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September 16, 2016 StoneHill Project No. 16091

Douglas Kirkland, Chair
Zoning Board of Adjustment
Town of Amherst
2 Main Street
Amherst, NH 03031

RE: Response to Zoning Board of Adjustment Concerns
Proposed LaBelle Winery Expansion and Distillery Water Use
Route 101, Amherst NH

Dear Chairman Kirkland and Members of the Zoning Board of Adjustment:

During the August 30, 2016, Town of Amherst Zoning Board of Adjustment (ZBA) meeting, there were concerns raised by members of the Board regarding the proposed distillery operation proposed by LaBelle Winery. As a result, several requests for additional information and clarification were made by the Board including the following: what will be the distillery water usage; how will wastes be handled; and will the distillery water usage impact nearby residential supply wells. At the request of Attorney Morgan A. Hollis, StoneHill Environmental, Inc. (StoneHill) prepared a Groundwater Resource Impact Assessment (WRIA) dated August 11, 2016, which was previously provided to the ZBA and included significant information regarding the proposed LaBelle Winery expansion project, and the associated groundwater uses and potential for impacts to nearby water supply wells. Attorney Hollis requested that StoneHill review the ZBA's concerns regarding the proposed distillery operation and prepare this response directly to the ZBA.

Overview of Distillery Operation

The distilled products to be produced by LaBelle will be made from fermented mash, wine and neutral spirits. In LaBelle's case, neutral grain spirits will be purchased to create artisan vodka, gin and other products, while wine will be used to then create brandy. Neither of those processes requires water to produce the final product besides incidental washing of equipment. In the case of whiskey, bourbon or other grain spirits, LaBelle will use water to create a mash from dry grain that will be boiled to bring out the sugars that are then fermented and distilled. Distilling involves heating the target product base to a boiling point that releases the alcohols as steam, which are then captured by condensing them again through cooling (via a closed loop water system) into a liquid that has a high proof. Small volumes of water may be used to mix with products (proofing) to reduce the final alcohol content. A slide presentation prepared by LaBelle is attached which provides an overview of the proposed distillery operation.

Distillery Water Usage

LaBelle has conducted extensive research on distilling operations and contacted other distilleries in the region to confirm the low water usage volumes they anticipate using at their proposed distillery. StoneHill confirmed with two local distilleries producing approximately 5000 and 10,000 gallons of spirits annually, that their daily water usage is well below 1000 gallons per day (gpd), most of which is associated with water used for wash down and cleaning. As such, the distillery proposed at the LaBelle facility is expected to use no more than 1000 gallons of water a day, and likely much less. This volume is the equivalent to the typical interior daily water use for two to three residential homes. LaBelle anticipates the distillery will produce approximately 1000 gallons of product in its first year, growing thereafter to 2000 gallons in year two and 3000 gallons in year three. Water usage for "proofing gallons" will be less than 1000 gallons in year one, less than 2000 gallons in year two, and less than 3000 gallons in year three. For example, if a 160 proof 750 ml bottle needs to be cut to 80 proof, only 375 mL of water are required to do so. Some production water will also be required for certain products such as whiskey and bourbons. Other products require no water, such as apple brandy and apple vodka. The only wastes generated by the distillery operation will be the mash used to produce whiskey and bourbons. LaBelle has indicated they intend to use the spent mash in products to be baked at the facility.

LaBelle will also be implementing the following water conservation measures:

- Cooling Water. The majority of water usage at a distillery stems from the cooling of the distillate. Distilleries will often simply circulate cold water to chill down the cooling coils and discharge the water down the drain. LaBelle will recirculate cooling water on a closed loop system, resulting in a vast reduction of water usage.

- Cleaning. The distillery will clean with steam and use other water conservation measures, just as at the winery, thereby reducing water use. Wash down water will be minimal using these cleaning methods.

Based upon the above information, the distillery water usage volume is only a small incremental increase in the site-wide water usage as compared to the other operations at the proposed expanded LaBelle facility. Again, it must also be recognized that it is likely that over 75 percent of the groundwater volume withdrawn from the on-site supply well (to be installed) and used at the proposed facility, will be returned to the aquifer via the on-site septic system leachfield(s). Furthermore, StoneHill included the anticipated distillery water use in the water usage volume presented in the WRIA previously submitted to the ZBA. That report concluded the development of the proposed expanded LaBelle facility would not result in any measurable impacts to residential wells in the vicinity of the site.

Vicinity Groundwater Flow

To further describe local groundwater flow conditions, StoneHill has prepared the attached *Figure 6-Drainage Divide and Interpreted Groundwater Flow*. This figure depicts the sub-regional watershed drainage basins which encompass the Site area and inferred groundwater flow directions. The

interpreted drainage areas are based on Site area topography and surface water drainage patterns. The Site is located within the lower portion of a watershed that drains directly to Baboosic Brook south of Route 101. Based on local topography and the above described drainage basin configuration, surface water and shallow groundwater beneath the Site will flow to the south to Baboosic Brook. In general, bedrock groundwater will flow in a similar direction with possible localized preferential flow along bedrock fracture orientations. It should be noted that all of the residential areas to the west and north of the Site are either side gradient or upgradient of the Site with respect to groundwater flow. As such, water withdrawal at the proposed LaBelle facility is not likely to have a negative impact on water supply wells located upgradient and side gradient of the Site. Furthermore, a large number of the residential properties to the west and north are located across drainage divides in different drainages than the proposed LaBelle facility, further minimizing the potential for water withdrawal at the LaBelle facility impacting these supply wells.

Abutter and Vicinity Supply Well Data

StoneHill reviewed readily available water supply bedrock well data for abutting and nearby properties available in the New Hampshire Water Well Board online database as of August 2016. The data for 57 bedrock wells in the site vicinity were identified and summarized in the attached Table 1. In the database a total of 18 wells were identified in Amherst, and 40 wells in Bedford, in the vicinity of the proposed LaBelle facility. All of the Amherst wells, and many of the nearby Bedford wells, are shown on the attached Figure 7. The review of well data is intended to identify common characteristics of supply wells in the study area, as well as any unique conditions that may be present. The summarized information also allows for general interpretations with respect to the adequacy of well yields at surrounding properties. It should be noted that there are limitations to the quality of well database information due to drillers submitting incomplete Well Completion Forms, and the questionable nature of data on the forms such as well yields and static water level depths. Additionally, some data may not accurately reflect current conditions. That said, the compiled data still provide a general picture of the characteristic trends for well construction and performance in the study area.

Reported well depths ranged from 100 feet below ground surface (bgs) to 1325 feet bgs, with most in the range of 300 to 500 feet bgs. Reported initial well yields from drilling reports filed with the NH Water Well Board ranged from 0.5 gallon per minute (gpm) to 55 gpm. Based upon the compiled data, the average depth to the bedrock surface is 19 feet, a depth which appears consistent with this region where a thin layer of glacial till overlays the bedrock in upland areas. The average depth to groundwater is 26 feet and the average well depth is 461 feet. The depth to static water is not unusual considering the upland location of many wells and the average well depth is in considered in a typical range for bedrock supply wells in New Hampshire. The average initial reported yield for supply wells in the project vicinity is about 12.5 gpm. The median well yield for bedrock wells in New Hampshire is reported to be 8 gpm. In general the data indicate relatively high reported well yields for wells in the Site vicinity.

The NH Water Well Board and NH Water Well Association recommend an optimum domestic well water supply capacity of 960 gallons over a four-hour period. This volume should be adequate in most cases for indoor domestic water needs and some limited outdoor water use. Studies have shown that actual indoor domestic water use is far less than this amount and likely be less than 300 gallons

per day for a family of four, or 75 gallons per day per person. The 960 gallons of overall well yield or production during a four hour period includes a combination of actual sustained rate the aquifer yields water to the well, and standing water storage in the well during non-pumping conditions, also known as available well storage. In order to further assess the potential performance of the existing wells listed in Table 1, the available storage volume was calculated for each well. The estimated available well storage volume ranged from about 60 gallons to 855 gallons, as indicated on Table 1. While it is expected that well yields may decrease over time due to mechanical factors such as reduction in pump performance, changes in well borehole conditions such as iron bacteria clogging, and hydrogeologic factors, the preponderance of the data available from the NH Water Well Board indicates that overall well yields in the vicinity of the Site are currently adequate to meet typical domestic water use needs. Possible exceptions pertain to wells that are more susceptible to drought conditions due the location and construction, and homeowners who have water uses that exceed typical domestic uses, such as for landscape and lawn irrigation, which easily exceed typical residential well storage capacity and bedrock well yields.

Response to the Haji-Aghajani Letter and Exhibit B

StoneHill has also reviewed the following documents previously submitted to the ZBA:

A. The letter dated August 3, 2016 signed by Kazem Haji-Aghajani and Melanie Chicoine; and
B. Exhibit B prepared by Kazem Haji-Aghajani submitted on August 16, 2016.

The August 3rd letter and Exhibit B both focus primarily on the groundwater usage at the current LaBelle Winery operation and predicted water usage for the proposed new facility. Based upon StoneHill's understanding of the current LaBelle operations, several years of actual daily water usage meter reading records, and the proposed new facility operations, the water usage volumes presented in the two Haji-Aghajani documents grossly exaggerate the actual and predicted LaBelle water usage. The volume presented by Haji-Aghajani for current LaBelle water usage of 144,876 gallons per day is over 75 times greater than the actual 2015 LaBelle average water usage of 1900 gallons per day. As such, the Haji-Aghajani water use volumes should be disregarded. Finally, Haji-Aghajani's predictions of "catastrophic consequences" on water resources in the area due to the proposed LaBelle facility are not supported by available data.

Summary and Conclusion

- The water usage at the proposed LaBelle distillery will be less than 1000 gpd, most of which will be associated with wash down and cleaning. This volume is the equivalent to the typical interior daily water use for two to three residential homes. Additionally, it should be noted that it is likely that over 75 percent of the groundwater used on site at the proposed facility, will be returned to the aquifer via the on-site septic system leachfields.

- The proposed facility is located at the lower downslope portion of a watershed that drains to the south directly to Baboosic Brook located south of Route 101. Groundwater also flows to the south-southeast. Therefore, the proposed LaBelle facility is downgradient of residential wells to the north and west, and as such, the risk of LaBelle operations impacting these residential wells is minimal.

- A review of readily available data for vicinity residential supply wells indicates that in general well yields in the area of the proposed LaBelle facility are currently adequate to meet typical domestic water use needs.

- Documents previously submitted to the ZBA by Kazem Haji-Aghajani grossly exaggerate the predicted water usage for the proposed LaBelle facility, as well as the existing LaBelle facility water usage. LaBelle records the daily water usage at their current facility and the average daily volume in 2015 was over 75 times less than estimated by Haji-Aghajani.

In conclusion, StoneHill's professional opinion is that the available data indicate the future groundwater withdrawal associated with the proposed Labelle distillery operation, as well as the other operations at the proposed LaBelle facility, will have little or no measurable impact on nearby water supply wells.

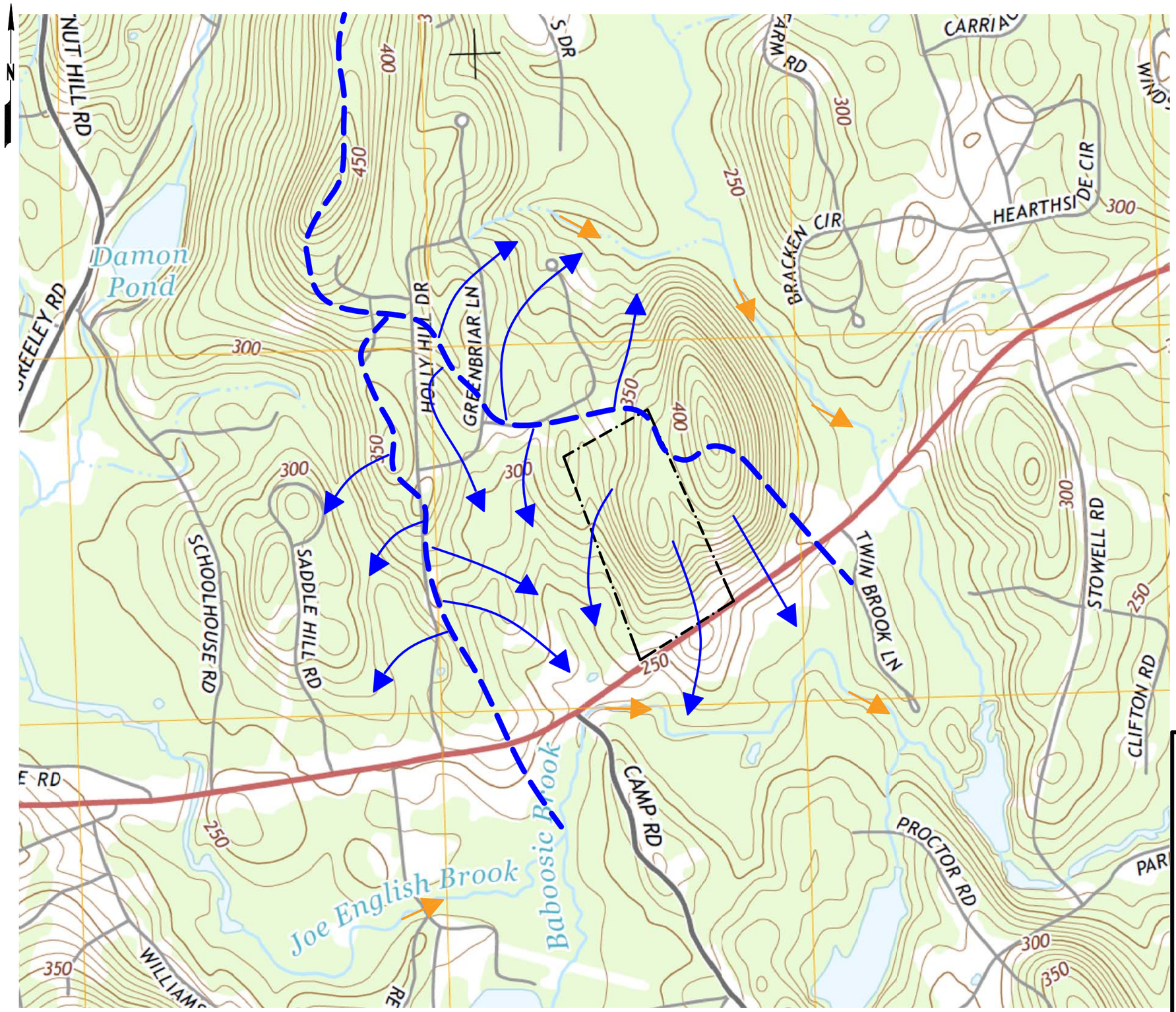
Please feel free to contact us if you have any questions regarding the information presented above.

Sincerely,

StoneHill Environmental, Inc.

Timothy S. Stone, PG, LSP
President

Attachments: Figure 6 Drainage Divide and Interpreted Groundwater Flow
Figure 7 Tax Map and Area Well Inventory
Table 1 Site Area Supply Well Data
Distillery Operation Slide Presentation – prepared by LaBelle



Legend:

- Surface Water Drainage Divide
- Interpretted Groundwater Flow Direction
- Property Boundary
- Stream Flow Direction

0 450 900 1,800

approximate scale in feet

Base Map Source:

USGS 7.5 Minute Topographic Map
Pinardville, NH 2015

FIGURE 6

DRAINAGE DIVIDE AND INTERPRETED GROUNDWATER FLOW

LaBelle Winery Expansion
Route 101
Amherst, NH

Prepared by:
StoneHill Environmental, Inc.
Project No. 16091

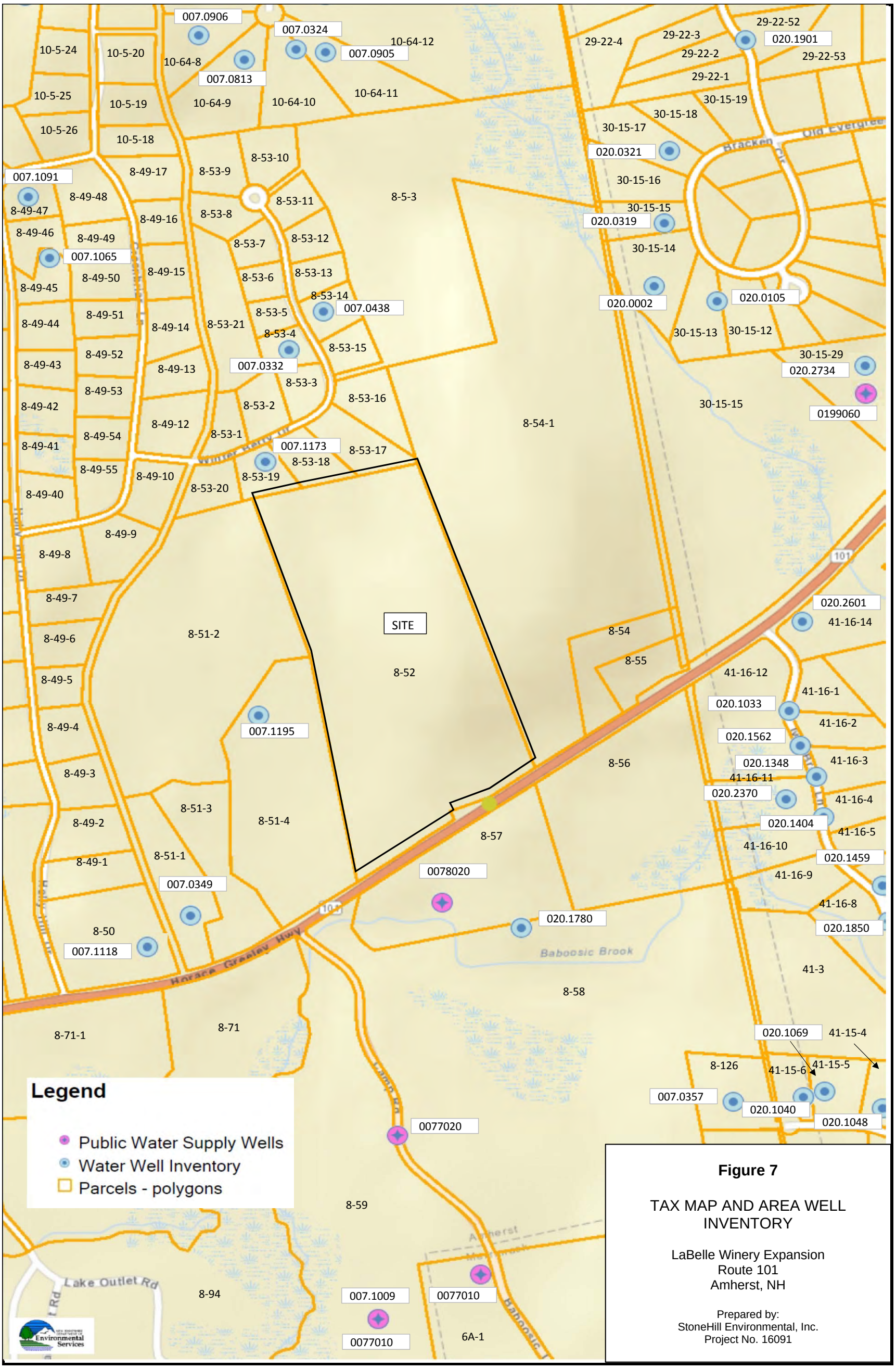


Figure 7

TAX MAP AND AREA WELL INVENTORY

LaBelle Winery Expansion
Route 101
Amherst, NH

Prepared by:
StoneHill Environmental, Inc.
Project No. 16091

Table 1
Site Area Supply Well Data
LaBelle Winery Expansion
Amherst, NH

Street Address	Map/Lot	State Well ID	Well Use	Date Installed	Reported Well Depth (feet bgs)	Depth to Bedrock (feet bgs)	Static Depth[1] (feet bgs)	Reported Well Yield (gpm)	Est. Storage[3] (gallons)
Amherst									
Camp Road	--	007.0922	Domestic	8/28/2001	420	8	--	12	522
Camp Road	--	007.1009	Domestic	2/12/2003	620	9	17.1	55	837
Holly Hill Drive	Lot 1	007.0618	Domestic	3/21/1997	590	1	50	30	743
33 Holly Hill Drive	8/49-46	007.1065	Domestic	4/14/2004	1005	7	--	2.25	830
35 Holly Hill Drive	8/49-47	007.1091	Domestic	9/28/2004	500	9	82	1	560
New South Drive	10/64-10	007.0324	Domestic	1/14/1991	450	78	20	7	578
16 New South Drive	10/64-11	007.0905	Domestic	8/22/2000	380	89	25	20	465
19 New South Drive	10/64-8	007.0906	Domestic	12/29/2000	100	10	15	20	60
21 New South Drive	10/64-9	007.0913	Domestic	7/19/2001	400	13	--	8	492
Old Mail Road	10/61-1	007.0031	Domestic	2/7/1985	995	1	--	0.5	830
Old Mail Road	10-61	007.0055	Domestic	4/23/1985	985	1.5	--	0.5	830
Route 101	--	007.1032	Domestic	1/23/2003	360	20	0	15	450
326 Route 101	--	007.1118	Domestic	7/13/2005	500	28	--	6	642
330 Route 101	8/51-1	007.0349	Domestic	6/19/1992	425	13	10	10	555
336 Route 101	8/51-004	007.1195	Domestic	11/20/2007	685	5	10	40	855
5 Winterberry Drive	--	007.1173	Domestic	5/25/2007	500	3	30	4	638
10 Winterberry Drive	8/53-4	007.0332	Domestic	8/14/1991	1000	--	150	25	645
15 Winterberry Drive	8/53-14	007.0438	Domestic	9/20/1994	20[2]	Dug Well	15	--	--
Bedford									
Bracken Circle	--	020.2463	Domestic	11/12/2003	340	10	10	15	428
Bracken Circle	--	020.2506	Domestic	11/12/2003	340	10	10	15	428
Bracken Circle	30/15-15	020.0002	Domestic	2/1/1984	550	10	10	1	743
Bracken Circle	30/15-16	020.0319	Domestic	2/22/1985	300	10	--	2.5	342
Bracken Circle	30/15-18	020.0321	Domestic	4/18/1985	460	10	--	6	582
Joppa Hill Road	30/15-13	020.0105	Domestic	10/26/1984	138	5	11	12	123
McAfee Farm Road	29/22-6	020.1977	Domestic	9/16/1998	420	6	20	30	533
McAfee Farm Road	Lot 7	020.2017	Domestic	5/18/1998	165	5	20	15	150
McAfee Farm Road	29/22-31	020.1831	Domestic	3/11/1997	520	9	--	2	710
11 McAfee Farm Road	30/22-52	020.1901	Domestic	8/7/1997	345	10	20	50	420
15 McAfee Farm Road	30/22-51	020.1777	Domestic	8/14/1997	325	8	45	15	353
19 McAfee Farm Road	30/22-49	020.1936	Domestic	5/1/1998	300	10	60	18	293
29 McAfee Farm Road	30/22-44	020.1907	Domestic	11/12/1997	245	7	15	5	278
32 McAfee Farm Road	30/22-8	020.1832	Domestic	2/25/1997	1000	12	18	1	843
32 McAfee Farm Road	30/22-8	020.1754	Domestic	11/13/1996	520	18	16	2	689
36 McAfee Farm Road	30/22-10	020.1863	Domestic	6/30/1997	405	10	21	3	509
37 McAfee Farm Road	30/22-41	020.1830	Domestic	3/14/1997	280	9	10	25	338
57 McAfee Farm Road	29/22-32	020.1909	Domestic	3/5/1998	345	4	20	7	420
64 McAfee Farm Road	29/22-16	020.1778	Domestic	7/8/1997	805	8	23	1	836
65 McAfee Farm Road	29/22-17	020.2055	Domestic	6/22/1999	805	5	20	3.5	840
Old Evergreen Road	30/15-1	020.0293	Domestic	3/1/1984	250	10	--	15	267
Proctor Road	--	020.1039	Domestic	11/5/1991	280	9	5	4	345
Proctor Road	--	020.1071	Domestic	12/20/1991	325	10	25	4	383
19 Proctor Road	41/15-1	020.1076	Domestic	10/25/1991	485	50	20	10	630
21 Proctor Road	41/15-2	020.1050	Domestic	12/10/1991	500	48	--	5.5	642
24 Proctor Road	41/15-8	020.1046	Domestic	9/11/1991	420	68	--	3	522
25 Proctor Road	41/15-3	020.1045	Domestic	9/5/1991	400	36	--	4	492
29 Proctor Road	41/15-4	020.1048	Domestic	10/10/1991	400	43	15	5	510
33 Proctor Road	41/15-5	020.1069	Domestic	11/14/1991	165	10	20	15	150
37 Proctor Road	41/15-6	020.1040	Domestic	10/15/1991	190	8	10	8	203
Route 101	--	020.1780	Domestic	8/11/1997	400	3	--	5	492
545 Route 101	30/15-29	020.2734	Domestic	8/21/2010	1325	6	30	0.5	825
2 Twin Brook Lane	41/16-14	020.2601	Domestic	12/5/2005	200	26	10	10	218
3 Twin Brook Lane	41/16-12	020.1562	Domestic	11/21/1993	450	30	40	7	548
8 Twin Brook Lane	41/16-01	020.1033	Domestic	7/13/1991	150	50	--	20	117
18 Twin Brook Lane	41/16-3	020.1348	Domestic	12/15/1993	450	39	--	9	567
19 Twin Brook Road	41/16-11	020.2370	Domestic	7/31/2002	480	32	42	30	590
22 Twin Brook Lane	41/16-4	020.1404	Domestic	8/9/1994	265	29	20	15	300
33 Twin Brook Lane	41/16-8	020.1850	Domestic	9/24/1997	300	27	20	15	353
34 Twin Brook Lane	41/16-6	020.1459	Domestic	12/22/1994	326	31	18	40	395
AVERAGES:					461	19	26	< 19 gpm: 7 gpm	> or =20 gpm: 32 gpm
								All wells:	12.5 gpm

Notes:
Source of Well Data is on-line New Hampshire Water Well Board well inventory database as of August 4, 2016.
bgs = Below Ground Surface
gpm = Gallons Per Minute
NA = Not Applicable
-- = Information not available from NHWWB well inventory database.
[1] = Static Water Level Depth reported on NHWWB well inventory database.
[2] = Depth to Bedrock measurement excluded from average since the reported depth is unlikely to be representative of typical study area conditions
[3] = Available well borehole groundwater storage was estimated using the following formula:
Available Storage = [(pump depth-20 feet) - static water level depth] x 1.5 gallons/foot
(The pump depth is assumed to be set 25 feet above the bottom of wells that are 625 feet or less in total depth, and set at 600 feet below ground surface in wells that are greater than 625 feet in total depth. All wells are assumed to be 6-inch diameter.)

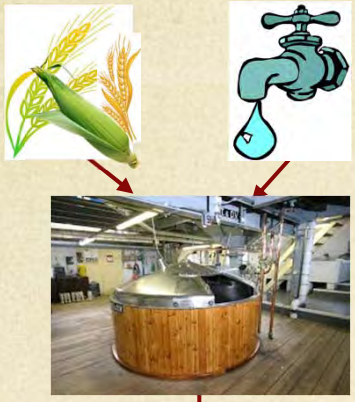
Distillery Water Usage

Amherst, NH Zoning Board
20 September 2016

Agenda

- Distilling Overview
  - Whiskey
  - Clear Spirits (Vodka & Gin)
  - Brandy
- Different Water Usage
  - Mashing (Whiskey Only)
  - Mash Chilling (Whiskey Only)
  - Neutral Grain Spirit (NGS) Diluting (Vodka and Gin Only)
  - Still Chilling
  - Bottle Dilution
  - Cleaning

Whiskey Overview



Mashing

Mash Chilling

Fermenting

Distilling

Still Chilling

Barreling

Bottle
Diluting

Gin & Vodka Overview

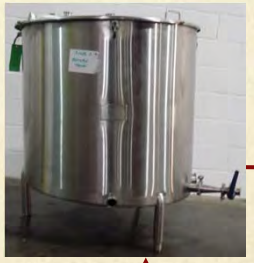
Purchased
Neutral Grain Spirits
(NGS)

NGS Diluting

Distilling

Still Chilling

Storing



Bottle
Diluting

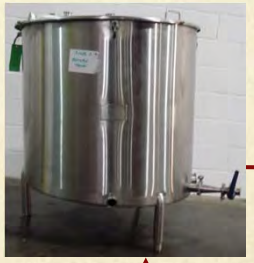
Brandy Overview

Wine produced at
Labelle Winery

Distilling

Still Chilling

Storing



Bottle
Diluting

Mashing (Whiskey Only)

Cooking grains in hot water to convert starches to sugar, then straining the grains from liquid.

- Grind Grains (Corn, Barely, Wheat, Rye)
- **Hydrate Mash (1.3 quarts per pound of grain)**

- Low temperature cooking of grains in water (145-160°F)
- Strain wash from grains
- Chill wash to 70°F*
- Ferment wash

* requires chilling fluid

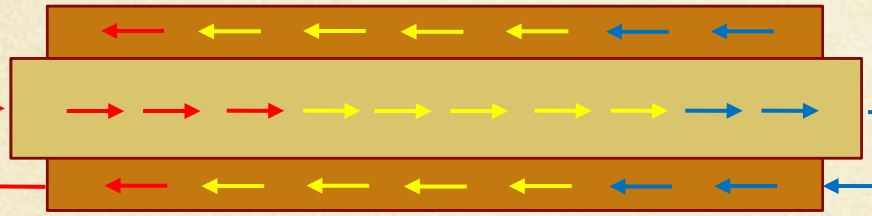
Mashing Chilling (Whiskey Only)

After Mashing, sugary liquid is very hot (145-160°F) and needs to be chilled to (70°F) before pitching yeast for fermenting, otherwise the high temp will kill the yeast. If Mash is not chilled quickly, non-desirable bacteria may begin to culture.

- Counter flow chilling is very effective way to quickly reduce mash temperatures.

- Chilling fluid can be reused and combined with Glycol for more effective cold temperature retention. Mash and chilled fluid never mix.
- Storage tanks can be buried underground to leverage cooler ground thermal temperatures.

Hot Mash



Chilled Mash

Underground Chill Storage Tank 1

Underground Chill Storage Tank 2

Neutral Grain Spirit (NGS) Diluting (Vodka and Gin Only)

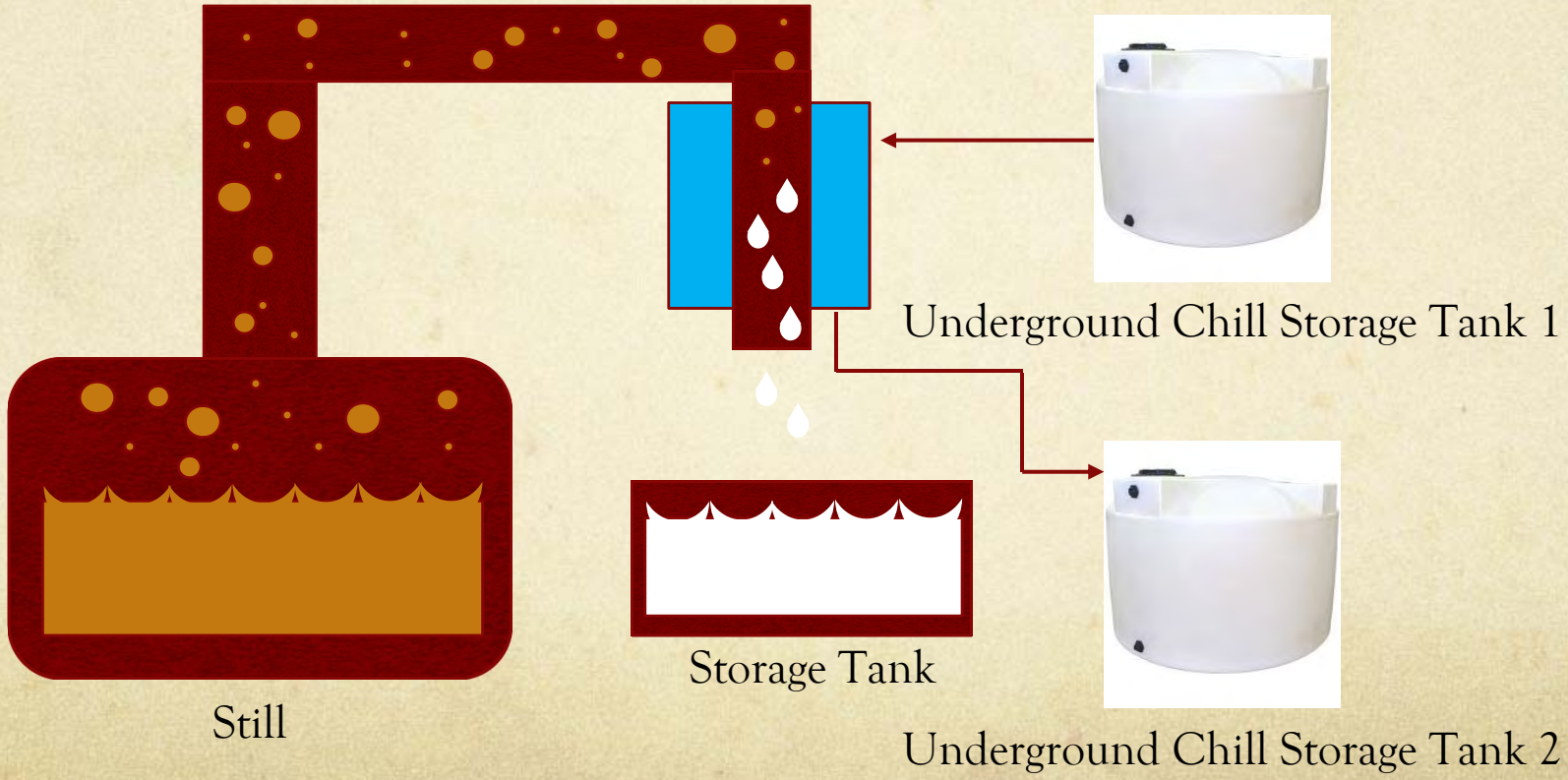
NGS is purchased at 95%+. NGS contains undesirable sulfites that need to be removed by distilling. Still input should be less than 50% ethanol. Therefore water will be combined with NGS before entering the still.

Purchased
Neutral Grain Spirits
(NGS)

NGS Diluting

Still Chilling

Water boils (turns to steam) at 212°F while Ethanol Alcohol boils at 174°F. Heating a wash above 174°F and below 212°F will separate the alcohol from water. Chilling the Ethanol vapors below 174°F will condense the vapor back to liquid.



Barreling & Bottle Diluting

Ethanol/Alcohol from the still will not be at the ideal barreling or bottling percentage. Ideal Barrel percentage of alcohol is approximately 70% (for whiskeys & brandys). The proper amount of water will need to added to reach the ideal percentage before barreling.

After barreling this product will need to be further diluted to approximately 35%-45% prior to bottling by adding more water. For Gins and Vodka this dilution step will be done directly from post still storage tank because these products do not need barreling.

Water Consumption Per Year for Product

		Year 1	Year 2	Year 3
Whiskey	Gallons	270	540	810
	H20 Required	2,581	5,161	7,742
Gin	Gallons	464	696	928
	H20 Required	316	474	632
Vodka	Gallons	464	696	928
	H20 Required	316	474	632
Brandy	Gallons	464	696	928
	H20 Required	232	348	464
Total Water Consumption		3,444	6,457	9,469