

## HOP QUALITY REPORT CERTIFICATE OF ANALYSIS



To: Wisconsin Hop Exchange

Sample ID: 24MAK1087-01LH

Variety: Mackinac™

Product: T-90 Pellet

Date : 3/15/2025

Certifying Officer: Zach Lilla - Lab Manager  
 TTB Certified Chemist - Member AOAC - ASBC - BJCP

| Method   |                      |                |                 |
|--|----------------------|----------------|-----------------|
| Hops-4C Moisture Analysis                      | % Moisture           | 11.6           |                 |
|  | % Dry Matter         | 88.4           |                 |
| AAR Xanthohumol by HPLC                        |                      | <b>NT</b> mg/g |                 |
| Hops-12 Hop Storage Index                      | HSI                  | 0.285          |                 |
| Hops-13 Essential Oil by Steam Distillation    | mL/100g              | <b>1.69</b>    |                 |
| Hops-14 Alpha and Beta Acids by HPLC<br>ICE-3  | Cohumulone           | 31.1           | (% of Total AA) |
|  | <b>% Alpha Acids</b> | <b>8.84</b>    |                 |
|  | Colupulone           | 55.4           | (% of Total BA) |
|  | <b>% Beta Acids</b>  | <b>2.89</b>    |                 |
|  | a/b ratio            | 3.06           |                 |
| Hops-17 Hop Essential Oil by GC-FID<br>(as is) | % area               | mg/100g        |                 |
|  | B-Pinene             | 0.37           | 5.87            |
|  | Myrcene              | 26.35          | 476.35          |
|  | Linalool             | 0.30           | 5.54            |
|  | Caryophyllene        | 10.56          | 175.27          |
|  | Farnesene            | 0.20           | 4.15            |
|  | Humulene             | 21.72          | 357.63          |
|  | Geraniol             | 0.69           | 13.07           |
| NT=NOT TESTED                                  |                      |                |                 |

Signed:   
 Zachary Lilla - Lab Manager - TTB Certified Chemist



# AROMA QUALITY (AQ)

## HOP QUALITY REPORT



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Variety: Mackinac™

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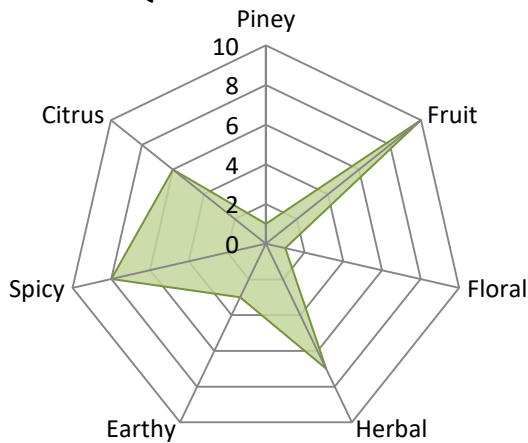
Certifying Officer: Zach Lilla - Lab Manager  
TTB Certified Chemist - Member AOAC - ASBC - BJCP

|  | Typical Range   |   |
|--|-----------------|---|
| % Moisture <span style="border: 1px solid black; padding: 2px;">11.6</span>        | 8 - 12 %        | ✓ |
| <b>HOP QUALITY (adjusted to 10% moisture)</b>                                      |                 |   |
| Total Oil ml/100g <span style="border: 1px solid black; padding: 2px;">1.72</span> | 1.2 - 1.8 ml    | ✓ |
| cohumulone <span style="border: 1px solid black; padding: 2px;">31.1</span>        | 27 - 32%        | ✓ |
| Alpha Acids <span style="border: 1px solid black; padding: 2px;">9.00</span>       | 9.0 - 13%       | ✓ |
| Beta Acids <span style="border: 1px solid black; padding: 2px;">2.95</span>        | 3.0 - 3.5%      | ↓ |
| Myrcene <span style="border: 1px solid black; padding: 2px;">26.35</span>          | 15.00 - 25.00 % | ↑ |

### AROMA QUALITY (AQ)

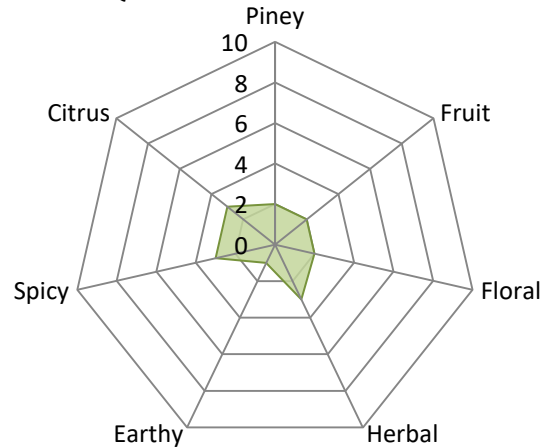
|               | % Area |                 | mg/mL of Hop Oil |        | mg/100g of Hops (@10%H2O) |   |        |            |   |
|---------------|--------|-----------------|------------------|--------|---------------------------|---|--------|------------|---|
| B-Pinene      | 0.37   | 0.40 - 1.00 %   | ↓                | 3.48   | 4 - 10                    | ↓ | 5.98   | 4.8 - 18   | ✓ |
| Myrcene       | 26.35  | 15.00 - 25.00 % | ↑                | 282.59 | 150 - 250                 | ↑ | 485.01 | 180 - 450  | ↑ |
| Linalool      | 0.30   | 0.6 - 1.20 %    | ↓                | 3.29   | 6 - 12                    | ↓ | 5.64   | 7.2 - 21.6 | ↓ |
| Caryophyllene | 10.56  | 9.00 - 12.00 %  | ✓                | 103.97 | 90 - 120                  | ✓ | 178.45 | 108 - 216  | ✓ |
| Farnesene     | 0.20   | 0.01 - 1.00 %   | ✓                | 2.46   | 0.1 - 10                  | ✓ | 4.23   | 0.12 - 18  | ✓ |
| Humulene      | 21.72  | 17.00 - 23.00 % | ✓                | 212.16 | 170 - 230                 | ✓ | 364.13 | 204 - 414  | ✓ |
| Geraniol      | 0.69   | 0.60 - 1.00 %   | ✓                | 7.75   | 6 - 10                    | ✓ | 13.30  | 7.2 - 18   | ✓ |

#### AQ vs VARIETY SPECS



**Aroma Intensity= 18**

#### AQ vs ALL HOP VARIETIES



**Aroma Intensity= 5**

Signed: \_\_\_\_\_

Zachary Lilla - Lab Manager - TTB Certified Chemist

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