Alternatives Analysis

No off site alternatives are feasible for this project and they were not considered. A number of on-site alternatives were considered before we decided on our proposed solution and are discussed below.

a. A No-Action Alternative was considered as an alternative to building a breakwater and continued maintenance dredging. See attached drawing #3. There was consideration given to allow the entrance to harbor to remain unchanged and allow a natural progression of the silty bottom material to accumulate. This most likely would cause the harbor to be blocked from the lake which would have a detrimental effect on the riparian owners around the harbor. The value of the riparian owners property would fall considerably. Since the local taxing authorities collect taxes based on these property values, total taxes for schools and other local community needs would be reduced. If the harbor entrance was blocked HHCA would lose a significant benefit for recreation from their property to the lake. This alternative was eliminated due to the detrimental loss of value and recreational opportunities. Additionally, there is concern of the environmental health of the harbor if the entrance is blocked. There are examples of the no action alternative being done on Lake Livingston and this has caused these communities to lose access to the lake and the value of their properties has been negatively effected. The no action alternative does not meet HHCA needs and was eliminated. The environmental impact would be minimal to the main lake but could cause an impoundments of the waters in the harbor.

b. On-site Alternative 1 - This alternative considered to meet HHCA needs was to continue to dredge the channel on a regular basis. Since 2018 we have dredged three times after obtaining permits from the Corps. Each time the channel was maintain for about two years before it was necessary to dredge again. The silty/sandy material that is migrating into the channel has become more invasive over time and has required us to dredge more material. We originally dredged 500 cubic yards but in our last permit we indicated that we would dredge up to 1500 cubic yards. As we have to dredge more material and this material is located further from the existing bulkhead, we are not able to reach the channel to dredge with an excavator from shore. More expensive solutions are required. It was deemed that just dredging by itself would not be a feasible long term solution. It would cost too much and would be required to be redone on a frequent basis creating an unsustainable financial burden for HHCA. The environmental impact of dredging has been mitigated by removing all dredge material from the lake and moving it permanently to a safe upland location.

c. On-site Alternative 2 (applicant's preferred alternative) - is to build a breakwater structure from the Carter's property out about 220 feet to block additional silty/sandy material from accumulating in the entrance to HHCA Harbor on Lake Livingston. In addition, a breakwater structure of 50 ft would be constructed from the existing Peninsula next to Ward's property. See drawing number #4 for the details of the breakwater structures. The breakwater structures would allow HHCA to meet its need of a secured entrance to the harbor. The harbor entrance would be of an acceptable water depth to allow HHCA and the public access to the harbor. The channel next to the

breakwater would be dredged per the requirements of the permit issued under Corps # SWG-2018-00456. The impact to the waters of Lake Livingston would be minimal considering that all dredged material would be permanently removed from the lake. The total area covered by the breakwater structures would be 0.5 acres our 0.0006% of the lake surface area. The bulkheads would allow us to access the channel from the shore in the future for easier and cheaper way to maintain the channel. The area covered by the bulkheads is less than two feet deep on average as can be seen by the Photographs from August 13, 2023, when the Pool Height was 128.15ft MSL or 2.85 feet below normal pool height of 131ft MSL. When material is dredged from the lake it will be contained temporarily by a 4 ft silt fence and straw bales or contained in the breakwater structures with a silt mesh barrier along the inside wall to prevent any dredged solid material returning to the lake. Presently, no motorized boats pass in the proposed area of the breakwater and distance around the bulkhead for people on kayaks is minimal. HHCA would allow access to the lake off the end of the breakwater structures. The breakwater follows the existing outline of the Carter property to allow them to recover land that was lost due to erosion. This would allow the property line to return to its original line. Most of this area is above water or nearly above water as can be seen by photographs from March 16, 2024. See photographs 6 and 7. There would be a small effect on the flow of Stephens Creek. This is the preferred alternative because it meets the needs of the HHCA and the Carter's. The details of the channel dredging can be seen in the Letter of Permission SWG-2018-00456 issued on July 3, 2023.

d. On-site Alternative 3 - An additional alternative to the preferred option above is to move the bulkhead for the Carter property at an angle to reduce the amount of area recovered from the shoreline erosion. See drawing number #5 for details of this option. This would allow a larger mouth for Stephen Creek. Photographs 4 and 5 shows the mouth of Stephens Creek when the Pool Elevation is normal at 131ft MSL on March 16th, 2024. The flow of water down Stephens Creek slows down as it enters the main lake and any sediment in the Creek drops out at this point. Stephens Creek is about 6 feet deep upstream of the mouth to the lake but the depth at the lake is less than 2 feet. Therefore, the preferred option has an additional benefit to easier navigation in Stephen Creek as the flow of water will tend to maintain the channel.

e. On-site Alternative 4 - An additional alternative would be not to install the 50 ft by 50 ft extension off the existing peninsula, See drawing #6 for details. The 50 ft by 50 ft extension causes the silty/sandy material that is moving along the Peninsula to be pushed out of the new channel we are creating by dredging. When the wind blows the waves across the lake, with a fetch of over 10 miles, they move bottom material into the Peninsula. This material crashes into the existing peninsula bulkhead and then flows in both directions. The 50 ft wall at the end of the peninsula will deflect this material back in the direction

of the lake and mitigate its effect on the dredged channel. Therefore, we do not prefer to build the breakwater without this extension on the end of the existing peninsula.

f. On-site Alternative 5 - An additional alternative would be to combine both alternative d. and e. above. See drawing number #7 for details. This would allow for a smaller footprint for the total project over Lake Livingston waters. Again, The flow of water down Stephen Creek slows down as it enters the main lake and any sediment in the Creek drops out at this point. Stephen Creek is about 6 feet deep upstream of the mouth to the lake but the depth at the lake is less than 2 feet. Therefore, the preferred option has an additional benefit to easier navigation in Stephens Creek as the flow of water will tend to maintain the channel. Additionally, the 50 ft by 50 ft extension causes the silty/sandy material that is moving along the Peninsula to be pushed out of the new channel HHCA are creating by dredging. When the wind blows the waves across the lake, with a fetch of over 10 miles, they move bottom material into the Peninsula. This material crashes into the existing peninsula bulkhead and then flows in both directions. The 50 ft wall at the end of the peninsula will deflect this material back in the direction of the lake and mitigate its effect on the channel. Therefore, we do not prefer to build the bulkhead without this extension on the end of the existing peninsula. HHCA does nor prefer to use this option.

Drawing #3 Rev1
Plan Drawing Do Nothing

Holiday Harbor Community Association
San Jacinto CAD Web Map

Army Corps Of Engineers
SWG-2018-00456

Streets
City Limits
Coldspring
Point Blank
Shepherd
Parcel Boundary

March 22, 2024

1:1,128
0 0.01 0.01 0.03 mi
0 0.01 0.03 0.05 km
50

San Jacinto County Appraisal District, Harris Govern --

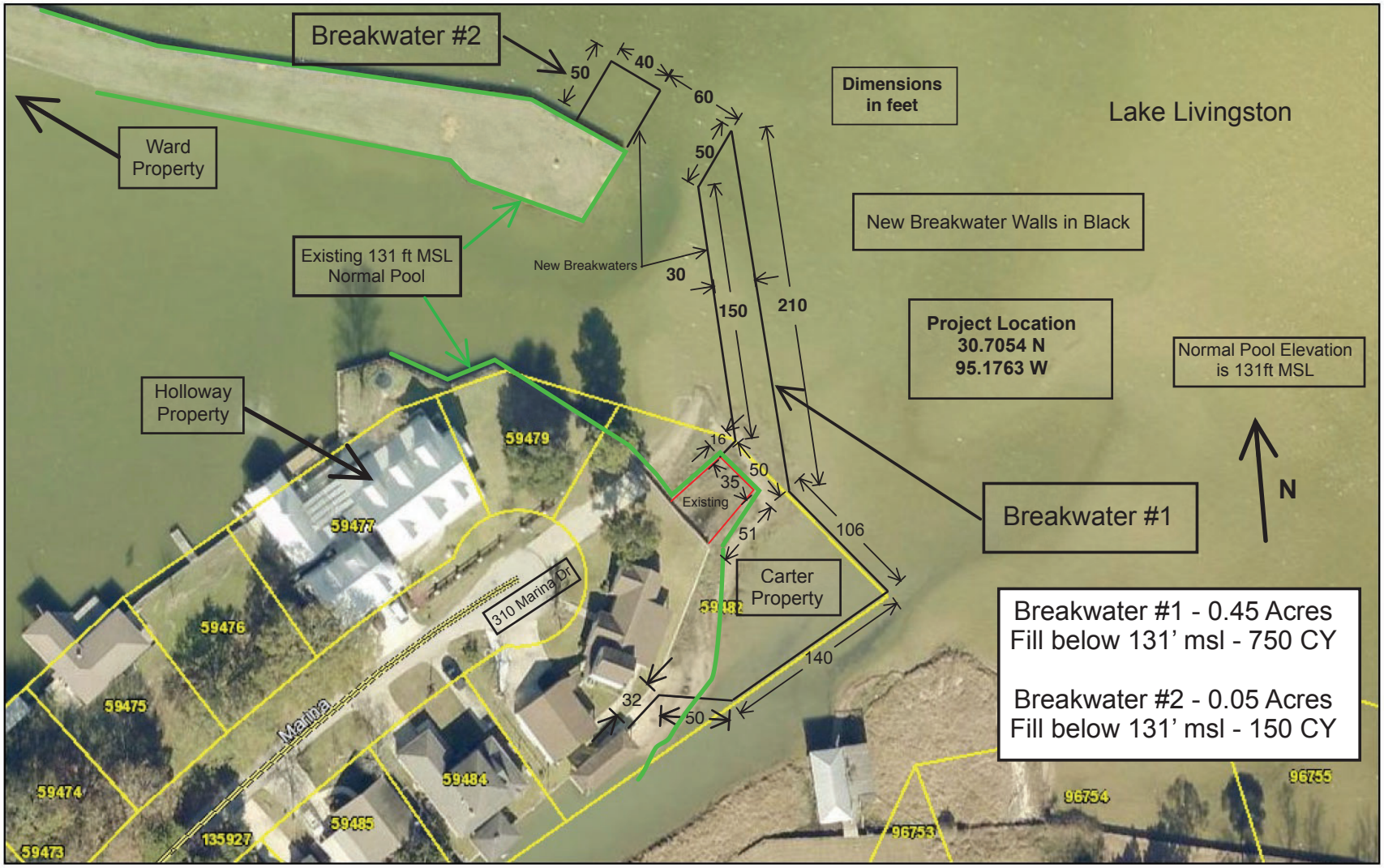
This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.

Drawing #4 rev 1
Plan Drawing of Preferred Breakwaters

Holiday Harbor Community Association

San Jacinto CAD Web Map

Army Corps Of Engineers
SWG-2018-00456



Streets
City Limits
Coldspring
Point Blank
Shepherd
Parcel Boundary

March 22, 2024

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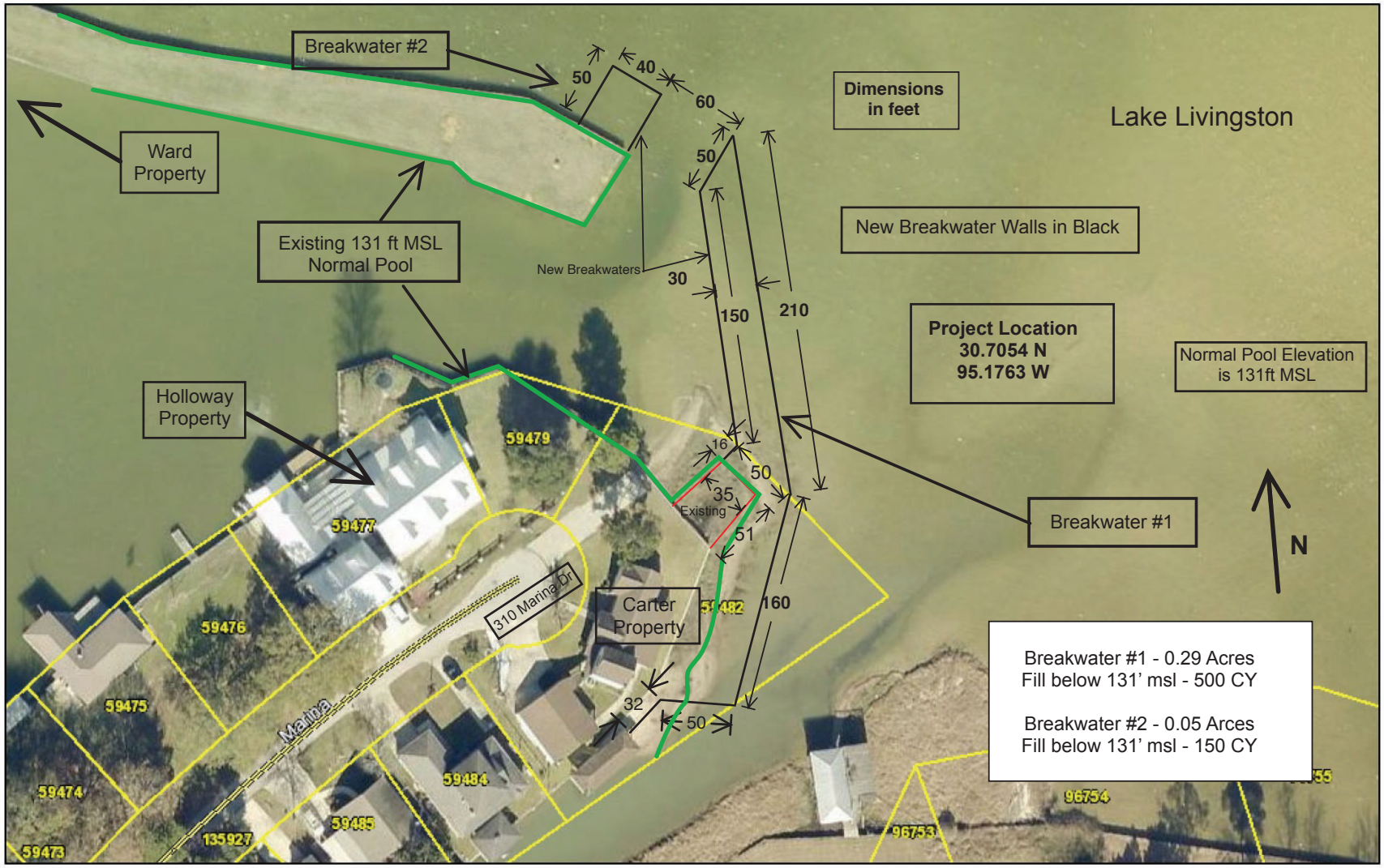
Drawing #5 Rev 1
Plan Drawing of Alternative D

Holiday Harbor Community Association
San Jacinto CAD Web Map

Army Corps Of Engineers
SWG-2018-00456



Streets
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Parcel Boundary

March 22, 2024

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San Jacinto County Appraisal District, Harris Govern --

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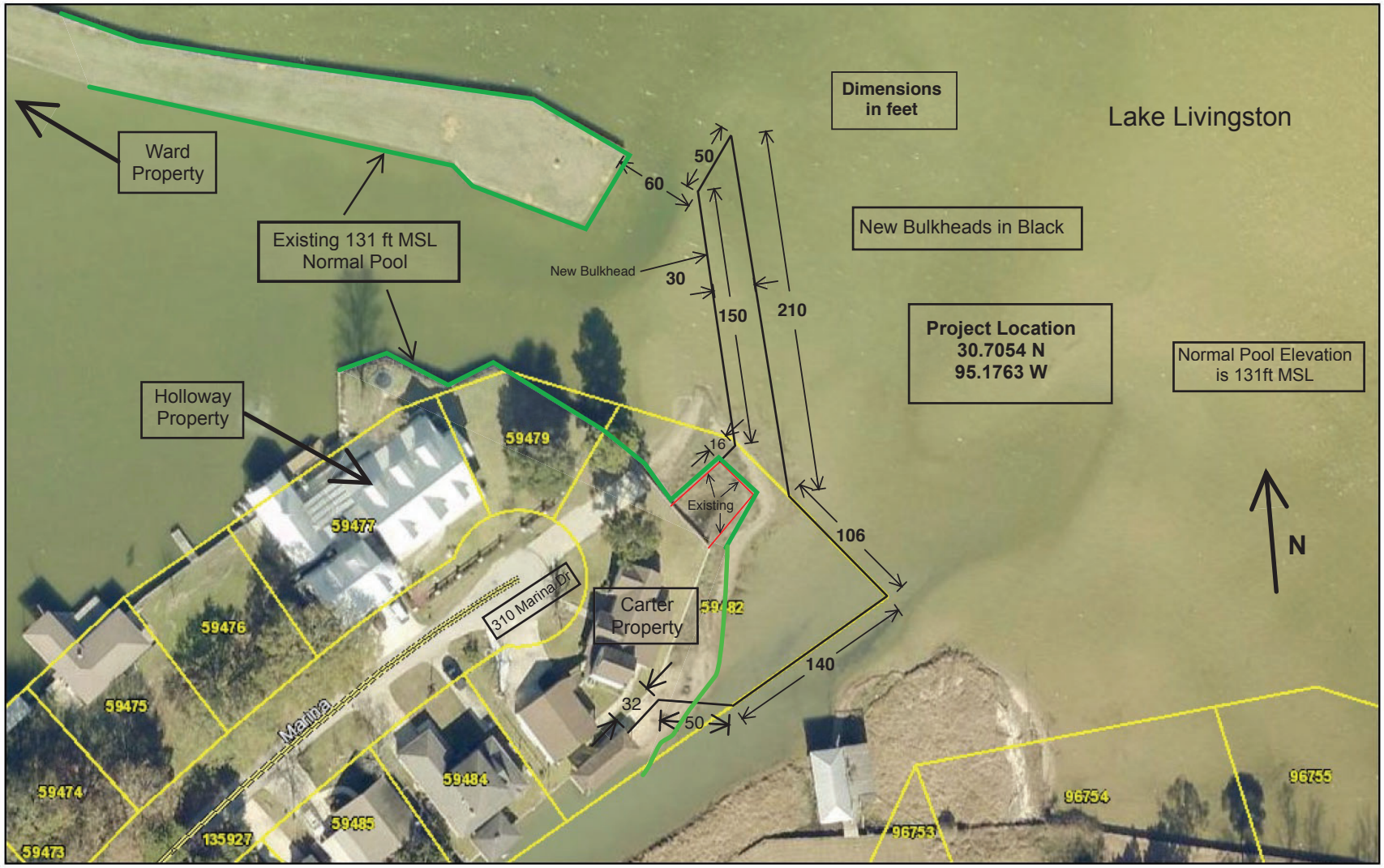
Drawing #6 Rev 1
Plan Drawing of Alternative E

Holiday Harbor Community Association

San Jacinto CAD Web Map

Army Corps Of Engineers
SWG-2018-00456



1:1,128

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0 0.01 0.03 0.05 km
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Streets
City Limits
Coldspring
Point Blank
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March 22, 2024

San Jacinto County Appraisal District, Harris Govern --

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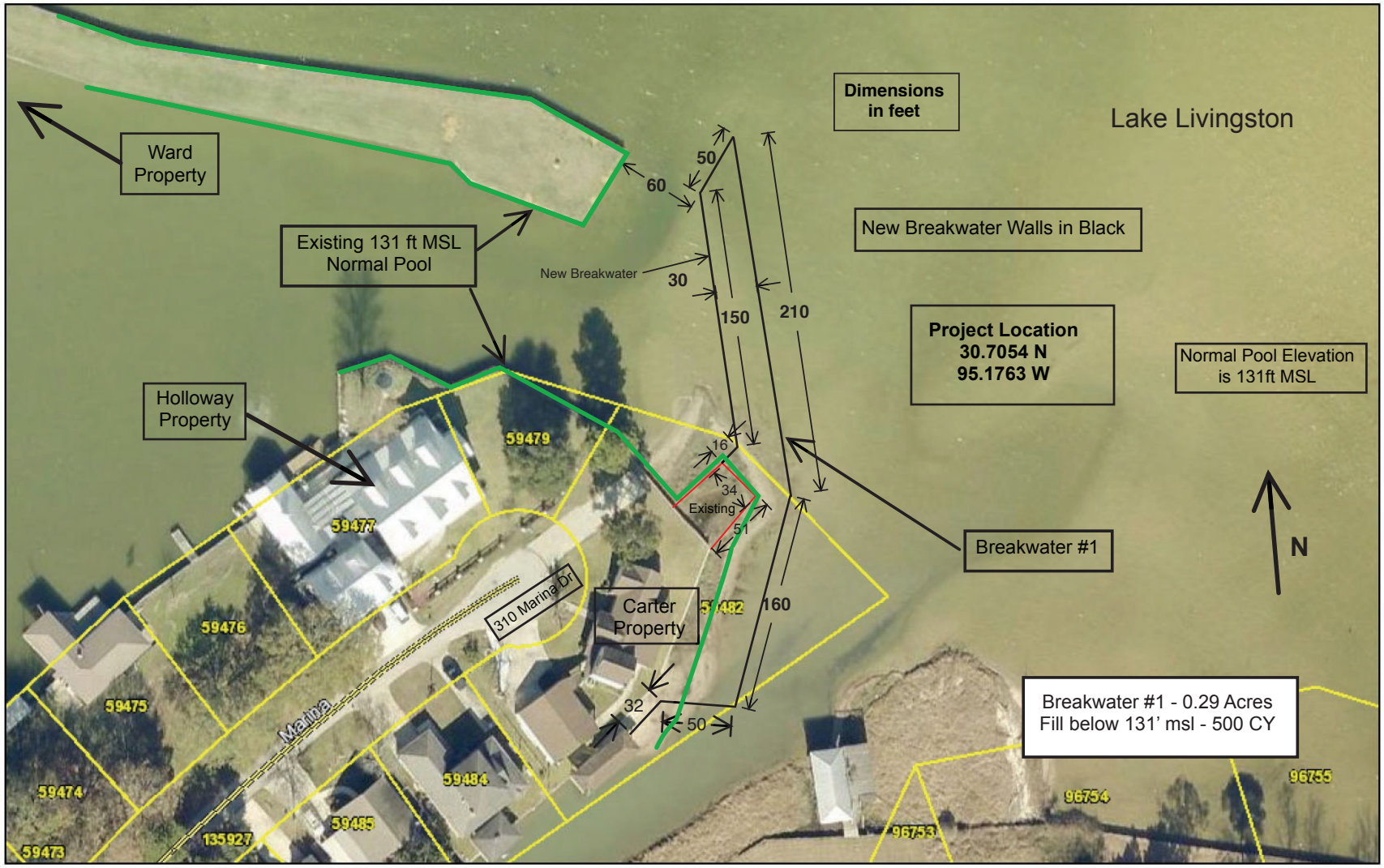
Drawing #7 rev 1
Plan Drawing of Alternative F

Holiday Harbor Community Association
San Jacinto CAD Web Map

Army Corps Of Engineers
SWG-2018-00456



Streets
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Shepherd
Parcel Boundary

March 22, 2024

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