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Environmental Land Management
1602 11th Drive NE
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RE: Agronomist Review for Hormel Foods - Austin, MN Permit # 00-SDP-08-14

The following is an agronomic review of waste byproducts applied from the Hormel Foods Plant in Austin, MN, permit# 00-SDP-08-14. A brief description of the regulated waste byproduct will be given to provide context of the review and a brief discussion of the land application sites, application rates and site characteristics will be done as well.

Product Description:

The Hormel Facility is permitted to apply up to 15 wet tons per acre. The typical target application rate is 10 wet tons per acre per year, or about 3.6 dry tons. Based on eleven tests of the by-product from 2018 through 2019, an application rate of 10 wet tons per acre will supply about 68 pounds of available nitrogen (N). It also contains about 126 pounds of phosphate (P₂O₅). The organic nitrogen in the product will be slowly converted to plant available nitrate as soil microbes convert it – thus, its ultimate availability will depend on numerous environmental conditions including, soil temperature, moisture, drainage and pH. The product is treated with a hydrated lime to stabilize it, and as a result, should help raise soil pH. It should be noted that the product does not contain detectable levels of arsenic, lead or mercury and has only negligible amounts of sodium.

A corn crop with a yield of 200 bushels per acre will require approximately 180-190 pounds of nitrogen and will remove about 70 pounds of phosphorus and 60 pounds of potassium per acre. A soybean crop with a yield of 50 bushels per acre will require approximately 190 pounds of nitrogen (fixed on its own), 40 pounds of phosphorus and 75 pounds of potassium per acre each year. From an agronomic perspective, soil fertility in the medium to high range is preferred. This translates to ±41 ppm for phosphorus using the Mehlich-3 ICP test and ±201 ppm for Potassium (ammonium acetate or Mehlich-3 ICP). The opinion in this review will be based on characteristics and rates of the applied byproduct, current soil tests and land application site conditions.

Land Application Sites for 2025 Crop Year:

Site	Permitted Acres	Acres Applied	Rate	Dry Tons	By Product	Application Period
Hulshizer Meltonville	196	196	3.8	751.5	Industrial Sludge	4th Quarter
Hulshizer Russ Home	206	180	3.8	690.9	Industrial Sludge	4th Quarter
Rosenberg Buntrock	197	195	3.3	643.6	Industrial Sludge	4th Quarter
Hulshizer Ron Home	194	165	4.1	680.5	Industrial Sludge	4th Quarter
Hulshizer Steve Home	149	149	3.6	530.9	Industrial Sludge	4th Quarter
Rosenberg Nevertell	185	148	3.8	569	Industrial Sludge	4th Quarter
Hulshizer Opkis	152	145	3.4	493	Industrial Sludge	4th Quarter
Hulshizer Peterson	77	75	3.9	290.8	Industrial Sludge	4th Quarter
Rosenberg Tesch	140	90	4.1	371	Industrial Sludge	4th Quarter
Rosenberg Otranto	189	189	2.8	520.2	Industrial Sludge	4th Quarter
Hertel 330	266	205	3.9	807.9	Industrial Sludge	4th Quarter
Hertel 120	109	33	3.9	129.7	Industrial Sludge	4th Quarter
Hertel 120	109	20	3.0	59.8	Industrial Sludge	2nd Quarter
Hertel Sand	298	155	2.8	440.4	Industrial Sludge	2nd Quarter
Hertel Sand	298	120	2.8	340.8	Industrial Sludge	2nd Quarter

The fields used for land application were evaluated for soil phosphorus levels, salts and soil pH. Farms with a soil pH below 6.0 should receive an application of agricultural lime. Salt levels should be managed to maintain levels below 1.0. Fields with a phosphorus level exceeding 41 ppm should be managed so that fertility levels do not increase, thus applying nutrients at crop removal rates. A summary of field characteristics is shown below for pH, MEH-3P, salts, phosphate (P2O5) and potassium (K2O):

Farmer	Site	pH	MEH-3 P	Salts	Net P2O5	Net K2O
Steve Hulshizer	Hulshizer Meltonville	6.9	42	0.2	66	-46
Mike Hulshizer	Hulshizer Russ Home	6.0	51	0.1	65	-47
Joe Rosenberg	Rosenberg Buntrock	6.8	81	0.2	47	-46

Steve Hulshizer	Hulshizer Ron Home	6.3	85	0.2	68	-51
Steve Hulshizer	Hulshizer Steve Home	6.6	36	0.2	51	-49
Joe Rosenberg	Rosenberg Nevertell	7.3	29	0.2	85	-33
Steve Hulshizer	Hulshizer Opkis	7.1	40	0.2	49	-47
Mike Hulshizer	Hulshizer Peterson	6.2	29	0.1	66	-47
Joe Rosenberg	Rosenberg Tesch	6.6	31	0.2	68	-51
Joe Rosenberg	Rosenberg Otranto	7.0	51	0.2	22	-50
Gene Hertel	Hertel 330	7.3	56	0.2	62	-51
Gene Hertel	Hertel 120	7.1	38	0.2	67	-47
Gene Hertel	Hertel 120	7.1	38	0.2	33	-48
Gene Hertel	Hertel Sand	6.4	15	0.1	55	-75
Gene Hertel	Hertel Sand	6.4	15	0.1	24	-51

Site Specific Discussion:

Hulshizer Meltonville: This farm received 751.5 dry tons of product applied on approximately 196 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 226 Bushels per acre was harvested on the farm. Based on this yield, approximately 72 lbs. of P2O5 and 50 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 4.4%, the phosphorus ranges from a minimum of 22 and a max of 56 with an average of 42 ppm; the Very High range according to Iowa State University. Soil potassium averages 138 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 66 lbs of P2O5 and -46 lbs of K2O are calculated on these acres. Average soil pH is 6.9 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hulshizer Russ Home: This farm received 690.9 dry tons of product applied on approximately 180 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 230 Bushels per acre was harvested on the farm. Based on this yield, approximately 74 lbs. of P2O5 and 51 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.3%, the phosphorus ranges from a minimum of 23 and a max of 81 with an average of 51 ppm; the Very High range according to Iowa State University. Soil potassium averages 118 ppm; the Very Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 65 lbs of P2O5 and -47 lbs of K2O are calculated on these acres. Average soil pH is 6 - Slightly Acidic and should be monitored to maintain soil pH near 6.5.

Reported salt (EC) levels are 0.1 mhoms/dm and there are no concerns related to current measured salt levels.

Rosenberg Buntrock: This farm received 643.6 dry tons of product applied on approximately 195 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 225 Bushels per acre was harvested on the farm. Based on this yield, approximately 72 lbs. of P2O5 and 50 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3%, the phosphorus ranges from a minimum of 20 and a max of 140 with an average of 81 ppm; the Very High range according to Iowa State University. Soil potassium averages 146 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 47 lbs of P2O5 and -46 lbs of K2O are calculated on these acres. Average soil pH is 6.8 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hulshizer Ron Home: This farm received 680.5 dry tons of product applied on approximately 165 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 250 Bushels per acre was harvested on the farm. Based on this yield, approximately 80 lbs. of P2O5 and 55 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 4%, the phosphorus ranges from a minimum of 42 and a max of 162 with an average of 85 ppm; the Very High range according to Iowa State University. Soil potassium averages 180 ppm; the Optimum range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 68 lbs of P2O5 and -51 lbs of K2O are calculated on these acres. Average soil pH is 6.3 - Slightly Acidic and should be monitored to maintain soil pH near 6.5. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hulshizer Steve Home: This farm received 530.9 dry tons of product applied on approximately 149 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 240 Bushels per acre was harvested on the farm. Based on this yield, approximately 77 lbs. of P2O5 and 53 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.7%, the phosphorus ranges from a minimum of 31 and a max of 47 with an average of 36 ppm; the Very High range according to Iowa State University. Soil potassium averages 131 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 51 lbs of P2O5 and -49 lbs of K2O are calculated on these acres. Average soil pH is 6.6 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Rosenberg Nevertell: This farm received 569 dry tons of product applied on approximately 148 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 167 Bushels per acre was harvested on the farm. Based on this yield, approximately 53 lbs. of P2O5 and 37 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 4.2%, the phosphorus ranges from a minimum of 10 and a max of 55 with an average of 29 ppm; the High range according to Iowa State University. Soil potassium averages 113 ppm; the Very Low range according to Iowa State University. Based on the cumulative application

rate and reported crop yields, a net of 85 lbs of P2O5 and -33 lbs of K2O are calculated on these acres. Average soil pH is 7.3 - Slightly Alkaline and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hulshizer Opkis: This farm received 493 dry tons of product applied on approximately 145 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 230 Bushels per acre was harvested on the farm. Based on this yield, approximately 74 lbs. of P2O5 and 51 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 4.9%, the phosphorus ranges from a minimum of 22 and a max of 59 with an average of 40 ppm; the Very High range according to Iowa State University. Soil potassium averages 117 ppm; the Very Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 49 lbs of P2O5 and -47 lbs of K2O are calculated on these acres. Average soil pH is 7.1 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hulshizer Peterson: This farm received 290.8 dry tons of product applied on approximately 75 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 230 Bushels per acre was harvested on the farm. Based on this yield, approximately 74 lbs. of P2O5 and 51 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 2.8%, the phosphorus ranges from a minimum of 12 and a max of 46 with an average of 29 ppm; the High range according to Iowa State University. Soil potassium averages 133 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 66 lbs of P2O5 and -47 lbs of K2O are calculated on these acres. Average soil pH is 6.2 - Slightly Acidic and should be monitored to maintain soil pH near 6.5. Reported salt (EC) levels are 0.1 mhoms/dm and there are no concerns related to current measured salt levels.

Rosenberg Tesch: This farm received 371 dry tons of product applied on approximately 90 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 250 Bushels per acre was harvested on the farm. Based on this yield, approximately 80 lbs. of P2O5 and 55 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.9%, the phosphorus ranges from a minimum of 15 and a max of 53 with an average of 31 ppm; the Very High range according to Iowa State University. Soil potassium averages 159 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 68 lbs of P2O5 and -51 lbs of K2O are calculated on these acres. Average soil pH is 6.6 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Rosenberg Otranto: This farm received 520.2 dry tons of product applied on approximately 189 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 240 Bushels per acre was harvested on the farm. Based on this yield, approximately 77 lbs. of P2O5 and 53 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3%, the phosphorus ranges from a minimum of 37 and a max of 64 with an average of 51 ppm; the Very High range according to Iowa State University. Soil potassium averages 136 ppm; the Low range according to Iowa State University. Based on the cumulative application rate

and reported crop yields, a net of 22 lbs of P2O5 and -50 lbs of K2O are calculated on these acres. Average soil pH is 7 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hertel 330: This farm received 807.9 dry tons of product applied on approximately 205 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 250 Bushels per acre was harvested on the farm. Based on this yield, approximately 80 lbs. of P2O5 and 55 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.2%, the phosphorus ranges from a minimum of 48 and a max of 69 with an average of 56 ppm; the Very High range according to Iowa State University. Soil potassium averages 177 ppm; the Optimum range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 62 lbs of P2O5 and -51 lbs of K2O are calculated on these acres. Average soil pH is 7.3 - Slightly Alkaline and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hertel 120: This farm received 129.7 dry tons of product applied on approximately 33 acres in the 4th Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 232 Bushels per acre was harvested on the farm. Based on this yield, approximately 74 lbs. of P2O5 and 51 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.7%, the phosphorus ranges from a minimum of 31 and a max of 51 with an average of 38 ppm; the Very High range according to Iowa State University. Soil potassium averages 142 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 67 lbs of P2O5 and -47 lbs of K2O are calculated on these acres. Average soil pH is 7.1 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hertel 120: This farm received 59.8 dry tons of product applied on approximately 20 acres in the 2nd Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 232 Bushels per acre was harvested on the farm. Based on this yield, approximately 74 lbs. of P2O5 and 51 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.7%, the phosphorus ranges from a minimum of 31 and a max of 51 with an average of 38 ppm; the Very High range according to Iowa State University. Soil potassium averages 142 ppm; the Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 33 lbs of P2O5 and -48 lbs of K2O are calculated on these acres. Average soil pH is 7.1 - Neutral and no action is needed. Reported salt (EC) levels are 0.2 mhoms/dm and there are no concerns related to current measured salt levels.

Hertel Sand: This farm received 440.4 dry tons of product applied on approximately 155 acres in the 2nd Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Soybeans yield of 65 Bushels per acre was harvested on the farm. Based on this yield, approximately 47 lbs. of P2O5 and 78 lbs. of K2O were removed. Soil test results show that the organic matter levels are approximately 3.4%, the phosphorus ranges from a minimum of 9 and a max of 25 with an average of 15 ppm; the Low range according to Iowa State University. Soil potassium averages 97 ppm; the Very Low range according to Iowa State University. Based on the cumulative application rate and reported crop

yields, a net of 55 lbs of P₂O₅ and -75 lbs of K₂O are calculated on these acres. Average soil pH is 6.4 - Slightly Acidic and should be monitored to maintain soil pH near 6.5. Reported salt (EC) levels are 0.1 mhoms/dm and there are no concerns related to current measured salt levels.

Hertel Sand: This farm received 340.8 dry tons of product applied on approximately 120 acres in the 2nd Quarter of the 2024-2025 crop year. A single by-product source was applied to the acres. A reported Corn yield of 245 Bushels per acre was harvested on the farm. Based on this yield, approximately 78 lbs. of P₂O₅ and 54 lbs. of K₂O were removed. Soil test results show that the organic matter levels are approximately 3.4%, the phosphorus ranges from a minimum of 9 and a max of 25 with an average of 15 ppm; the Low range according to Iowa State University. Soil potassium averages 97 ppm; the Very Low range according to Iowa State University. Based on the cumulative application rate and reported crop yields, a net of 24 lbs of P₂O₅ and -51 lbs of K₂O are calculated on these acres. Average soil pH is 6.4 - Slightly Acidic and should be monitored to maintain soil pH near 6.5. Reported salt (EC) levels are 0.1 mhoms/dm and there are no concerns related to current measured salt levels.

Soil phosphorus and applied nitrogen are the primary nutrients of concern to water quality and public health. The reported rates of Nitrogen do not pose a risk to water quality. The applied phosphorus rates are below crop removal rates for the reported crop yields. If additional phosphorus applications are calibrated to soil test needs of the reported soil phosphorus levels, the applied phosphorus does not pose a significant risk to environmental quality or public health. Soil phosphorus levels that have increased significantly above the Very High range should be managed to reduce soil test levels through crop removal. As such long-term management should consider maintaining and not building additional soil phosphorus levels as there is little to no agronomic benefit, and potential for increased phosphorus runoff increases with corresponding increases in soil test phosphorus. Salt levels in the soils appears to be well below any thresholds for crop injury. Best management practices in nutrient management and land application should always be followed.

Regards,



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