invoice 2207061

Project 0764 Rollingwood General Engineering Services

Task 100 General Engineering

Professional Personnel

			Hours	Rate	Amount	
183	Aguilar, Javier Monthly Invoicing	7/13/2022	.75	90.00	67.50	
141	Winek, Lauren coordinating with city on incoivng and inspectikons for several projects in construction	7/2/2022	.25	180.00	45.00	
141	Winek, Lauren Project task set up and coordinating with City on tasks	7/6/2022	.50	180.00	90.00	
141	Winek, Lauren invoice catgory finalizing and GIS correspondance on responsibilities of KFA and WSB	7/7/2022	.50	180.00	90.00	
141	Winek, Lauren bi-weekly meeting agenda, invoicing, progress report, Council Report	7/12/2022	2.50	180.00	450.00	
141	Winek, Lauren bi-weekly meeting	7/13/2022	1.50	180.00	270.00	
141	Winek, Lauren responding to council questions per City Admin direction	7/14/2022	.50	180.00	90.00	
141	Winek, Lauren estimated useful life of driange and water projects for bond, research for estimate for facilities pricing for bond, easement meeting and prep	7/19/2022	4.75	180.00	855.00	
141	Winek, Lauren bi-weekly meeting agenda, easement survey coordination/correspondance with City, project management, timeline	7/26/2022	.75	180.00	135.00	
141	Winek, Lauren bi-weekly meeting and finalizing city timeline	7/27/2022	1.75	180.00	315.00	
141	Winek, Lauren easement/survey coordination	7/28/2022	.25	180.00	45.00	
	Totals		14.00		2,452.50	
	Total Labor					**2,452.50**
				Total this Task		**$2,452.50**

Task 101 Development Services

Professional Personnel

			Hours	Rate	Amount
195	Angel, Selina Began and Completed Rollingwood Chapter 101 checklist, Sent to Brandon and Lauren for review, Began Rollingwood Checklist Chapter 107	7/19/2022	2.00	100.00	200.00
195	Angel, Selina Continued creating checklist for Chapter 107	7/21/2022	1.50	100.00	150.00
195	Angel, Selina Meeting with Rollingwood staff, Lauren and Brandon via teams	7/27/2022	1.50	100.00	150.00
187	Melland, Brandon MPN Permit entry and emails from customers.	7/1/2022	4.00	170.00	680.00
187	Melland, Brandon Permit Entry into MPN	7/3/2022	3.00	170.00	510.00
187	Melland, Brandon Permit Entry into MPN	7/5/2022	1.00	170.00	170.00

187	Melland, Brandon Call with D Adair and N. Dykes	7/7/2022	1.00	170.00	170.00
187	Melland, Brandon Review of Previous Permits for Compliance with Zoning Requirements	7/8/2022	1.50	170.00	255.00
187	Melland, Brandon Review of Timberline Ridge Replat and Call with A. Wayman	7/13/2022	1.00	170.00	170.00
187	Melland, Brandon Review Coordination and Call with Charlie Z. and A. Wayman	7/14/2022	.75	170.00	127.50
187	Melland, Brandon Brooke Brown Memo Rseponse	7/18/2022	.50	170.00	85.00
187	Melland, Brandon Brooke Brown Memo Rseponse	7/19/2022	1.25	170.00	212.50
187	Melland, Brandon General PM, and Calls with N. Dykes and A. Wayman	7/19/2022	.75	170.00	127.50
187	Melland, Brandon Coordination with A. Wayman RE; Code Amendment Cost Estimates	7/19/2022	.25	170.00	42.50
187	Melland, Brandon Brooke Brown Memo Rseponse	7/20/2022	.25	170.00	42.50
187	Melland, Brandon Call with A Wayman RE: Brooke Brown Memo and Code Amendment Cost Estimates	7/20/2022	.25	170.00	42.50
187	Melland, Brandon Attend City Council Meeting Virtually	7/20/2022	3.00	170.00	510.00
187	Melland, Brandon Preparation of Code Amendment Cost Estimates	7/20/2022	1.50	170.00	255.00
187	Melland, Brandon Project Management Meeting with Lauren and General Review of Open Cases in My Permit Now.	7/26/2022	1.50	170.00	255.00
187	Melland, Brandon Meeting with Staff	7/27/2022	1.50	170.00	255.00
187	Melland, Brandon Project Management Call with Lauren, and General Development Review Questions/emails from Staff	7/28/2022	1.00	170.00	170.00
187	Melland, Brandon Email and Calls with Desiree	7/29/2022	.25	170.00	42.50
141	Winek, Lauren WW service question correspondance, reviewing 601 Riley and 3225 Park Hills	7/5/2022	1.25	180.00	225.00
141	Winek, Lauren sewer tap question, curb and gutter questions, Tx gas lateral correspondance	7/6/2022	.75	180.00	135.00
141	Winek, Lauren 3225 Park HIlls and 601 Riley road council inquiries	7/10/2022	.25	180.00	45.00
141	Winek, Lauren Review status update email	7/11/2022	.25	180.00	45.00
141	Winek, Lauren Gathering surveyor information for building height survey and correspondance with the City	7/12/2022	.75	180.00	135.00
141	Winek, Lauren cut/fill questions and variance process coorespondance with City	7/14/2022	.50	180.00	90.00
141	Winek, Lauren weekly review status update email	7/16/2022	.50	180.00	90.00
141	Winek, Lauren Developer question responses, building height survey correspondance with City	7/18/2022	.50	180.00	90.00
141	Winek, Lauren council presentation of zoning discussion, discussion with Nikki on permitting	7/19/2022	1.00	180.00	180.00

141	Winek, Lauren	7/20/2022	.25	180.00	45.00	
	weekly review status email					
141	Winek, Lauren	7/25/2022	.50	180.00	90.00	
	Cut/Fill variance correspondance					
141	Winek, Lauren	7/26/2022	1.75	180.00	315.00	
	bond amount, demo permit, building height, and cantiliever discussions, MPN					
141	Winek, Lauren	7/27/2022	.75	180.00	135.00	
	MPN downloads, assigning permits, MPN processes					
141	Winek, Lauren	7/28/2022	.50	180.00	90.00	
	surety bond, MPN process					
	Totals		38.75		6,332.50	
	Total Labor					**6,332.50**

Total this Task **$6,332.50**

Task 102 Water

Professional Personnel

			Hours	Rate	Amount	
047	Blackburn, Gregory	7/6/2022	1.00	180.00	180.00	
	401 Inwood Water plans review, low pressure complaints					
047	Blackburn, Gregory	7/27/2022	.50	180.00	90.00	
	O&M list for W/WW systems					
081	Densler, Allison	7/5/2022	.50	145.00	72.50	
	401 Inwood, 404/406 Riley Rd water model review					
081	Densler, Allison	7/6/2022	.50	145.00	72.50	
	reviewing model, discussing results with Greg					
009	Murphy, Dale	7/26/2022	2.00	210.00	420.00	
	LCRA Mtg on Raw Water Supply					
	Totals		4.50		835.00	
	Total Labor					**835.00**

Total this Task **$835.00**

Task 105 MS4

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/26/2022	.75	180.00	135.00	
	MS4 permit noticing documents					
	Totals		.75		135.00	
	Total Labor					**135.00**

Total this Task **$135.00**

Task 106 Drainage

Professional Personnel

			Hours	Rate	Amount
209	Ballard, Anna	7/20/2022	.25	110.00	27.50
	Task discussion pertaining to Rollingwood drainage				
209	Ballard, Anna	7/21/2022	1.00	110.00	110.00

	Drainage					
209	Ballard, Anna	7/26/2022	1.00	110.00	110.00	
	meet with lauren; RW Drainage					
163	Salinas, III, Abelardo	7/19/2022	2.00	220.00	440.00	
	Nixon/Pleasant property owner meeting					
163	Salinas, III, Abelardo	7/20/2022	3.00	220.00	660.00	
	Council IIP presentation					
141	Winek, Lauren	7/19/2022	.50	180.00	90.00	
	Drainage infrastrucute meeting preparation for PW. Mapping out areas that need frequent sediment removal, areas of frequesnt flooding, etc.					
141	Winek, Lauren	7/20/2022	.50	180.00	90.00	
	IIP council update					
141	Winek, Lauren	7/26/2022	1.25	180.00	225.00	
	Drainage maintenance issues list, creating list/map for Public Works for drainage issues to look at throughout the City					
141	Winek, Lauren	7/28/2022	.75	180.00	135.00	
	survey coordiantion for marking easements for drainage project					
	Totals		10.25		1,887.50	
	Total Labor					**1,887.50**

Reimbursable Expenses

Mileage

EX 0004024	7/19/2022	Winek, Lauren	3.88	
	Total Reimbursables		**3.88**	**3.88**

Total this Task **$1,891.38**

Task 107 GIS

Professional Personnel

			Hours	Rate	Amount	
184	Stotts, Matthew	7/1/2022	.50	125.00	62.50	
	GIS: Data package for WSB					
184	Stotts, Matthew	7/12/2022	2.50	125.00	312.50	
	GIS: 3rd party infrastructure exhibit					
141	Winek, Lauren	7/12/2022	.75	180.00	135.00	
	quarterly GIS updates, 3rd party infrastructure map					
	Totals		3.75		510.00	
	Total Labor					**510.00**

Total this Task **$510.00**

Task 300 Drainage Reviews General

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/6/2022	.25	180.00	45.00	
	downloading new reviews and review team coordination					
141	Winek, Lauren	7/18/2022	.25	180.00	45.00	
	downloading reviews from MPN and assigning review					
141	Winek, Lauren	7/25/2022	.25	180.00	45.00	
	downloading new reviews and internal review coordination					
	Totals		.75		135.00	
	Total Labor					**135.00**

				Total this Task		**$135.00**

Task 337 DR-08 South Peak

Professional Personnel

			Hours	**Rate**	**Amount**	
141	Winek, Lauren	7/12/2022	.25	180.00	45.00	
	site inspection coorespondnce					
	Totals		.25		45.00	
	Total Labor					**45.00**
				Total this Task		**$45.00**

Task 352 DR-601 Riley

Professional Personnel

			Hours	**Rate**	**Amount**	
141	Winek, Lauren	7/20/2022	.50	180.00	90.00	
	pool review and issuing approval					
	Totals		.50		90.00	
	Total Labor					**90.00**
				Total this Task		**$90.00**

Task 355 DR-3220 Park Hills Drive

Professional Personnel

			Hours	**Rate**	**Amount**	
141	Winek, Lauren	7/20/2022	.25	180.00	45.00	
	drainage review of revised plans					
	Totals		.25		45.00	
	Total Labor					**45.00**
				Total this Task		**$45.00**

Task 360 DR-3202 Pickwick Lane

Professional Personnel

			Hours	**Rate**	**Amount**	
141	Winek, Lauren	7/28/2022	.50	180.00	90.00	
	review and emailing comments					
	Totals		.50		90.00	
	Total Labor					**90.00**
				Total this Task		**$90.00**

Task 374 DR-4 Michele Circle

Professional Personnel

			Hours	Rate	Amount	
179	Williams, Philip drainage review 3	7/11/2022	1.00	110.00	110.00	
141	Winek, Lauren qc and issuing approval	7/14/2022	.50	180.00	90.00	
	Totals		1.50		200.00	
	Total Labor					**200.00**
				Total this Task		**$200.00**

Task 377 DR-5015 Timberline

Professional Personnel

			Hours	Rate	Amount	
179	Williams, Philip drainage review 3	7/2/2022	.50	110.00	55.00	
141	Winek, Lauren qc and issuing approval letter	7/7/2022	.50	180.00	90.00	
	Totals		1.00		145.00	
	Total Labor					**145.00**
				Total this Task		**$145.00**

Task 378 DR-108 Kristi Drive

Professional Personnel

			Hours	Rate	Amount	
174	Hernandez, Aldo working through the third submittal review	7/26/2022	2.00	110.00	220.00	
141	Winek, Lauren drainage qc, easement correspondance with City	7/28/2022	.75	180.00	135.00	
	Totals		2.75		355.00	
	Total Labor					**355.00**
				Total this Task		**$355.00**

Task 382 DR-301 Pleasant Drive

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren drainage review and reviewing citizen concerns	7/5/2022	1.50	180.00	270.00	
141	Winek, Lauren drainage review and reviewing citizen concerns	7/7/2022	1.00	180.00	180.00	
141	Winek, Lauren reviewing comments with brandon	7/18/2022	.25	180.00	45.00	
141	Winek, Lauren Call with City and setting up meeting with engineer	7/26/2022	.50	180.00	90.00	
141	Winek, Lauren call with engineer and sending over plan sheets	7/27/2022	1.50	180.00	270.00	
	Totals		4.75		855.00	
	Total Labor					**855.00**

	Total this Task	**$855.00**

Task 385 DR-4904 Rollingwood Drive

Professional Personnel

			Hours	**Rate**	**Amount**	
141	Winek, Lauren review and issuing approval	7/14/2022	.50	180.00	90.00	
	Totals		.50		90.00	
	Total Labor					**90.00**

	Total this Task	**$90.00**

Task 390 DR – 2803 Pickwick

Professional Personnel

			Hours	**Rate**	**Amount**	
179	Williams, Philip drainage review 2	7/2/2022	.50	110.00	55.00	
141	Winek, Lauren qc and issuing approval letter	7/7/2022	.50	180.00	90.00	
	Totals		1.00		145.00	
	Total Labor					**145.00**

	Total this Task	**$145.00**

Task 391 DR – 3210 Pickwick

Professional Personnel

			Hours	**Rate**	**Amount**	
174	Hernandez, Aldo going over review 2 comments and research, confirm grading, check n values	7/5/2022	1.25	110.00	137.50	
141	Winek, Lauren review and issuing comments	7/16/2022	.50	180.00	90.00	
141	Winek, Lauren qc review and issuing comments	7/16/2022	.50	180.00	90.00	
	Totals		2.25		317.50	
	Total Labor					**317.50**

	Total this Task	**$317.50**

Task 393 DR-301 Pleasant

Professional Personnel

			Hours	**Rate**	**Amount**
163	Salinas, III, Abelardo Drainage review	7/14/2022	.50	220.00	110.00
163	Salinas, III, Abelardo Drainage review comments	7/15/2022	1.00	220.00	220.00
163	Salinas, III, Abelardo Meeting with Engineer to discuss comments	7/27/2022	.50	220.00	110.00

141	Winek, Lauren	7/18/2022	1.25	180.00	225.00	
	finalizing comment letter and plan markups					
141	Winek, Lauren	7/19/2022	.50	180.00	90.00	
	demo permit discussion					
	Totals		3.75		755.00	
	Total Labor					**755.00**

Total this Task **$755.00**

Task 394 DR – 400 Farley

Professional Personnel

			Hours	Rate	Amount	
174	Hernandez, Aldo	7/8/2022	2.75	110.00	302.50	
	drainage review 1 for 400 Farley					
141	Winek, Lauren	7/20/2022	.50	180.00	90.00	
	qc review and uploading comment letter					
	Totals		3.25		392.50	
	Total Labor					**392.50**

Total this Task **$392.50**

Task 600 Zoning Review General

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/6/2022	.25	180.00	45.00	
	downloading new reviews and review team coordination					
141	Winek, Lauren	7/11/2022	.75	180.00	135.00	
	building height exhibit and looking into surveyors that can verify building height					
141	Winek, Lauren	7/18/2022	.25	180.00	45.00	
	downloading reviews from MPN and assigning review					
141	Winek, Lauren	7/25/2022	.25	180.00	45.00	
	downloading new reviews and internal review coordination					
	Totals		1.50		270.00	
	Total Labor					**270.00**

Total this Task **$270.00**

Task 625 625 - ZR-Western Hills Athletic Club

Professional Personnel

			Hours	Rate	Amount	
187	Melland, Brandon	7/13/2022	1.50	170.00	255.00	
	WAC Tennis Court Expansion Reviiew Coordination with A. Wayman					
187	Melland, Brandon	7/14/2022	1.00	170.00	170.00	
	Call wth Charlie Zech, Zach Elkins, and A. Wayman					
	Totals		2.50		425.00	
	Total Labor					**425.00**

Total this Task **$425.00**

Project	0764	Rollingwood General Engineering Services	Invoice	2207061

Task 640 ZR-601 Riley Rd

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/20/2022	.50	180.00	90.00	
	pool review and issuing approval					
	Totals		.50		90.00	
	Total Labor					**90.00**
				Total this Task		**$90.00**

Task 641 ZR-3220 Park Hills Drive

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/20/2022	.50	180.00	90.00	
	drainage review of revised plans					
	Totals		.50		90.00	
	Total Labor					**90.00**
				Total this Task		**$90.00**

Task 644 ZR-3202 Pickwick Lane

Professional Personnel

			Hours	Rate	Amount	
195	Angel, Selina	7/28/2022	1.50	100.00	150.00	
	Teams call with Lauren to discuss, Began and completed review, Sent out to Lauren for review					
141	Winek, Lauren	7/20/2022	.25	180.00	45.00	
	downloading new review docs from MPN					
141	Winek, Lauren	7/26/2022	.50	180.00	90.00	
	demo permit					
	Totals		2.25		285.00	
	Total Labor					**285.00**
				Total this Task		**$285.00**

Task 657 ZR-4 Michele Circle

Professional Personnel

			Hours	Rate	Amount	
195	Angel, Selina	7/8/2022	1.50	100.00	150.00	
	Reviewed resubmittal, Sent comments to Lauren to send out					
141	Winek, Lauren	7/14/2022	.50	180.00	90.00	
	qc and issuing comments					
	Totals		2.00		240.00	
	Total Labor					**240.00**
				Total this Task		**$240.00**

Task 660 ZR-5015 Timberline

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/7/2022	.50	180.00	90.00	
	qc and issuing approval letter for revised pool barrier plans					
	Totals		.50		90.00	
	Total Labor					**90.00**

Total this Task **$90.00**

Task 661 ZR-108 Kristi Drive

Professional Personnel

			Hours	Rate	Amount	
174	Hernandez, Aldo	7/28/2022	1.75	110.00	192.50	
	zoning review 3 of 108 kristi					
187	Melland, Brandon	7/28/2022	.50	170.00	85.00	
	Call with Lauren					
	Totals		2.25		277.50	
	Total Labor					**277.50**

Total this Task **$277.50**

Task 664 ZR-301 Pleasant Drive

Professional Personnel

			Hours	Rate	Amount	
187	Melland, Brandon	7/18/2022	1.00	170.00	170.00	
	Zoning Review					
187	Melland, Brandon	7/19/2022	.75	170.00	127.50	
	Zoning Review					
	Totals		1.75		297.50	
	Total Labor					**297.50**

Total this Task **$297.50**

Task 665 ZR-4904 Rollingwood Drive

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/12/2022	.50	180.00	90.00	
	call with owner					
141	Winek, Lauren	7/14/2022	.50	180.00	90.00	
	review and issuing approval					
	Totals		1.00		180.00	
	Total Labor					**180.00**

Total this Task **$180.00**

Task 670 ZR – 2803 Pickwick

Professional Personnel

			Hours	Rate	Amount	
187	Melland, Brandon	7/15/2022	.50	170.00	85.00	
	Call with Matt Rygg and N. Dykes					
187	Melland, Brandon	7/19/2022	.75	170.00	127.50	
	Zoning Review Coodination & Call with Matt Rygg					
187	Melland, Brandon	7/21/2022	.75	170.00	127.50	
	Zoning Review					
141	Winek, Lauren	7/7/2022	.75	180.00	135.00	
	qc and issuing approval letter					
	Totals		2.75		475.00	
	Total Labor					**475.00**

Total this Task **$475.00**

Task	673	ZR-301 Pleasant

Professional Personnel

			Hours	Rate	Amount	
141	Winek, Lauren	7/5/2022	1.50	180.00	270.00	
	zoning review and reviewing citizen concerns					
141	Winek, Lauren	7/18/2022	.50	180.00	90.00	
	reviewing comments with brandon					
	Totals		2.00		360.00	
	Total Labor					**360.00**

Total this Task **$360.00**

Task	674	ZR – 400 Farley

Professional Personnel

			Hours	Rate	Amount	
174	Hernandez, Aldo	7/8/2022	2.50	110.00	275.00	
	review 1 of zoning 400 farley					
187	Melland, Brandon	7/19/2022	.25	170.00	42.50	
	Zoning Review Coodination					
141	Winek, Lauren	7/16/2022	.50	180.00	90.00	
	qc review					
141	Winek, Lauren	7/19/2022	.25	180.00	45.00	
	setback discussion					
141	Winek, Lauren	7/20/2022	.50	180.00	90.00	
	QC review and uplaoding comments					
	Totals		4.00		542.50	
	Total Labor					**542.50**

Total this Task **$542.50**

Task	851	Plat Review General

Project	0764	Rollingwood General Engineering Services	Invoice	2207061

Professional Personnel

			Hours	Rate	Amount	
195	Angel, Selina	7/14/2022	.25	100.00	25.00	
	Discussion with Brandon about UDC discrepency ("front") for Timberline Ridge					
	Totals		.25		25.00	
	Total Labor					**25.00**
				Total this Task		**$25.00**
				Total this Project		**$19,463.88**
				Total this Report		**$19,463.88**

Crossroads utility services

OPERATOR'S REPORT

City of Rollingwood

November 16, 2022

Crossroads utility services

MEMORANDUM

To: Ms. Ashley Wayman, City Administrator, City of Rollingwood
From: Andrew Hunt, Crossroads Utility Services LLC
Subject: Monthly Report
Date: 11/3/22

Previous Directives

- *No directives*

Current Operations Report

I. **Utility Operations Report**

A. **Billing Report/ Water Accountability** – Please see enclosed water operations report

a. Bac-t samples have been pulled for October 2022 – all clean samples

B. **Water System Operations and Maintenance** –

a. 2600 Hatley – We repaired a pin hole leak in the main
b. 5015 Timberline – Responded to damaged waterline
c. 1003 Ewing- We repaired a 1" service line.

C. **Wastewater Collection System Operations and Maintenance** -

a. No issues

D. **Lift Station Maintenance** – *See enclosed report*

II. **Customer Service Issues** – No reported issues

III. **Emergency Response Items –** No new items. We are awaiting the plan for generator installations at the lift stations.

IV. **Drought Contingency Plan / Watering Restrictions**

a. Lake Travis Level – 640.36 – Current Storage 524,235 acre-feet (46% full)
b. The City of Austin is currently in Stage 1 watering restrictions – (twice per week watering)

<u>City of Austin Stage 1 Restrictions – effective June 6, 2022</u>

As a result of the combined storage in Lake Travis and Lake Buchanan falling below 1.4 million acre-feet, the City of Austin has implemented Drought Stage One Regulations of its Drought Contingency Plan effective June 6, 2022.

The City of Austin is currently in **Stage 1 Drought Water Use Restrictions**.

- Residential
    - **Hose-end Sprinklers** - two days per week - midnight to 8 a.m. and/or 7 p.m. to midnight
        - **Even address** - Thursday, Sunday
        - **Odd address** - Wednesday, Saturday
    - **Automatic Irrigation** -one day per week - midnight to 8 a.m. and/or 7 p.m. to midnight (*Residential customers may also water a second day with a hose-end sprinkler)*
        - **Even address** - Thursday
        - **Odd address** - Wednesday
- **Commercial / Multi-family / Public Schools**
    - **Hose-end Sprinklers or Automatic Irrigation** - one day per week - midnight to 8 a.m. and/or 7 p.m. to midnight
        - **Even address** - Tuesday
        - **Odd address** - Friday
- **Wasting water** is prohibited
- Washing vehicles at home is permitted with an auto shut-off hose or bucket
- Charity car washes may only be held at a commercial car wash
- Fountains must recirculate water
- Restaurants may not serve water unless requested by a customer
- Patio misters at commercial properties (*including restaurants and bars*) may only operate between 4 p.m. and midnight
- **Commercial power/pressure washing equipment** must meet efficiency requirements

MEMORANDUM

To: Ms. Ashley Wayman, City of Rollingwood
From: Andrew Hunt, Crossroads Utility Services LLC
Subject: Lift Station Report Detail
Date: 11/3/22

1. Lift Station 1 – Dellana Ln.
    - No issues to report

1. Lift Station 2 – Hatley Dr.
    - Trouble shot an issue related to the transducer
    - Ordered new backup dailer – dailer control board was shutting down intermittently

1. Lift Station 3 – Almarion Way
    - No issues to report

1. Lift Station 4- Rockway Cv.
    - Phone line issue reported to ATT

2. Lift Station 5 – Vale Dr.
    - No issues to report

3. Lift Station 6 – Pleasant Cv.
    - No issues to report

4. Lift Station 7 – Nixon Dr.
    - No issues to report

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Water Utilities Division

Monthly Operational Report For Public Water Systems Purchasing Treated Water From Another System
Which Uses Surface Water Sources or Groundwater Sources Under The Influence of Surface Water

PUBLIC WATER SYSTEM NAME: **City of Rollingwood** System I.D. #: 2270016

Month: **October 2022** Submitted by: Date:

No. of Connections: **537** License #: Grade:

TREATED WATER PURCHASED FROM A WHOLESALE SUPPLIER					
Date	Quantity (mgd)	Date	Quantity (mgd)	Monthly Summary (mgd)	
1	0.542	16	0.457	Total	
2	0.542	17	0.415	Monthly	
3	0.570	18	0.424	Purchase:	16.163
4	0.683	19	0.410		
5	0.700	20	0.948	Average	
6	0.614	21	0.438	Daily:	0.521
7	0.516	22	0.440		
8	0.516	23	0.441	Maximum	
9	0.517	24	0.430	Daily:	0.948
10	0.579	25	0.430		
11	0.655	26	0.551	Minimum	
12	0.716	27	0.432	Daily:	0.366
13	0.711	28	0.375		
14	0.455	29	0.375		
15	0.457	30	0.376		
		31	0.475		

DISTRIBUTION SYSTEM
(DISINFECTANT RESIDUAL MONITORING)

Minimum allowable disinfectant residual:	0.5	mg/L	Percentage of the measurements below the limit this month:	
Total no. of measurements this month:	32		0%	(1A)
No. of measurements below the limit:	0			
Percentage of the measurements below the limit last month:			0%	(1B)

PUBLIC NOTIFICATION			
		If YES, Date when Notice was Given to the:	
TREATMENT TECHNIQUE VIOLATION	Yes/No	TCEQ	Customers*
More that 5.0% of the disinfectant residuals in the distribution system below acceptable levels for two consecutive months? - see (1A) and (1B)	NO		

* A sample copy of the Notice to the customers must accompany this report.

MASTER METER REPORT

DISTRICT: **City of Rollingwood** MONTH: **October 2022**

LOCATION: **Bee Cave Woods** I.D. #: **2270016**

		METER #07914810	SIZE 6"	METER #18713312	SIZE 3"	TOTAL FLOW	TOTAL GAL PURCHASED	CHLORINE RESIDUAL
DAY	DATE	A	TH GAL	B	TH GAL	TH GAL	MG	mg/L
Sat	1	890849	370.0	92143	148.0	518.0	0.542	2.3
Sun	2	891219	370.0	92291	148.0	518.0	0.542	2.4
Mon	3	891589	401.0	92439	148.0	549.0	0.570	2.1
Tue	4	891990	528.0	92587	143.0	671.0	0.683	2.2
Wed	5	892518	527.0	92730	157.0	684.0	0.700	1.9
Thu	6	893045	469.0	92887	129.0	598.0	0.614	2.1
Fri	7	893514	352.0	93016	148.0	500.0	0.516	2.1
Sat	8	893866	352.0	93164	148.0	500.0	0.516	2.2
Sun	9	894218	352.0	93312	149.0	501.0	0.517	2.1
Mon	10	894570	415.0	93461	157.0	572.0	0.579	2.1
Tue	11	894985	505.0	93618	144.0	649.0	0.655	2.1
Wed	12	895490	542.0	93762	153.0	695.0	0.716	2.3
Thu	13	896032	556.0	93915	144.0	700.0	0.711	2.2
Fri	14	896588	278.0	94059	157.0	435.0	0.455	2.1
Sat	15	896866	279.0	94216	158.0	437.0	0.457	2.0
Sun	16	897145	279.0	94374	158.0	437.0	0.457	2.0
Mon	17	897424	257.0	94532	147.0	404.0	0.415	2.2
Tue	18	897681	254.0	94679	166.0	420.0	0.424	2.2
Wed	19	897935	255.0	94845	150.0	405.0	0.410	2.5
Thu	20	898190	690.0	94995	224.0	914.0	0.948	2.3
Fri	21	898880	300.0	95219	117.0	417.0	0.438	2.3
Sat	22	899180	301.0	95336	117.0	418.0	0.440	2.5
Sun	23	899481	301.0	95453	118.0	419.0	0.441	2.5
Mon	24	899782	270.0	95571	157.0	427.0	0.430	2.1
Tue	25	900052	268.0	95728	147.0	415.0	0.430	2.3
Wed	26	900320	411.0	95875	134.0	545.0	0.551	2.2
Thu	27	900731	266.0	96009	156.0	422.0	0.432	2.1
Fri	28	900997	208.0	96165	148.0	356.0	0.366	2.2
Sat	29	901205	208.0	96313	148.0	356.0	0.366	2.7
Sun	30	901413	208.0	96461	149.0	357.0	0.367	2.3
Mon	31	901621	309.0	96610	149.0	458.0	0.475	2.3
Tue	1	901930		96759				
Total			11081.0		4616.0	15697.0	16.2	
Avg.			357.5		148.9	506.4	0.521	2.2
Max.			690.0		224.0	914.0	0.948	2.7
Min.			208.0		117.0	356.0	0.366	1.9

Operator: ______________________________

MASTER METER REPORT

DISTRICT: **City of Rollingwood** MONTH: **October 2022**

LOCATION: **Riley MM** I.D. #: **2270016**

		METER No S/N	SIZE 6"	METER No S/N	SIZE 3"	TOTAL FLOW
DAY	DATE	A	TH GAL	B	TH GAL	TH GAL
Sat	1	471	0.0	3421	24.0	24.0
Sun	2	471	0.0	3445	24.0	24.0
Mon	3	471	0.0	3469	21.0	21.0
Tue	4	471	0.0	3490	12.0	12.0
Wed	5	471	0.0	3502	16.0	16.0
Thu	6	471	0.0	3518	16.0	16.0
Fri	7	471	0.0	3534	16.0	16.0
Sat	8	471	0.0	3550	16.0	16.0
Sun	9	471	0.0	3566	16.0	16.0
Mon	10	471	0.0	3582	7.0	7.0
Tue	11	471	0.0	3589	6.0	6.0
Wed	12	471	0.0	3595	21.0	21.0
Thu	13	471	0.0	3616	11.0	11.0
Fri	14	471	0.0	3627	20.0	20.0
Sat	15	471	0.0	3647	20.0	20.0
Sun	16	471	0.0	3667	20.0	20.0
Mon	17	471	0.0	3687	11.0	11.0
Tue	18	471	0.0	3698	4.0	4.0
Wed	19	471	0.0	3702	5.0	5.0
Thu	20	471	0.0	3707	34.0	34.0
Fri	21	471	0.0	3741	21.0	21.0
Sat	22	471	0.0	3762	22.0	22.0
Sun	23	471	0.0	3784	22.0	22.0
Mon	24	471	0.0	3806	3.0	3.0
Tue	25	471	0.0	3809	15.0	15.0
Wed	26	471	0.0	3824	6.0	6.0
Thu	27	471	0.0	3830	10.0	10.0
Fri	28	471	0.0	3840	19.0	19.0
Sat	29	471	0.0	3859	19.0	19.0
Sun	30	471	0.0	3878	19.0	19.0
Mon	31	471	0.0	3897	17.0	17.0
Tue	1	471		3914		
Total			0.0		493.0	493.0
Avg.			0.0		15.9	15.9
Max.			0.0		34.0	34.0
Min.			0.0		3.0	3.0

Operator: ______________________

MASTER METER REPORT

DISTRICT: **City of Rollingwood** MONTH: **October 2022**

LOCATION: **Hatley MM** I.D. #: **2270016**

		METER No S/n	SIZE 6"	METER #151074A	SIZE 3"	TOTAL FLOW
DAY	DATE	A	TH GAL	B	TH GAL	TH GAL
Sat	1	78	0.0	6826	0.0	0.0
Sun	2	78	0.0	6826	0.0	0.0
Mon	3	78	0.0	6826	0.0	0.0
Tue	4	78	0.0	6826	0.0	0.0
Wed	5	78	0.0	6826	0.0	0.0
Thu	6	78	0.0	6826	0.0	0.0
Fri	7	78	0.0	6826	0.0	0.0
Sat	8	78	0.0	6826	0.0	0.0
Sun	9	78	0.0	6826	0.0	0.0
Mon	10	78	0.0	6826	0.0	0.0
Tue	11	78	0.0	6826	0.0	0.0
Wed	12	78	0.0	6826	0.0	0.0
Thu	13	78	0.0	6826	0.0	0.0
Fri	14	78	0.0	6826	0.0	0.0
Sat	15	78	0.0	6826	0.0	0.0
Sun	16	78	0.0	6826	0.0	0.0
Mon	17	78	0.0	6826	0.0	0.0
Tue	18	78	0.0	6826	0.0	0.0
Wed	19	78	0.0	6826	0.0	0.0
Thu	20	78	0.0	6826	0.0	0.0
Fri	21	78	0.0	6826	0.0	0.0
Sat	22	78	0.0	6826	0.0	0.0
Sun	23	78	0.0	6826	0.0	0.0
Mon	24	78	0.0	6826	0.0	0.0
Tue	25	78	0.0	6826	0.0	0.0
Wed	26	78	0.0	6826	0.0	0.0
Thu	27	78	0.0	6826	0.0	0.0
Fri	28	78	0.0	6826	0.0	0.0
Sat	29	78	0.0	6826	0.0	0.0
Sun	30	78	0.0	6826	0.0	0.0
Mon	31	78	0.0	6826	0.0	0.0
Tue	1	78		6826		
Total			0.0		0.0	0.0
Avg.			0.0		0.0	0.0
Max.			0.0		0.0	0.0
Min.			0.0		0.0	0.0

Operator: ______________________________

K·FRIESE + ASSOCIATES
PUBLIC PROJECT ENGINEERING

1120 S. Capital of TX Hwy, CityView 2, Suite 100
Austin, Texas 78746
P: 512.338.1704
TBPE Firm No. 6535

CITY OF ROLLINGWOOD
MONTHLY ENGINEERING REPORT
November 9, 2022

Includes Activities and Services from October 1, 2022 to October 31, 2022

1. Site Development Plans (Drainage) and RSDP Review

a. Drainage Plan Reviews

KFA Task No.	Project Address	Status	Date Returned
315	4919 Timberline Dr	Approved	10/5/2022
321	104 Riley Road	In review	-
348	3225 Park Hills Drive	Approved	10/7/2022
371	402 Inwood	Post Approval Questions	10/14/2022
376	4815 Timberline Dr	Approved	10/5/2022
382	301 Pleasant Drive	Approved In review for post-approval revisions	10/25/2022 -
388	208 Ashworth	Returned with comments	10/17/2022
390	2803 Pickwick	Approved	10/31/2022
395	5004 Timberline	Approved	10/19/2022
397	302 Vale	In review	-
401	4707 Timberline Dr	Returned with comments	10/6/2022

b. Residential Stormwater Discharge Permit (RSDP)

KFA Task No.	Project Address	Status	Date Returned
-	-	-	-

c. Drainage Plan Inspections

KFA Task No.	Project Address	Status	Date Returned
-	-	-	-

2. Zoning Reviews for Site Development Plans

KFA Task No.	Project Address	Status	Date Returned
659	4815 Timberline	Returned Comments Completed	9/26/2022 10/3/2022
654	5014 Timberline	Completed	10/6/2022
638	3225 Park Hills Drive	Completed	10/6/2022
686	303 Inwood	Returned Answer to Variance Question	10/17/2022
682	5 Timberline Ridge	Returned Comments Returned Comments Returned Comments	9/13/2022 10/10/2022 10/18/2022
653	402 Inwood	Returned Answers to Zoning Questions	10/14/2022
686	302 Inwood	Returned Answers to Zoning Questions	10/24/2022
667	208 Ashworth	Returned Comments Returned Comments	9/13/2022 10/31/2022
664	301 Pleasant	Returned Comments Returned Comments Completed per Nikki Returned Comments Returned Answers to Applicant Questions Returned Answers to Applicant Questions	7/19/2022 8/8/2022 9/8/2022 10/12/2022 10/25/2022 10/27/2022
678	302 Vale	Returned Comments Returned Answers to Applicant Questions	8/22/2022 10/5/2022
624	104 Riley Rd	Returned Comments Returned Comments	9/2/2022 10/31/2022
670	2803 Pickwick	Returned Comments	10/4/2022
685	4707 Timberline	Returned Comments Returned Comments Stop Work Order Questions Answered	10/6/2022 10/10/2022 10/14/2022
675	5004 Timberline	Returned Comments Returned Comments Returned Comments	8/9/2022 9/22/2022 10/18/2022

3. Plat Reviews

KFA Task No.	Project Address	Status	Date Returned
-	-	-	-

4. Right-of-Way Reviews

KFA Task No.	Project Address	Status	Date Returned
-	-	-	-

5. WORK AUTHORIZATION PROJECT UPDATES

Project	Project Summary	Status	Next steps
WA03 Hubbard, Hatley, Drainage Improvements PS&E	Preparation of plans, specifications and estimates for the development of a construction bid package. Option 2 from the PER has been selected as the preferred option which proposes to construct a storm drain system from the creek at Almarion Way extending upstream to Hatley, Hubbard and Pickwick.	Intention will be to bid this package together with the Nixon/Pleasant project. KFA on hold pending easement coordination, design, coordination by City staff. .	Property owner coordination may result in supplemental services. Final design to proceed once scope and easements are resolved. Easement/homeowner coordination.
WA04 Nixon/Pleasant Drainage Improvements PS&E	Preparation of plans, specifications and estimates for the development of a construction bid package. This will include channel improvements and Segment 1 of the storm sewer improvements.	Intention will be to bid this package together with the Hubbard/Hatley project. KFA on hold pending easement coordination, design, coordination by City staff. Marking easement and improvement location in the field Addressing property owner concerns.	Property owner coordination may result in supplemental services. Final design to proceed once scope and easements are resolved. Easement/homeowner coordination.

6. General Engineering Services

Task	Assignment Summary	Status	Next steps
General	Coordination with City staff regarding on-going development review services, engineering services, monthly report preparation and attendance of meetings at City's request.	On-Going. Bi-weekly meetings. City timeline of recurring activities.	Regular recurring activities
Development Services	Coordination with City staff regarding on-going development services, MyPermitNow Support, and meeting with staff and applicants as requested.	Building and development services and coordination with staff. MyPermitNow (MPN) support and coordination with Development Services Manager. Entering permits into MPN.	Continued coordination and support.
Water/Wastewater System Modeling & Mapping Updates	Data gathering and review of water/wastewater system infrastructure mapping. Develop/update wastewater and water system model updates to evaluate current and future system capacity needs. Utilize model to plan for infrastructure repairs, upgrades, and future growth needs.	None.	Updating models as needed.
Water/Wastewater System	Coordination/support with Crossroads regarding infrastructure such as valves, pressure planes, and infrastructure.	None.	Continue coordination to support mapping and KFA modeling efforts.
Stratford Drive / Riley Road Traffic Reconfiguration	Reconfigure City of Austin intersection at Stratford and Riley to prevent traffic from Zilker Park cutting across neighborhood. Explore potential traffic calming solutions. City/KFA coordination with City of Austin on design solution.	COA wants to remove left turn restrictions. Currently have removable delineators, pavement markings and no left turn signs to discourage left turns from Stratford Dr.	None.

Task	Assignment Summary	Status	Next steps
GIS	KFA to send quarterly updates for the City GIS layers.	On-going GIS exhibits and mapping updates as requested.	GIS exhibits and mapping updates as needed.
MS4 Compliance	Coordination with City staff on compliance with the Storm Water Management Permit for the 2022 calendar year.	On-going Continue coordination and compliance efforts for permit compliance.	Continue compliance coordination for 2022.

Submitted By,

Tyson Hasz, PE
Project Engineer

TRAVIS CENTRAL APPRAISAL DISTRICT

CITY OF ROLLINGWOOD
THE HONORABLE MICHAEL R. DYSON, MAYOR
403 NIXON DRIVE
ROLLINGWOOD, TX 78746

Jurisdiction: CITY OF ROLLINGWOOD - 11

Re: Certification of 2022 and 2021 Appraisal Roll

I, Marya Crigler, Chief Appraiser of the Travis Central Appraisal District hereby certify your 2022 and 2021 Appraisal Rolls subject to appeals pending before the Appraisal Review Board. (See attachment)

Sincerely,
Marya Crigler
Chief Appraiser

Enlosure

	CERTIFIED	UNDER REVIEW	TOTAL
REAL PROPERTY & MFT HOMES	(Count) (616)	(Count) (0)	(Count) (616)
Land HS Value	415,171,688	0	415,171,688
Land NHS Value	111,418,758	0	111,418,758
Ag Land Market Value	0	0	0
Total Land Value	**526,590,446**	**0**	**526,590,446**
Improvement HS Value	439,847,918	0	439,847,918
Improvement NHS Value	269,793,587	0	269,793,587
Total Improvement	**709,641,505**	**0**	**709,641,505**
Market Value	**1,236,231,951**	**0**	**1,236,231,951**
BUSINESS PERSONAL PROPERTY	(359)	(0)	(359)
Market Value	**40,138,423**	**0**	**40,138,423**
OIL & GAS / MINERALS	(0)	(0)	(0)
Market Value	**0**	**0**	**0**
OTHER (Intangibles)	(0)	(0)	(0)
Market Value	**0**	**0**	**0**
	(Total Count) (975)	(Total Count) (0)	(Total Count) (975)
TOTAL MARKET	**1,276,370,374**	**0**	**1,276,370,374**
Ag Land Market Value	0	0	0
Ag Use	0	0	0
Ag Loss (-)	0	0	0
APPRAISED VALUE	**1,276,370,374**	**0**	**1,276,370,374**
	100.0%	0.0%	100.0%
HS CAP Limitation Value (-)	60,650,044	0	60,650,044
NET APPRAISED VALUE	**1,215,720,330**	**0**	**1,215,720,330**
Total Exemption Amount	27,006,601	0	27,006,601
NET TAXABLE	**1,188,713,729**	**0**	**1,188,713,729**
TAX LIMIT/FREEZE ADJUSTMENT	**0**	**0**	**0**
LIMIT ADJ TAXABLE (I&S)	**1,188,713,729**	**0**	**1,188,713,729**
CHAPTER 313 ADJUSTMENT	**0**	**0**	**0**
LIMIT ADJ TAXABLE (M&O)	**1,188,713,729**	**0**	**1,188,713,729**

APPROX TOTAL LEVY = NET TAXABLE * (TAX RATE / 100)
$2,606,849.21 = 1,188,713,729 * 0.219300 / 100)

EXEMPTIONS		CERTIFIED		UNDER REVIEW		TOTAL	
Code	Method	Total	Count	Total	Count	Total	Count
DV2	DV2 - Conversion	7,500	1	0	0	7,500	1
DV2S	DV2S - Conversion	7,500	1	0	0	7,500	1
DV3	DV3	10,000	1	0	0	10,000	1
DV4	DV4 - Conversion	24,000	2	0	0	24,000	2
DVHSS	DVHSS -	1,272,186	1	0	0	1,272,186	1
EX-XV	EX-XV - Conversion	24,889,501	10	0	0	24,889,501	10
EX366	EX366 - Conversion	10,440	30	0	0	10,440	30
OV65	OV65 - Conversion	419,333	140	0	0	419,333	140
OV65	OV65-Local	15,000	5	0	0	15,000	5
OV65	OV65-Prorated	0	0	0	0	0	0
OV65	OV65-State	0	0	0	0	0	0
OV65S	OV65S - Conversion	33,000	12	0	0	33,000	12
SO	SO	23,343	1	0	0	23,343	1
SO	SO - Conversion	294,798	15	0	0	294,798	15
	Total:	**27,006,601**	**219**	**0**	**0**	**27,006,601**	**219**

	NOT UNDER REVIEW	UNDER REVIEW	TOTAL
REAL PROPERTY & MFT HOMES	(Count) (612)	(Count) (0)	(Count) (612)
Land HS Value	826,853,835	0	826,853,835
Land NHS Value	129,094,498	0	129,094,498
Ag Land Market Value	0	0	0
Total Land Value	**955,948,333**	**0**	**955,948,333**
Improvement HS Value	720,867,101	0	720,867,101
Improvement NHS Value	310,566,402	0	310,566,402
Total Improvement	**1,031,433,503**	**0**	**1,031,433,503**
Market Value	**1,987,381,836**	**0**	**1,987,381,836**
BUSINESS PERSONAL PROPERTY	(338)	(0)	(338)
Market Value	**40,551,768**	**0**	**40,551,768**
OIL & GAS / MINERALS	(0)	(0)	(0)
Market Value	**0**	**0**	**0**
OTHER (Intangibles)	(0)	(0)	(0)
Market Value	**0**	**0**	**0**
	(Total Count) (950)	(Total Count) (0)	(Total Count) (950)
TOTAL MARKET	**2,027,933,604**	**0**	**2,027,933,604**
Ag Land Market Value	0	0	0
Ag Use	0	0	0
Ag Loss (-)	0	0	0
APPRAISED VALUE	**2,027,933,604**	**0**	**2,027,933,604**
	100.0%	0.0%	100.0%
HS CAP Limitation Value (-)	529,371,349	0	529,371,349
NET APPRAISED VALUE	**1,498,562,255**	**0**	**1,498,562,255**
Total Exemption Amount	28,208,005	0	28,208,005
NET TAXABLE	**1,470,354,250**	**0**	**1,470,354,250**
TAX LIMIT/FREEZE ADJUSTMENT	**0**	**0**	**0**
LIMIT ADJ TAXABLE (I&S)	**1,470,354,250**	**0**	**1,470,354,250**
CHAPTER 313 ADJUSTMENT	**0**	**0**	**0**
LIMIT ADJ TAXABLE (M&O)	**1,470,354,250**	**0**	**1,470,354,250**

APPROX TOTAL LEVY = NET TAXABLE * (TAX RATE / 100)
$2,640,756.23 = 1,470,354,250 * 0.179600 / 100)

CITY OF ROLLINGWOOD

Exemptions

EXEMPTIONS		NOT UNDER REVIEW		UNDER REVIEW		TOTAL	
Code	Method	Total	Count	Total	Count	Total	Count
DV2	DV2	7,500	1	0	0	7,500	1
DV2S	DV2S	7,500	1	0	0	7,500	1
DV3	DV3	10,000	1	0	0	10,000	1
DV4	DV4	24,000	2	0	0	24,000	2
DVHSS	DVHSS	1,399,405	2	0	0	1,399,405	2
DVHSS	DVHSS-Prorated	0	0	0	0	0	0
EX-XV	EX-XV	25,898,261	10	0	0	25,898,261	10
EX-XV	EX-XV-PRORATED	0	0	0	0	0	0
EX366	EX366	79,719	83	0	0	79,719	83
OV65	OV65-Local	419,333	140	0	0	419,333	140
OV65	OV65-Prorated	0	0	0	0	0	0
OV65	OV65-State	0	0	0	0	0	0
OV65S	OV65S-Local	24,000	9	0	0	24,000	9
OV65S	OV65S-Prorated	0	0	0	0	0	0
OV65S	OV65S-State	0	0	0	0	0	0
SO	SO	338,287	17	0	0	338,287	17
	Total:	**28,208,005**	**266**	**0**	**0**	**28,208,005**	**266**

Texas Gas Service.
A Division of ONE Gas

November 1, 2022

City of Rollingwood
403 Nixon Drive
Rollingwood, Texas 78746

Honorable Mayor and Members of the City Council:

Pursuant to the Cost of Gas Clause currently in effect for the Central-Gulf service area, the following is the determination of the cost of gas to be used for billings in November 2022:

1.	Cost of Purchased Gas @ 14.73 PSIA	$7.2871			
2.	Cost of Purchased Gas @ 14.65 PSIA	$7.2476			
3.	Purchase/Sales Ratio	1.0008			
4.	Commodity Cost (Line 2 x Line 3)		$7.2534		
5.	Reconciliation Factor		$0.4805		
6.	Other Cost		$0.0000		
7.	Subtotal (Line 4 + Line 5 + Line 6)			$7.7339	
8.	Revenue-associated Fees and Taxes			$0.0000	
9.	Cost of Gas (Line 7 + Line 8)			$7.7339	/ Mcf
				$0.7734	/ Ccf

Billings using the cost of gas as determined above will begin with meters read on and after October 27, 2022 and end with meters read on and after November 28, 2022.

Sincerely,

Lisa Wattinger

Lisa Wattinger, Manager
Gas Supply