BEFORE THE ENVIRONMENTAL APPEALS BOARD
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

IN THE MATTER OF: Hudson Oil Refinery Superfund Site, Cushing, Oklahoma Land O'Lakes, Inc., Petitioner. Petition for Reimbursement Under Section 106(b)(2) of the Comprehensive Environmental Response Act of 1980, as amended ("CERCLA"), 42 U.S.C. § 9606(b)(2) and for Relief for Constitutional Violations under CERCLA Section 106(b) 09-01	Docket No. CERCLA 06-16-08 Petition No. __________________ **DECLARATION OF D. KEITH BAUGHER**

I, D. Keith Baugher, make this declaration based on my personal knowledge.

1. I am a Consultant with DKB Consulting, Inc. I am a Chemical Engineer with over 50 years of experience in Petroleum Refinery Operations. For 33 years I functioned in various engineering, supervisory and management positions within several of ExxonMobil Corporation (formerly Exxon) refineries. For the last 14 years of my Exxon career I was Process Operations Manager, responsible for directing the operation of one of the largest US refineries. Subsequent to my retirement from Exxon, I have provided consulting on refinery operations for numerous large and small refineries.

2. I have been retained by Land O'Lakes, Inc. ("Land O'Lakes") to serve as an expert witness on refinery operations and opine on how chemical constituents that the EPA required Land O'Lakes to cleanup under the 2009 Unilateral Administrative Order (UAO) are

EXHIBIT
4

attributable to historical refinery operations at the former Hudson Refinery (the "Site"). My engagement was to provide operational background to demonstrate (1) the application of the petroleum exclusion to the Hudson Site in order to show that Land O'Lakes was not liable under CERCLA Section 107 (a) for costs that Land O'Lakes is seeking reimbursement, and (2) that USEPA's selection of the ordered response costs was arbitrary and capricious or otherwise not in accordance with the law.

3. Attached as an Appendix to my Declaration are my resume and qualifications and the documents, data and facts which I considered in formulating the opinions set forth in this declaration.

4. The Figures, Tables and Attachments with their contents are listed in the table below:

Exhibit	Subject
Figure 1	South Refinery at Time of Sale to Midland
Figure 2A	South Refinery at Time of Sale to Hudson
Figure 2B	North Refinery at Time of Sale to Hudson
Figure 3	Midland's Process and Storm Water Treatment System
Figure 4	Aerial Photograph North Refinery (Late 1960s)
Figure 5	Aerial Photograph South Refinery (Early 1970s)
Figure 6	Midland Product Remaining In Tank
Figure 7	South Refinery Processing and Tankage Area Footprint
Figure 8	North Refinery Processing and Tankage Area Footprint
Figure 9	Coke Pond
Figure 10	Photograph - Coke Fines Removed from Coke Pond
Figure 11	Areas Addressed under the UAO for "visual contamination" within the Coke Pond Excavation, Coke Pond Expansion, and SAOC 5-1

Exhibit	Subject
Figure 12	Areas Addressed under the UAO for “visual contamination” within the Coke Pond Excavation and the Coke Pond Expansion compared to historical refinery units in 1931
Figure 13	Areas Addressed under the UAO for “visual contamination” within the Coke Pond Excavation and the Coke Pond Expansion compared to historical refinery units in 1938
Figure 14	Areas Addressed under the UAO for “visual contamination” within the Coke Pond Excavation and the Coke Pond Expansion
Figure 15	Photograph: Leaking Buried Pipe under Former Crude Stills
Figure 16	Photograph - “Visual contamination” from “Rats Nest” of Leaking Buried Piping under Former Crude Stills
Figure 17	Photograph - “Visual contamination” from Leaking pre WWII Threaded Pipe “T”
Figure 18	Areas Addressed under the UAO for “visual contamination” within the Coke Pond Excavation and the Coke Pond Expansion
Figure 19	Photograph - Buried North/South Pipe-way under East Berm of Coke Pond
Figure 20	Photograph - Buried Pipe Dug up from Around Coke Pond Expansion Area
Figure 21	Areas Addressed Under the UAO for “visual contamination” within the Excavation Near Pothole #2 and SAOC 5-1
Figure 22	Photograph - “Visual contamination” around Buried Pipe being Excavated North of Coke Pond
Figure 23	Photograph - “Visual contamination” Around Buried Pipe North of Coke Pond
Figure 24	Photograph - Heavy Petroleum Product Leaking from Buried Pip
Figure 25	Areas Addressed Under the UAO within SAOC 2-12 and 2-14
Figure 26	Areas Addressed Under the UAO within and near SAOC-2-4, 2-11, 2-12, 2-14 and 2-15, and Unnamed Seep 1
Figure 27	Areas Addressed Under the UAO within and near SAOC-2-4, 2-11, 2-12, 2-14 and 2-15, and Unnamed Seep 1
Figure 28	Photograph - Leaking Pipe Buried under the Rail Spur
Figure 29	Photograph - Petroleum Product Leaking from pipeline under the Rail Spur

Exhibit	Subject
Figure 30	Photograph - “Visual contamination” Around Buried Pipe under Rail Spur
Figure 31	Photograph - Leaking Screwed Pipe Collar (pre WWII) Under Rail Spur
Figure 32	Area Addressed Under the UAO within SAOC 2-1, 2-2, and 2-3
Figure 33	Areas Addressed Under the UAO within and near SAOC-1
Figure 34	Areas Addressed Under the UAO within SAOC 3-1, 3-2, 3-4, 3-6, and 3-7
Figure 35	Areas Addressed Under the UAO for “visual contamination” within SAOC 3-6 and 3-7
Figure 36	Areas Addressed Under the UAO within SAOC 4-1, 4-3, and 4-6
Figure 37	Areas Addressed Under the UAO within SAOC 4-1, 4-3, and 4-6
Figure 38	Area Addressed Under the UAO within SAOC 7-1
Figure 39	Areas Addressed under the UAO for “visual contamination” within “Coke Tar Area,” and the excavation Near Pothole #2 and SAOC 5-1
Figure 40	Photograph - Petroleum Product Leaking from Buried Pipe in “Coke Tar Area”
Figure 41	Photograph - “Visual contamination” surrounding a Buried Pipe in “Coke Tar Area”
Figure 42	Area Addressed Under the UAO within AA-1
Figure 43	Areas Addressed Under the UAO for Lead
Figure 44	Area Addressed Under the UAO for Lead within SAOC 5-1
Figure 45	Areas Addressed Under the UAO for Lead within SAOC 2-5 and 2-6
Figure 46	Areas Addressed Under the UAO for Lead within SAOC 2-5 and 2-6
Figure 47	Areas Addressed Under the UAO for Lead within SAOC 3-5, 3-6 and 3-7
Figure 48	Area Addressed Under the UAO for Lead within SAOC 2-7
Figure 49	Area Addressed Under the UAO within SAOC 1-8
Table 1	Time Required to Displace Midland Crude and Products in Tankage
Table 2	Tank Time Line
Attachment 1	Resume

Exhibit	Subject
Attachment 2	Documents Reviewed

5. Where facts are stated in this Declaration, I reviewed and relied on the sources identified in Attachment 2, and I believe those facts to be accurate. I also conducted a Site visit and met with a number of fact witnesses, including Mick Gaskins, Glen Wright and Forrest Fuqua.

6. If asked to testify before the EPA's Environmental Appeals Board or in court regarding my opinions and conclusions, my testimony would be consistent with my Declaration.

INTRODUCTION

7. In preparing my Declaration I have read and reviewed the affidavits of each of the other Land O' Lakes experts and fact witnesses. I note throughout my Declaration where I relied on either findings or opinions expressed by these other experts. The history of the former Hudson Refinery, which consists of the North Refinery and South Refinery, is covered in the Affidavit of Jay Vandeven. I have read and agree with Mr. Vandeven's history of the Site and will not repeat it in my Declaration, but instead incorporate it by reference.

8. My opinions are summarized below, followed by a discussion of the basis for those opinions. In providing the foundation for my opinions, I discuss general refinery operations and review the condition of the refinery when it was sold by Midland Cooperatives, Inc. (Midland) to Hudson Oil Company (Hudson) in February 1977. I also briefly discuss the evolution of the refinery wastewater system. I address Hudson's operation of the refinery after the February 1977 sale and Hudson's subsequent shut down in December 1982 after almost 6 years of operation. This is followed by a brief discussion of the Site activities between the shut-down and EPA's January 6, 2009 Unilateral Action Order ("UAO"), which are covered in more

detail in the Affidavits of Mr. Vandeven and Dr. Tarek Saba. The next sections provide my analysis of the historical operational sources that led to the releases and contamination that Land O' Lakes was compelled to address under the UAO.

SUMMARY OF OPINIONS

9. **Opinion 1 -** In February 1977, Midland sold to Hudson an operating and well maintained refinery.

10. **Opinion 2 -** Hudson's nearly six years of refinery operations eliminated any crude oil, feedstocks, products, chemicals, additives, and by-products sold and transferred by Midland to Hudson in February, 1977 because of the sheer number of turnover cycles created from the 19,000 barrels per day ("B/D") of refinery throughput.

11. Midland was not involved in either Hudson's decision to close the refinery with crude oil, feedstocks, products, chemicals, additives, and by-products in some of the pipes, tanks and vessels or the various subsequent efforts to maintain the refinery in a state that would allow a restart by a potential purchaser. Material that may have leaked into the environment during the period after the 1982 shut-down was in part attributable to Hudson's and subsequent owners' decisions to leave the refinery with some inventory, products and materials in place.

12. **Opinion 3 -** RCRA became effective for refineries soon after Midland's sale to Hudson. All of the RCRA Hazardous listed Waste streams at the Hudson refinery - DAF float (K048), Slop oil emulsion solids (K049), Heat exchanger sludge (K050), API separator sludge (K051), Leaded gasoline tank bottoms (K052), Crude tank sediment (K169), Clarified slurry tank sediment (K170), Spent hydrofining catalyst (K171) and Spent hydrotreating catalyst (K172) were either placed in the Hudson LTU or removed prior to the 2009 UAO and disposed of as part of the response to the Final Consent Decree (FCD), the Emergency Removal Action (ERA), or the Non-time Critical Removal Action (NTCRA).

13. **Opinion 4 -** The Contaminants of Concern (COCs) identified in the 2007 Record of Decision (ROD) and the "visual contamination" that the EPA directed Land O'Lakes to excavate and remove from the refinery processing and tankage areas are attributable to leaks or spills of crude oil or refined petroleum products during the almost 70 years that the refinery operated or attributable to third party activities.

14. **Opinion 5 -** I am unaware of a source of arsenic associated with the refining of the crude oil at the Site which could explain the elevated arsenic levels measured in soil in a few locations in the processing and tankage areas.

15. **Opinion 6 -** The largest excavation required by the ROD involved the removal of approximately 32,863 cubic yards ("CY") of soil and coke fines from the Coke Pond and the Coke Pond Expansion Area (David Brady Affidavit). Approximately 5,596 CY of the 32,863 CY removed was petroleum coke fines, a product refined from crude at this and many other US refineries.

16. **Opinion 7 -** The 27,267 CY of soil removed from areas surrounding the Coke Pond (an area referred to as the Coke Pond Expansion) was required because of EPA-designated "visual contamination". This material was attributable to leaks and spills of petroleum products from pipes and tanks and unrelated to the coke fines. My conclusion is that all this material was petroleum excluded under CERCLA.

17. **Opinion 8 -** Lead, Benzo(a)pyrene (BaP), and the "visual contamination" that the EPA RPM directed Land O'Lakes to excavate and remove from SAOC-1, SAOC-2, SAOC-3, and SAOC-4 are attributable to leaks or spills of crude oil and petroleum products during the years that the refinery occupied the Hudson Site or third party activities. This material was either subject to the petroleum exclusion or the costs to address it are divisible.

18. **Opinion 9 -** The ROD required only one excavation in SAOC-7 in the North Refinery tank field, south of Tanks 100 and 101. The contaminants in this area are attributable to spills and leaks of petroleum products from tanks and their associated piping and are subject to CERCLA's petroleum exclusion.

19. **Opinion 10 -** EPA mischaracterized tar like materials encountered during the investigation and excavation of the Site as "Coke Tar." This mischaracterized "coke tar" is, in reality, crude oil or a petroleum product. It is not the RCRA listed waste K087. K087 requires the use of coal and was never produced during the operation of the refinery on the Site.

20. **Opinion 11 -** The mischaracterized "coke tar" and "visual contamination" that the EPA RPM directed Land O' Lakes to excavate and remove from the "Coke Tar Area" are attributable to leaks or spills of crude oil and petroleum products during the years that the refinery occupied the Site. All this material is subject to the CERCLA petroleum exclusion.

21. **Opinion 12 -** Material identified by the EPA RPM as "Coke Tar" and/or "visual contamination" north of Tank 97 and next to State Highway 33 (an area designated as Additional Area 1 ("AA-1")) was crude oil, which is attributable to leaks from the pipelines which transferred crude to Tanks 96 and 97. All this material was subject to the CERCLA petroleum exclusion.

22. **Opinion 13 -** When leaded gasoline (a refined petroleum product) is spilled or leaked, the gasoline quickly evaporates leaving behind the Tetraethyl Lead (TEL). It is not unusual at an old refinery site, like the Hudson refinery, to find elevated lead levels in the soil in areas where leaded gasoline has spilled or leaked. In the absence of evidence of elevated levels of lead in the area of the TEL storage facilities (there being no other sources of lead at the Site), it is my opinion that all but one of the elevated soil lead levels in the South Refinery processing

and tankage areas were the result of leaded gasoline spills or leaks. All such materials are subject to the CERCLA petroleum exclusion.

23. **Opinion 14 -** The Lockheed Report, an aerial photograph interpretation conducted on behalf of EPA, incorrectly identified various pools of water as pools of "hazardous substances" from leaking tanks. The EPA's use of Lockheed's incorrect analysis as part of its decision to take action at the Site was arbitrary and capricious.

BASES FOR OPINIONS

Opinion 1. In February 1977, Midland sold to Hudson an operating and well maintained refinery.

24. The Hudson refinery evolved over many decades from its initial startup in approximately 1915. Consistent with the petroleum refining industry standard during that early timeframe, the refining operation included crude stills in what would become the South Refinery. In the mid-1930s, the 17 batch-operated crude stills were replaced by a crude distillation column. Later in the 1930s, a thermal cracker was added to increase the production of motor gasoline. Figures 1 and 2 are plot plans showing the refinery at the time it was purchased by Midland in 1943. These Figures depict the major processing units and the tankage areas.

25. Midland expanded the refinery in 1953 with an additional crude unit on the South Refinery (Crude Unit No. 2) and, most importantly, the startup of a Fluid Catalytic Cracker (FCC) Unit on the North Refinery. This expansion allowed both an increase in crude running capacity and a significant increase in gasoline production. Gasoline octane was enhanced with the startup of the Platformer Unit in 1956 and a Hydrofluoric Acid (HF) Alkylation Unit in 1960 on the North Refinery. Finally, Midland added a delayed coker in 1969 on the South Refinery to convert the "bottom of the barrel" (residuum) from primarily No. 6 fuel oil into more valuable

lighter products and petroleum coke. Along the way additional support facilities such as treaters, loading racks, pipelines and tanks were added to support the increased production rates.

26. Midland invested in facilities to improve the environmental performance of the refinery, often well before the enactment of regulatory requirements. An additional stage of cyclones was added to the FCC in 1971 to reduce particulate emissions. An acid sludge incinerator was installed on the HF Alkylation Unit to eliminate the generation of acid sludge. As a result, there were no acid sludge pits at the refinery. (Wright, 2015). Midland installed floating roofs on their large crude and gasoline tanks prior to Clean Air Act requirements to reduce emissions of volatiles. Midland invested in a waste water treatment system that separated storm water from process water.[1] The oily process water was routed through American Petroleum Institute (API) separators to skim off any free oil and then entered an extensive pond system[2] that Midland constructed in 1960 to allow time for biological treatment to further reduce contaminants before discharged into Skull Creek. The pond system and waste handling ultimately became a successful part of the Site's NPDES permit, which was approved by EPA in 1973 and became effective in 1974. Storm water was captured in a pond and also pumped into the biological pond system, if necessary, before entering Skull Creek.[3] Figure 3 shows the process and storm water treatment system at the time of the sale to Hudson. Depicted on Figure 3 are the three API separators, storm water pond and the six biological ponds. The oil recovered

[1] Environmental Management Program, WBWC, EPAFOIA0008786.

[2] Vandeven Affidavit.

[3] Analysis and Interpretations of Aerial Photographs of the Hudson Refinery Superfund Site, Cushing, Oklahoma, February 6, 2009, William E. Coons, PhD.

from the South Refinery API separators and skimmed from ponds was recycled to the crude distillation units and re-entered the refining process based on boiling range. The oil recovered from the North Refinery was injected into the FCC along with fresh feed. As discussed later in my Declaration, and in the Affidavit of Dr. Boehm, recovered oil that is directed back to the process is covered under CERCLA's petroleum exclusion. The Site's waste water treatment system, and its evolution, is discussed in greater detail in Vandeven's Affidavit.[4]

27. The absence of solid waste disposal pits at the Site indicates that this refinery did not follow the pattern and practice of many refineries of burying refinery solid wastes onsite. Records indicate that oily wastes were land farmed and biologically treated (Williams, 2015). I have been involved in the operation of refineries for over 50 years and have performed due diligence investigations for a number of purchasers of refineries and petrochemical sites. In each situation the cleanup of numerous buried oily solid waste pits was necessary. Anecdotal opinions have been offered by others that this refinery Site was unusually clean. The condition of the Hudson refinery after closure in 1982 represented one of the cleanest refinery sites with which I have been involved.

28. The existing data and affidavits of Refinery employees Fuqua, Wright, Williams and Gaskins I have reviewed indicate that the refinery was well maintained by Midland and Hudson. Midland maintained the refinery by performing routine repairs as well as complete refinery turnarounds every two years.[5] Universal Oil Products ("UOP") performed on-stream

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[4] Vandeven Affidavit.

[5] Forrest Fuqua, Williams, Wright, Gaskins Affidavits.

equipment inspections and comprehensive internal inspections during turnarounds.[6] Review of two appraisals confirmed that the refinery was well maintained; a 1976 appraisal of the Refinery by Turner Mason & Solomon a year before the sale to Hudson and a PCI Consultants, Inc. (PCI)[7] report a year after the 1982 shut-down.

29. Midland sold to Hudson in February 1977 a relatively small refinery - approximately 19,000 barrels per day ("B/D") of crude distillation but a high gasoline conversion of approximately 60% gasoline. This gasoline recovery was comparable to other much larger US refineries. While some of the operating units were older, Midland had invested in upgrades to incorporate the latest technology.[8] Adequate tank capacity was available at the Site for crude, intermediate, and finished product storage.

30. A group of low altitude aerial color photographs[9] show the refinery Site in the late 1960s, prior to the construction of the coker unit, and in the early 1970s after the coker unit was placed in service. As can be seen in the photograph attached as Figure 4 there is essentially no standing oil, water or even soil staining around the North Refinery tank farm. An overflight of the older South Refinery, taken in the 1970s after the coker unit was in operation, is shown in Figure 5. This photograph shows standing water around Tank 36 (coker feed) and Tanks 96 and 97 (crude). The water is an accumulation of rainwater collected in the lower portion of their respective bermed containment areas. The manual drain valves from tank containment areas

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6 Fair Market Value Appraisal, Turner Mason, February 2, 1976, LOL -0012736-770.

7 Physical Asset Appraisal of the Cushing Refinery, April 30, 1984, EPAFOIA0000643-668.

8 Fair Market Value, Turner Mason, February 2, 1976, LOL-0012736-770.

9 Low Level Overflight Photographs, EPAFOIA01041587-2067.

were normally kept closed[10] for both fire safety and environmental reasons to prevent a spill from spreading to other areas of the refinery and into the storm water system. Once an operator had visually confirmed the absence of free oil, the drains were opened to drain water away from the base of the tank to prevent corrosion of the critical tank floor to wall connection. When this was accomplished, the drain valves were reclosed. The gravity drainage of stormwater from around Tanks 96 and 97 was inadequate so water was allowed to remain once it was clear of the tank base.[11]

31. Also shown in the Figure 5 photograph is the coker quench water pond (i.e., the Coke Pond). This pool of water was an integral part of the delayed coker operation used to quench the hot coke before it was removed from the coke drums. The Coke Pond was a closed system with the only water entering the pond coming from the coke quenching operation, water from the coke cutting, drainage/washdown water from the solid coke handling area and city water used to make up for evaporative losses (Williams, 2015; Wright, 2015). No other sources of water entered the pond, other than direct precipitation, and the pond did not overflow to the refinery storm water or process water system (Williams, 2015; Wright, 2015). Coke fines were entrained in the water as the water was returned to the Coke Pond. These fines settled to the bottom of the Coke Pond. Because of the intense heat (~900 degrees F) the coke fines experienced during the coking cycle, they did not contain the type of hydrocarbon which would release as free oil into the pond. I have been to the site of a large number of delayed cokers nationwide and I am familiar with the storage of petroleum coke and coke quench water systems.

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[10] SPCC, July 10, 1977, EPAFOIA0012738-50.

[11] Staff Meeting Minutes, EPAFOIA0017479. EPAFOIA0022395.

I have never observed free oil on the water around delayed coke storage areas or quench water ponds. This is consistent with the testimony of Wright (Wright, 2015) who reports only a sheen was occasionally observed on the pond. Any oil observed on the Coke Pond would have been removed by the use of vacuum trucks (Williams, 2015; Wright, 2015). While spills of oil from other sources could have on occasion reached the Coke Pond, it would have been quickly removed to prevent a fire.

32. Based on my experience, it is probable that spills and leaks occurred at the Hudson refinery during its nearly 70 years of operation. But the practice at this refinery, as at most other refineries, was to immediately stop the spill or leak and vacuum up the oil. The 1963 Midland General Safety Rules Manual[12] emphasized this point in stating: "*Oil, acid or caustic spills are to be cleaned up immediately.*" Insurance inspections of refineries are quick to point out incidences of oil pooling in locations around a refinery because of their concern for the fire hazard posed by these pools of oil. I reviewed numerous insurance inspection reports[13] of the Midland refinery and none noted pools of oil in the refinery, except the 1966 report[14] which noted: "*the dikes around tanks 96 and 97 contain a considerable amount of water and oil.*" The report recommended that all tank dikes be drained on a regular basis. Drainage of storm water from these two tank containment areas continued to be a problem, and staff meeting minutes[15] indicate a steam pump was installed to lift the storm water out of the dikes and into the nearby

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[12] General Safety Rules Manual, EPAFIOA0012714-719.

[13] Various Insurance Inspection Reports, EPAFOIA0077879-922.

[14] Oil Insurance Association, 1966, EPAFOIA0077895-897.

[15] Staff Meeting Minutes, EPAFPIA002377.

separator. Over the past 50 years I have spent extensive field time on the site of operating refineries. In none of these refineries, both large and small, was it acceptable to allow pools of oil to lie around the refinery as the EPA has claimed[16] existed at the Site based on Lockheed's review of the black and white aerial photographs. Spills do occur, but the refining industry practice, and indeed the practice used at this refinery, was to quickly vacuum up the spill to prevent fires.

33. Once Hudson purchased the refinery in early 1977, it continued to operate the refinery in much the same manner as it had been operated by Midland. Hudson did not add or make major modifications to the process operating units in place when they purchased the refinery. They did make several modifications to the environmental facilities. Hudson added an aeration pond (Aeration Pond 7 or AP-7) in October 1977 as the first treatment pond ahead of Wastewater Pond 1 to improve the biological activity. Hudson separated the one storm water pond that had been installed by Midland into a series of three ponds prior to being discharged into Skull Creek. Finally, Hudson installed a Resource Conservation Recovery Act (RCRA) Land Treatment Unit ("LTU") in the North Refinery to land farm hazardous wastes and oily solids (non-hazardous) on-site.[17] The units added and reconfigured by Hudson are discussed in greater detail in Vandeven's Affidavit.

Opinion 2. Hudson's nearly six years of refinery operations eliminated any crude oil, feedstocks, products, chemicals, additives and by-products sold and

[16] Hudson Refinery Superfund Site Unilateral Administrative Order for Remedial Design and Remedial Action, January 6, 2009.

[17] Post-Closure Permit, Land Treatment Unit, Cushing Refinery, July 19, 1996, EPAFOIA0011536-551.

transferred by Midland to Hudson in February 1977 because of the sheer number of turnover cycles created from the 19,000 barrels per day ("B/D") of refinery throughput.

34. The inventory of feedstocks, crude, and petroleum products in tanks, vessels, and piping that Midland sold and transferred to Hudson in 1977 were consumed or sold by the time the refinery shut down in December 1982. The purging of any Midland material was the consequence of repeating and multiple cycles of operational throughput during Hudson's nearly six years of operations (February 1, 1977 through December 30, 1982). I discuss my opinion below as it pertains to the a) process vessels and piping and b) the tanks that contained crude and product.

35. Because of the relatively small volumes of hydrocarbons in the various process unit vessels and piping and the continuous nature of the refinery operations, Midland's inventory of feedstocks, crude, and petroleum products was displaced, or diluted to an insignificant level within, a few days after Hudson assumed operation of the refinery. The three complete refinery turnarounds that Hudson conducted in 1977,[18] 1979,[19] and 1982[20] ensured that none of Midland's inventory of feedstocks, crude, and petroleum products remained in the processing unit vessels and piping. The purpose of these periodic, complete refinery turnarounds was to perform internal visual inspection of the processing vessels and to make the necessary repairs that could not be performed while the refinery was operating. To perform these inspections, it was

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[18] Minutes of the Refining Management Staff Meeting, June 28, 1977, LOL0088022, LOL088026. LOL088045, EPAFOIA0076650.

[19] Minutes of the Refining Management Staff Meeting, May 31, 1979, EPAFOIA0022477, August 30, 1979, LOL0404730.

[20] Minutes of the Refining Management Staff Meeting, January 11, 1982, EPAFOIA0022602.

necessary to remove all of the hydrocarbons, chemicals, and, in some cases, catalyst from each processing vessel. The vessels were then carefully prepared before anyone was allowed to enter them. This not only involved removing the liquids present, but also assuring that all vapors were removed and ventilated to provide sufficient oxygen prior to allowing inspectors to enter the vessels. Any scale, coke, or sludge was also removed in order to conduct a comprehensive inspection. As a result of the continuous operations and the turnarounds conducted by Hudson in 1977, 1979, and 1982, no Midland produced materials or transferred inventory within the processing units could have remained at the time of shut-down by Hudson in December 1982.

36. While occasional tank shut-downs were necessary to make repairs due to leaks or other problems, the Hudson tanks, like most refinery tanks, operated for years without being completely emptied and cleaned out. Because of the infrequent tank shut-downs, the most conservative approach in evaluating the rate at which Midland tank contents were replaced by Hudson material is to assume no tank shut-downs and that ideal mixing of the two materials took place throughout the tank inventory. Figure 6 demonstrates that the concentration of Midland purchased or produced materials in any vessel is a function of the ratio of the rate of production or purchase of Hudson materials[21] to the volume of material in tank at the time of purchase.[22] The graph demonstrates that after this ratio reaches 6 (turnovers) less than 0.1% of the vessels contents were produced or purchased by Midland.

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[21] 1977 Refinery LP, LOL0395352-63

[22] Preliminary Figures on Material Covered Under Paragraph 1.1, LOL001409-92, LOL0097910.

37. The slowest rate of replacing Midland material with Hudson material occurred with the large ASTs. Table 1 shows this rate by classes of hydrocarbons. The longest time required to reach the point where all of the Midland material was replaced by Hudson material in the ASTs was 49 days (Diesel and Gas Oil tanks). Finished gasoline and gasoline blending components were replaced in their respective ASTs within a month. In all cases, the crude purchased by Midland and petroleum products produced by Midland and stored in ASTs were replaced many times over during the six years of Hudson's operation of the refinery. Because of this extended operation timeframe it is not reasonable to expect any Midland products or inventory existed at the time of the Hudson refinery shut-down on December 30, 1982.

38. Major chemicals used in the Hudson refinery operation included Hydrofluoric Acid ("HF"), caustic, and TEL. Based on the amount of these chemicals in inventory[23] at the time of the sale to Hudson and the rate of consumption[24,25] by Hudson, the percentage of these chemicals that were originally purchased by Midland was reduced to less than 0.1% within 4 months after Hudson began operating the refinery. Therefore, after six years of Hudson's operation of the refinery none of Midland's chemicals remained on Site.

39. Midland was not involved in Hudson's decision to close the refinery with products, by-products and chemicals in some of the pipes, tanks and vessels nor the various attempts to maintain the refinery's integrity for 14 years after the shut-down, so that the refinery

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[23] Cushing Refinery Inventory and Supplies, LOL0097910.

[24] Chemical Supplies, EPAFO1A0016744-16875.

[25] Minutes of Management Staff Meeting, July 30, 1981, EPAFOIA0017113; Minutes of Refinery Staff Meeting, January 29, 1981, LOL0022376.

could be quickly restarted by a potential purchaser. Any material that may have leaked into the environment during this 14 year period was attributable, in part, to Hudson's decision to leave the refinery with its crude inventory, products and materials in place at shut-down.

40. Hudson shut down the refinery at the end of 1982. It was shut down with products, by-products and chemicals in some pipes, tanks, and vessels in anticipation of the sale of the refinery and potential re-start. Testimony of the refinery manager indicated that the process vessels and above ground piping were purged, the liquid levels in the various vessels replaced with clean distillate, and some were blanketed with natural gas to minimize internal corrosion (Williams, 2015; Wright, 2015). The platinum catalyst in the platformer was removed to offsite storage[26] and the FCC catalyst was stored in unit hoppers or sold. The HDS catalyst remained in the unit reactor (Wright, 2015). While the process unit piping was reported to have been purged, the active underground piping between tankage and loading racks was left containing petroleum product. Several months after the shut-down, the products in the tanks were sold[27] and removed. Heels of product (from a few inches to a few feet) remained in many of these tanks.[28]

41. The hydrocarbons that remained in the processing vessels, piping and tanks after the 1982 shut-down were products produced by Hudson. All the chemicals and catalyst left in the processing vessels had also been purchased by Hudson.

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[26] Physical Assets Appraisal of the Cushing Refinery, April 30, 1984, EPAFOIA0000643-668.
[27] Fuqua affidavit.
[28] Fuqua memo, October 15, 1985, FFR001003-1006.

42. After Hudson shut down the refinery at the end of 1982, through the Hudson bankruptcy period, the Hudson sale to U.S. Refining in 1989, and until the refinery was sold to Quantum Realty in 1996, a team of former Hudson employees maintained the refinery equipment to preserve its value and maximize the potential for operations restart. This maintenance was performed during the 1987-1994 RCRA clean-up of the Site. This team routinely inspected the equipment, lubricated the rotating equipment, monitored for leaks, rotated the large compressors and operated the valves. Six years after the shut-down, in 1988, Fuqua[29] was concerned that the accelerating deterioration of the refinery was reaching a critical point. In November, 1989 PCI detailed a five-million dollar estimate of repairs necessary to restart the refinery.[30] A portion of this work was undertaken by U.S. Refining in preparation for restarting the refinery. In 1991, U.S. Refining conducted a comprehensive inspection of the refinery in preparation for restarting the refinery (Wright, 2015). Video of the refinery taken in 1991[31] shows the structures in good condition and no dangling insulation from vessels or piping. The insulation jacketing appears intact in most areas with several bands of jacketing and insulation having been removed from two of the towers, most likely for inspection. In 1994, the court found in its Closure Order that the FCD had been completed by Hudson and the clean-up of the Site was environmentally sound. Unfortunately, thereafter, issues within U.S. Refining resulted in the refinery being placed in receivership. Fourteen years after the refinery was shut down, on October 1, 1996, the refinery

[29] Note, Forrest Fuqua, August 22, 1988, LOL0161255.

[30] Physical Asset Appraisal of the Cushing Refinery, PSI, November 9, 1989, EPAFOIA0000435-445

[31] https://www.youtube.com/watch?feature=player_detailpage&v=27QEdyNn7_Q

was purchased by Quantum Realty with the loss of any hope of ever restarting the refinery. The efforts to maintain the integrity of the refinery were discontinued with the purchase by Quantum Realty.

43. It is my opinion that, after the 1982 shut-down, corrosion of the buried piping and tank bottoms due to soil side galvanic corrosion likely resulted in unobserved leaks of petroleum products (unrelated in any way to Midland) into the subsurface soils at the Site.

Opinion 3. RCRA became effective for refineries soon after Midland sold the Site to Hudson. All of the RCRA Listed Hazardous Waste streams at the Hudson refinery - DAF float (K048), Slop oil emulsion solids (K049), Heat exchanger sludge (K050), API separator sludge (K051), Leaded gasoline tank bottoms (K052), Crude tank sediment (K169), Clarified slurry tank sediment (K170), Spent hydrofining catalyst (K171) and Spent hydrotreating catalyst (K172) - were either placed in the Hudson LTU or removed prior to the 2009 UAO and disposed of as part of the response to the Final Consent Decree (FCD), EPA Emergency Removal Action (ERA) or the Non-time Critical Removal Action (NTCRA).

44. After RCRA was passed in 1976, and after the supporting RCRA regulations were adopted in the early 1980s, certain refinery wastes were classified as hazardous waste. For petroleum refineries this included: DAF float (K048), Slop oil emulsion solids (K049), Heat exchanger sludge (K050), API separator sludge (K051), Leaded gasoline tank bottoms (K052), Crude tank sediment (K169), Clarified slurry tank sediment (K170), Spent hydrofining catalyst (K171) and Spent hydrotreating catalyst (K172). The regulations required that these "listed" hazardous wastes be handled and disposed of in a very controlled fashion.

45. The FCD required the removal of sludge from API separators at the Site where the sludge exceeded 40% of a separator's capacity.[32] The sludge in number one API separator met this criterion and was cleaned out prior to the completion of the FCD.[33] As part of the Emergency Removal Action, the EPA removed sludge (K048 & K051) from all of the Site API separators, mixed it with soil, declared the resulting mixture an Oil Pollution Act ("OPA") waste and placed it on the EPA constructed LTU in the North Refinery.[34] Slop Oil Emulsion Solids (K049) were identified and removed from four tanks as part of the response to the FCD. Heat exchange sludge (K050) left behind by Midland was removed by Hudson and disposed of at the LTU during the three refinery turnarounds conducted during their six years of operations. Any remaining heat exchanger sludge left in the exchangers after the refinery was shut down by Hudson at the end of 1982 was removed by EPA during the ERA and NTCRA. Spent hydrofining catalyst (K171) and Spent hydrotreating catalyst (K172) left in the Hydrodesulferization Unit ("HDS") reactors after the refinery shut down was removed during the dismantling of this unit as part of the NTCRA. Finally, Leaded gasoline tank bottoms (K052), Crude tank sediment (K169), and Clarified slurry tank sediment (K170) was removed during the ERA, mixed with Site soil and placed on the EPA constructed LTU. All RCRA waste streams were identified and addressed by EPA. As discussed in detail in Vandeven's Affidavit, many of these EPA actions impacted and spread contamination over large areas of the Site.

[32] Final Consent Decree Work Plan, EPAFOIA0001766-89

[33] Report Review Compliance Status Assessment, A.T. Kearney, Inc., CABK01181-211

[34] Oil Spill Response Report for Hudson Refinery Cushing, Payne County, Oklahoma, June 26. 2000, LOL0255216-6640

46. There were 74 atmospheric storage tanks, containing crude or petroleum products, on the Site at the time the refinery was shut down by Hudson at the end of 1982. Unlike the processing units, shut-downs (turnarounds) for removal of the contents of the tanks at the Hudson refinery to perform internal inspections were not routinely conducted. During Hudson's operating period, staff meeting minutes[35] indicate that 10 of the 74 tanks were removed from service and cleaned before being returning to service. Any AST contents, including bottom sediment, potentially remaining from Midland's operation were removed from these 10 ASTs. As a result of the FCD, an additional 21 tanks were emptied and cleaned in 1986.[36] During the FCD, four tanks (65, 65A, 66 and 66A) were declared to contain RCRA listed hazardous wastes (slop emulsion solids). The solids were removed and disposed of at an approved hazardous waste site. Tank 46 sediment failed the test for lead toxicity leaching and was removed for disposal at an approved hazardous waste site. Three additional tanks (40, 64 & 76) were cleaned, with the rinsate disposed of in the Site biological wastewater treatment system. During the ERA all of the remaining tanks (or what was left of them after Western's salvaging) at the Site were emptied

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[35] Hudson Staff Meeting Minutes, 1977-1982, EOAFO1A0017336-93, 0017112-19, 0017123-24, 0015912-16, 0016266-68, 0017130-38, 0017148-78, 0017404-07, 0017416-51, 0017497-526, 0017532-43, 0022363-85, 0022392- 422, 0022467-90, LOL003804-08, 004249-51, 0088016-18,0 088020-23, 0 088026-28, 0088030-33, 0076649-50,0100585-86, 0088044-48, 0088051-52, 0404679-82, 0088134-37, 100676-79, 0088054-60, 0404674-76, 0404665-70, 0100673-75, 0404690-92, 0100607-09, 0104365-66, 0404658-62, 0100669-70, 0088068-70, 0156511-13, 0100659-62, 0404696-701, 0104315-16, 0100656-58, 0100663-65, 0404704-09, 0088080-81, 0088084-85, 0100649-51, 0404861-64, 0404799-800, 0404651-52, 0402829-32, 0404767-96, 0404761-63, 0404889-95, 0404753-60, 0404745-57, 0404871-85, 0404726-40, 0404719-25, 0404815-46, 0404900-02, 0254823-55

[36] Annottated_Full_Tank_Inventory_1974 copy, Tank Cleaning Certificate, EPAFOIA0001720-32

and cleaned.[37] During the NTCRA all of the tanks (again, what was left after Western's salvaging) were dismantled.[38]

47. Table 2 shows the tanks listed in the 1974 Spill Prevention Control and Countermeasures Plan ("SPCC"),[39] grouped as crude oil, intermediate products or finished products. Table 2 also lists tank's size, contents, and tank condition from the time of the sale of the refinery in 1977 until the NTCRA in 2003. Intervening removal of tanks and their contents occurred from salvage operations by Western. The ERA and NTCRA removed all of the remaining tanks and contents. As noted in Table 2, at the conclusion of the ERA[40] all of the tanks on the Site had been emptied, contents disposed of, and cleaned.

Opinion 4. The Contaminants of Concern (COCs) identified in the 2007 Record of Decision (ROD) and the "visual contamination" that the EPA directed Land O'Lakes to excavate and remove from the refinery processing and tankage areas are attributable to leaks or spills of crude oil or refined petroleum products during the almost 70 years that the refinery occupied the Site or attributable to third party activities.

48. Figures 7 and 8 show the areas remediated by Land O'Lakes under the UAO in the South Refinery and North Refinery processing and tankage areas. These excavations were directed by the EPA to remove COCs and "visual contamination" as directed by the EPA RPM. The shaded areas in Figure 7 and 8 show the footprint of the refinery processing units and ASTs on the South Refinery and North Refinery. I summarize below the basis of my opinion that these

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[37] Oil Spill Response Report, LOL0255215-6640

49 Final Work Plan Non-critical Removal Action, IT Corporation, November 2002, EPAFAOIA0023238-43

[39] Spill Prevention Control and Countermeasures Plan, Midland Refinery, July 10, 1974,

[40] Oil Spill Response Report, LOL0255215-6640

areas were impacted by the release of crude oil, refined petroleum product or the activities of others. In subsequent sections I provide a more detailed discussion of the historical processing and material transfer operations that most likely caused these releases.

49. Lead and BaP above the ROD cleanup level and the “visual contamination” excavated in the shaded areas depicted on Figures 7 and 8 are reasonably attributable to leaks and spills or deposits of crude oil, intermediate and finished petroleum products, and additives indigenous to the refining process that began on the Site before 1917. These materials are petroleum excluded under CERCLA (Boehm and Vandeven 2015). The two railroad rights-of-way that cross the South Refinery are excluded from the shaded processing and tankage area because there is no documentation, nor is it reasonable to expect, that spills or leaks from the refinery entered these railroad rights-of-way causing elevated lead and arsenic that Land O’Lakes was required by the UAO and ROD to excavate. Also excluded from the shaded South Refinery processing and tankage area are the two South Refinery API separators which were part of the refinery’s waste water treatment system.

50. Figures 7 and 8 clearly show that most of the soil that Land O’Lakes was directed to excavate and dispose of offsite was located in the Hudson processing and tankage areas in the South Refinery. The lead, BaP and “visual contamination” encountered during these excavations are attributable to spills and leaks of crude and petroleum products during the nearly 70 years of refining at this location. Chemical analysis of soil samples taken from theses excavations confirm that lead, BaP and “visual contamination” were attributable to petroleum products and subject to the CERCLA petroleum exclusion (Boehm 2015). I have reviewed records of the operations of the refinery over its entire history, as well as documentation and photographic evidence from Land O’Lakes’ work implementing the ROD and UAO. Based upon my

knowledge and experience gained in running and remediating refineries over 50 years, knowing the processes employed in these areas from an operational standpoint, it is my opinion that the COCs (lead and BaP) and "visual contamination" identified by EPA (Saba 2015) in excavations in the South Refinery and North Refinery operating and tankage areas are attributable to presence of petroleum and petroleum products from the refining processes units, piping, and tankage that existed.

Opinion 5. I am unaware of a source of arsenic associated with the refining of the crude oil at the Site which could explain the elevated arsenic levels measured in soil in a few locations in the processing and tankage areas.

51. The light, sweet crude[41] that was processed at the refinery over its history contained very little arsenic. Arsenic in the crude tends to concentrate in the residuum and petroleum coke. Arsenic above the ROD cleanup level in soil samples appears randomly in seven small South Refinery processing and tankage areas and was not from areas associated with residuum or petroleum coke. The occurrence of arsenic in these refinery processing and tankage areas is not attributable to refining, but to the activities of others or natural background.

Opinion 6. The largest excavation required by the ROD involved the removal of approximately 32,863 cubic yards ("CY") of soil and coke fines from the Coke Pond and the Coke Pond Expansion Area (Brady Affidavit). Approximately 5,596 CY of the 32,863 CY removed was petroleum coke fines, a product refined from crude at this and many other US refineries.

52. The excavation of the Coke Pond (Figure 9) accounted for about 15% of the total combined volume of material excavated from the Coke Pond and the Coke Pond Expansion Area. The Coke Pond was originally one of two water reservoirs in the northern portion of the South Refinery. The southwestern reservoir was filled in between 1938 and 1942 (see 1938 and

[41] Fair Market Value, Turner Mason, February 2, 1976, LOL-0012736-770

1942 Sanborn Maps, Vandeven Aff., Sanborn 5 and 6). By 1963 only the eastern reservoir, which was used as a spray pond to evaporatively cool water used for the South Refinery heat exchangers, remained. The remaining eastern reservoir became the Coke Pond. With the construction of the delayed coker in 1969, the Coke Pond became the source of quench water for the coker. The coker is a semi-batch type process. During the oil-on cycle, residuum is heated to over 900 degrees F and fed to one of two coke drums. In the drum, the hot residuum thermally cracks to lighter products which leave the drum as a vapor for further processing into refined products, such as gasoline. Left behind in the drum is petroleum coke in the form of a solid, porous material. Once the drum is filled with coke, the hot residuum is diverted to the other drum. The coke in the drum is steamed to remove any light hydrocarbons and the drum is filled with water from the Coke Pond to cool the coke. Once the coke has cooled the water is returned to the Coke Pond. Later the coke is cut from the drum using a large folding drill (also from the Coke Pond). The coke was sold as an anode coke, a high grade coke used to produce anodes for aluminum manufacturing. Coke spilled during removal from the drum, from the conveyor during loading of rail cars or trucks, and from the rail cars or trucks themselves was also washed into the Coke Pond. The water from the coker entered the Coke Pond on the southwest side and flowed around a peninsula (used for removal of coke fines from the Coke Pond for sale) to the southeast side where it was pumped back to the coker as needed. As the water flows through the Coke Pond, coke fines settle out of the water. For additional information on the history of the Coke Pond see Wright Aff. (¶¶ 166-171) and Williams (¶ 131).

53. To maintain the Coke Pond deep enough to ensure the complete separation of the coke fines from the water, and to gather the coke fines for sale, it was necessary to periodically dredge the coke fines from the pond. The photograph attached as Figure 10 to my Declaration

shows the black material removed from the Coke Pond during implementation of the UAO. Based upon my refining experience, the material removed from the Coke Pond under the ROD and UAO has all of the characteristics of, and in fact is, petroleum coke. This material was clearly a refinery petroleum product, sold as fuel as discussed below, and not a sludge or waste.

54. The Coke Pond was dredged by Midland in 1976 and by Hudson in 1978[42] and 1981[43] to remove the accumulated coke for sale. (Williams, 2015; Gaskins, 2015; Wright, 2015) The coke fines were dredged to the underlying clay base and sold as fuel - a petroleum product (See Wright, Gaskins and Williams Affidavits, 2015). Hudson stated in its 1982 industrial waste generation plan submitted to the Oklahoma State Department of Health[44] that it expected to deposit less than a ton of coke fines per year on the LTU. In fact, the contents of the Coke Pond that were placed in the LTU by Hudson were the very bottom layer of coke fines. The coke fines removed from the Coke Pond during the UAO response were deposited after the 1981 clean-out during Hudson's remaining two years of operating the coker and not during the preceding years that Midland operated the coker. Thus, the materials in the Coke Pond that were required to be excavated and disposed by EPA in the UAO and ROD were both a petroleum-excluded product and were not attributable in any way to Midland.

Opinion 7. The 27,267 CY of soil removed from areas surrounding the Coke Pond (an area referred to as the Coke Pond Expansion) was required because of EPA-designated "visual contamination". This material was attributable to leaks and spills of petroleum products from pipes and tanks and unrelated to the coke fines. My conclusion is that all this material was petroleum excluded under CERCLA.

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[42] Staff Meeting Minutes, LOL0100657, 0404864,

[43] Staff Meeting Minutes, EPAFOIA0017536, 0017516

[44] Controlled industrial Waste Generator's Listing, July 16, 1982, FF000578-80

55. Once the coke fines were excavated from the Coke Pond during the UAO response, streaks of "visual contamination" were observed in the in the Coke Pond containment walls.[45] As a result of the EPA RPM observing these streaks of "visual contamination," Land O'Lakes was instructed to expand the excavation outward until "visual contamination" was no longer observed. These "visual contamination" streaks were dissimilar from the coke fines (Brady) and unrelated to the operation of the Coke Pond. The Coke Pond Expansion area excavation grew so much that it resulted in re-excavation of portions of SAOC-3 and SAOC-4 to the west and south (Brady). It also expanded outside of the Coke Pond to the north, south and east as shown by the red outline in Figure 11 (Brady).

56. From before 1917 and until approximately 1938, much of the area contained within the red line shown in Figure 12 (i.e., the area excavated as part of the Coke Pond Expansion because of "visual contamination"), was occupied by a series of crude stills. These stills were batch-operated, much like "moonshine" stills. Crude was charged into the still, which was then heated by a fire below the still. Vapor from the still was routed through piping that snaked through opened-top boxes of water to condense the vapor. The non-condensable vapor was used to fuel the fire or was discarded to a flare. The condensed vapor was routed to tankage as straight run gasoline. Once the temperature reached a specific point, the still was shut down and the remaining liquid transferred to another still and the process started over. In the second still the condensed vapor was routed to kerosene tankage and the remaining liquid routed to another still where the process was repeated with the condensed vapor stored as middle distillate. The liquid in the final still was transfered to tankage and sold as heavy fuel oil which is often

[45] Brady Affidavit

called No. 6 fuel oil. The various stills, condensers, and tanks were connected by buried, threaded piping. Consequently, all material in this area of the Site was crude oil or refined petroleum product.

57. By 1938 or 1939 (see Figure 13), the batch stills were dismantled and replaced by the more efficient continuous distillation column process (depicted as a blue hatched area), which occupied a small fraction of the footprint of the former stills. In addition, the intra-unit piping for the new distillation columns was above ground, while most of the former buried piping that had connected the stills was left in place.

58. A machine shop was constructed on the south end of the former crude still complex. Prior to 1945 a vis-breaker (thermal cracker) was added near the center of the processing area. This was the first conversion equipment added to the Site. It thermally cracked the heaviest oil from the crude unit into lighter more valuable fractions (gasoline and middle distillates) and reduced the production of No. 6 Fuel oil. In 1969, a delayed coker, with petroleum coke rail car loading facilities, was built near the southern edge of the UAO excavation area shown in Figure 12. This replaced the vis-breaker by employing higher temperatures to convert more of the heavy oil into lighter products. This essentially ended the production of No. 6 fuel oil at the refinery. Petroleum coke was produced at the new coker and was sold as high grade anode coke for electrodes used to manufacture aluminum.

59. The Coke Pond Expansion Area (the southern and western portion of the area outlined by the red line in Figure 14) encompassed most of the modern South Refinery processing area (outlined by the dotted blue line). Numerous areas of "visual contamination"

were associated with the buried pipes encountered in the excavation around the area occupied by the former crude stills[46]. These pipes were left in the ground after the dismantling of the crude stills and other historical operations that transported petroleum products and crude between the processing area and tanks. It was typical during the operating period of the refinery for the idled buried pipes to be capped at the surface at both ends and left in the ground full of crude or petroleum products. Although the corrosion rate associated with the oil left in these buried pipes was very slow, the galvanic corrosion of the unprotected steel pipe on the soil side inevitably resulted in holes and leaks from these pipes. Therefore, staining of the soil around these buried pipes would be expected from leaks of crude and petroleum products under the former processing area. EPA discovered these areas of "visual contamination" in the subsurface across the refinery areas before the lodging of the FCD in October 1987 (Saba 2015). EPA, in the FCD Work Plan, directed the "visual contamination" or staining to be treated in place by soil amendments and biological activity to reduce oil and grease to acceptable levels. (Technico Environmental Inc.,CABK 02332-2234 (1994) and Saba 2015)

60. Photographs taken during the UAO response show the numerous buried petroleum product piping encountered during the excavation of the South Refinery processing area. Several examples of these photographs are shown in Figures 15, 16, and 17. Based on the historical Sanborn map locations of the old shell stills on the South refinery from the pre-WWII era, and the fact that some of the piping encountered in this area used threaded connections, which were more commonly used prior to WWII, many of these buried pipes most likely predated the piping used during Midland's ownership.

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[46] Brady Affidavit

61. During the EPA ERA, the contents of the tanks, piping, and process equipment were spread over the SAOC 3 and 4 areas. It is reasonable to attribute some of the "visual contamination" that the EPA designated in the South Refinery processing area to the ERA activities.

62. The Coke Pond Expansion excavation extended north of the South Refinery processing area as shown in Figure 11. Prior to 1938, this area was a water reservoir. Prior to 1961, the water reservoir was filled in and Tanks 65 and 66 were constructed on this location (Figure 18). These two tanks originally contained leaded gasoline, but later were converted to contain No. 6 fuel oil – both refined petroleum products and covered by the petroleum exclusion. They were dismantled prior to 1979. The surface soils around these two tanks had been bioremediated to less than 5% oil and grease during the FCD.

63. It is reasonable to attribute "visual contamination" in this area to leaks from Tanks 64 (just west of the Coke Pond Expansion Area) and 65 as well as leaks from buried piping serving these and other tanks. Along the western edge of the Coke Pond Expansion excavation (Figure 18), piping transporting heavy oils to the North Refinery FCC and to Tank 36 also passed through this area and leaks from these pipes contributed to the "visual contamination." The pumps which transported topped crude from Tank 36 to the coker are included in the Coke Pond Expansion area and leaks from these pumps and the buried piping associated with them likely contributed to the "visual contamination" observed by the EPA RPM.

64. During the ERA,[47] the contents of Tanks 37, 38, 63, and 64 were spread on the ground in the area ultimately excavated during the Coke Pond Expansion in order to mix with the soil prior to moving the resulting solids to the EPA LTU on the North Refinery. This action also likely contributed to the "visual contamination" observed in the area of the Coke Pond Expansion.

65. The "visual contamination" in the narrow eastern leg of the Coke Pond Expansion excavation is attributable to leaking buried and surface piping in this area used to transport petroleum products between the South Refinery and the North Refinery. Figure 19 shows some of these pipes which were under the east berm of the coke pond (Brady).

66. A portion of the pile of piping in Figure 20 was dug up from the areas around the Coke Pond.

67. The northern section of the Coke Tar Area excavation – and into SAOC-5 - was occupied by Tank 35, an API separator, and two small tanks that were used to collect oil skimmed from the separator (Figure 21). Spills and leaks of petroleum product from these tanks and their associated buried piping were a likely source of the "visual contamination" in this area of SAOC-5. During the ERA[48] the contents of these two tanks were spread in the area that became part of the Coke Tar Area (see Vandeven Affidavit). This action likely contributed to the "visual contamination" that the EPA RPM designated in the area west of the Coke Pond.

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[47] Oil Spill Response Report, June 26, 2000, LOL0255215-6640

[48] Oil Spill Response Report, June 26, 2000, LOL0255215-6640

68. The EPA RPM required Land O'Lakes to excavate an area of over 6,400 square feet, in the Coke Tar area, to a depth of 2.5 to 8 feet until the designated "visual contamination" was removed. The "visual contamination" in this area is reasonably attributable to leaks in buried piping transporting petroleum products. Photographs from this excavation, like the ones shown in Figures 22, 23 and 24 show "visual contamination" around buried pipes which likely leaked over the long history of a refinery on this Site. All this material was petroleum excluded under CERCLA (Boehm 2015).

69. The Coke Pond Expansion excavation continued south and west, encompassing nearly all of SAOC-4. Some of the areas excavated due to "visual contamination" in the Coke Pond Expansion were previously excavated as part of SAOC-4 and were awaiting post-excavation sampling. The Coke Pond Expansion also extended south of SAOC-4 into SAOC-3. Portions of these excavations had been previously shown to meet ROD requirements and had been backfilled with soils from the on-site borrow area (Brady).

Opinion 8. Lead, Benzo(a)pyrene (BaP), and "visual contamination" that the EPA RPM directed Land O' Lakes to excavate and remove from SAOC-1, SAOC-2, SAOC-3, and SAOC-4 are attributable to leaks or spills of crude oil and petroleum products during the years that the refinery occupied the Hudson Site or third party activities. This material was either subject to the petroleum exclusion or the costs incurred to address it are divisible.

70. As shown in Figure 25 (SAOC-2 excavations overlaid on a 1917 refinery plot plan), EPA required excavation under a fuel oil tank that was in service at the refinery prior to 1917. Figure 25 also shows the other excavation in this area is aligned with the fuel oil loading spur. The "visual contamination" that the EPA RPM identified in these two locations is reasonably attributable to spills and leaks of petroleum products from these early refinery operations.

71. By 1924 the fuel oil tank was dismantled and a variety of other tanks were present near the SAOC-2 excavations, including tanks 23, 31, 32, 39, 44, 50, 51, 52, and 54 (Figure 26). These tanks contained a variety of petroleum products, including distillates, benzene, gas oil, and naphtha. The fuel oil loading spur has been moved slightly and extended by 1924 and was now located over another excavation. Leaks and spills from these tanks, their associated piping and piping associated with the fuel oil loading spur likely caused the "visual contamination" identified by EPA in these areas.

72. By 1938 (Figure 27), Tanks 23, 39, 50, 51, and 52 were dismantled and the location they had occupied remained an open area throughout the remaining history of the refinery. Two pipes, which likely serviced Tanks 23, 39, 50, 51, and/or 52, were discovered during the SAOC-2 excavations (Brady). Tanks 31 and 32 were replaced by Tank 70, containing recovered oil. Tank 30, containing gasoline, replaced Tank 54. Prior to 1970, Tank 30 was converted to kerosene service and remained in this service until the Hudson refinery shut-down in late 1982. Tank 30 was emptied and cleaned in 1986. The original fuel tank along with Tanks 23, 30, 39, 50, 51, and 52 and their associated piping in this area were the likely source of the "visual contamination" encountered during the several excavations in SAOC-2. During the 1997 ERA[49] the contents of several rundown tanks were spread over this area and could have contributed to the "visual contamination" observed in this area.

73. The most extensive excavation in SAOC-2 was under and around the No. 6 fuel oil loading spur area. Two excavations, covering an area of over 12,000 square feet, were dug to

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[49] Oil Spill Response Report, June 26, 2000, LOL0255215-6640

a depth of 15 inches to greater than 2 feet. Any contamination in soil that was excavated from this area is attributable leaking threaded piping that transported the heavy No. 6 fuel oil (a petroleum product) to the riser at each loading spot. The rail loading spur was placed in service prior to 1917 and operated actively until at least 1969 when the delayed coker was placed in service. After that time, it was used infrequently due to the reduction in No. 6 fuel oil production at the refinery.

74. The buried, threaded piping was particularly prone to leakage because the stresses created by the threaded connections which accelerated the galvanic corrosion from the exposure of the unprotected steel pipe to the surrounding soil. Several photographs (Figures 28, 29, 30 & 31) show the leaking pipes that were buried under the fuel oil loading rail spur.

75. As shown in Figure 32, a small area in SAOC-2 (~600 square feet) was required to be excavated to a depth of at least 2 feet in a drainage ditch west of the Tank 93 containment dike. Gasoline from the adjacent Tank 93 would not have produced the "visual contamination" staining of the soil observed by the EPA RPM in this ditch. The drainage ditch served the main railway, areas outside the refinery, and the refinery truck loading area. A number of buried pipes transferring petroleum products from the South Refinery to the truck loading rack crossed this ditch upstream of the observed "visual contamination." The source of staining in the soil is attributable to leakage from these pipes or third party leaks that drained into the ditch.

76. Also shown in Figure 32 are two areas in SAOC-2 totaling over 22,000 square feet which were excavated to a depth of 6 inches because of the presence of arsenic. The southernmost excavation is on the railway right-of-way and unrelated to refinery operations. The other arsenic area is east of Tank 93. Refinery operations would not be a source of these elevated soil arsenic levels.

77. Figure 33 shows all of the excavations in SAOC-1 overlaid on a 1924 refinery plot plan. The largest excavation covers over 18,000 square feet and was dug to a depth of 6 inches to over 2 feet. This area is within the containment area and under Tank 27. In the earlier years of the refinery operations, this tank stored crude oil but was converted, prior to 1974, to gas oil service, a petroleum product, used as Fluid Catalytic Cracker ("FCC") feed or as blend stock for No. 6 fuel oil. This tank operated until the refinery was shut down in 1982. As a result of the "visual contamination" observed in this area by the EPA RPM, Land O'Lakes was directed to excavate the area directly under Tank 27 to a depth of greater than 2 feet. The "visual contamination" encountered in this area is attributable to leaks or spills of crude or gas oil stored in Tank 27 and the buried piping used to transport crude and gas oil to and from Tank 27 during the many years this tank was in service at the refinery. All of this material would be subject to the CERCLA petroleum exclusion. Refinery operations would not be a source of the elevated arsenic levels detected in the surface soil around this tank.

78. Three areas covering a total of over 22,000 square feet were excavated to a depth between 6 inches and 2 feet on the railway right-of-way in SAOC-1. Leaks and spills from refinery tanks and piping would not have drained onto the railway since it is elevated above the surrounding refinery facilities and not under the ownership, custody, or control of the refinery.[50] None of the ROD COCs in these areas were related to refinery operations.

79. Figure 34 shows the excavation for "visual contamination" and elevated lead in SAOC-3 overlaid on a 1931 refinery plot plan. The four excavations which the EPA RPM determined to contain "visual contamination" covered approximately 5,500 square feet and were

[50] Overflight photographs of South Refinery, EPAFOIA0104224

dug to a depth of at least 2 feet. Three were under or near the crude and tar stills where leaks and spills from the stills and their associated piping most likely caused the "visual contamination." Figure 35 shows the largest excavation area in SAOC-3 overlaid on the 1938 refinery plot plan. The "visual contamination" identified in this excavation area was under and near a pump house which pumped crude and petroleum products to and from the tank in the rundown area to the east of the pump house. The "visual contamination" in this area is reasonably attributable to leaks and spills from these pumps and their associated piping. All of this material is subject to the CERCLA petroleum exclusion.

80. Figure 36 shows the SAOC-4 excavations overlaid on a 1931 refinery plot plan. These excavations covered an area of more than 8,000 square feet and were dug to a depth between 15 inches to greater than 2 feet. The southern-most excavation was near the crude and tar stills which operated during the early years of the refinery. Leaks and spills from these stills and their associated buried piping most likely led to the contamination discovered in the excavation. All of this material is subject to the CERCLA petroleum exclusion.

81. Figure 37 shows the SAOC-4 excavations overlaid on a 1980 refinery aerial photograph. The northern most excavation is near Tank 36 which contained heavy oil (topped crude) which was used as coker feed. Leaks and spills from this tank and the buried piping to and from this tank are the most likely sources of the contamination discovered in these excavations. The middle excavation was also most likely contaminated by leaking piping carrying heavy petroleum products in the area. This area was also used by the EPA during the

ERA[51] to mix petroleum products from tanks, piping and vessels with soil prior to placing the mixture on the LTU they had constructed in the north refinery. All of the material Land O' Lakes was compelled to remove in this area is subject to the CERCLA petroleum exclusion.

Opinion 9. The ROD required only one excavation in SAOC-7 in the North Refinery tank field, south of Tanks 100 and 101. The contaminants in this area are attributable to spills and leaks of petroleum products from tanks and their associated piping and are subject to CERCLA's petroleum exclusion.

82. The only excavation conducted in the North Refinery processing or tank farm areas is shown in Figure 38. This excavation covered approximately 5500 square feet and was 2 feet deep. The excavation was south of Tanks 100 and 101, which historically contained platformate and platformer feed stock, a petroleum product. The area is north of Tanks 40, 42, and 45, which were present prior to 1956 and contained gas oil, cat gasoline and light cat cycle oil. The sources of contaminants in this area are attributable to leaks or spills of petroleum products from these tanks or their associated piping. Staff Meeting minutes[52] indicated that in 1981 there was a buried pipe leaking between Tanks 100 and 101. This leak and others from the buried piping serving tanks in this area most likely contributed to the COCs discovered in SAOC-7. All of this material is subject to the CERCLA petroleum exclusion.

Opinion 10. EPA mischaracterized tar like materials encountered during the investigation and excavation of the Site as "Coke Tar." This mischaracterized "coke tar" is, in reality, crude oil or a petroleum product. It is not the RCRA listed waste K087. K087 requires the use of coal and was never produced during the operation of the refinery on the Site.

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[51] Oil Spill Response Report, June 26, 2000, LOL0255215-6640

[52] Refinery Staff Meeting Minutes, EAPFOIA0017137

83. The ROD states that coke tar material was identified in several locations of the south refinery, mainly to the west and north of the Coke Pond. This identification was based on visual observations by EPA and no soil COCs were shown to exceed cleanup levels. During the RA activities multiple black hydrocarbon materials, with varying degrees of viscosity, were observed in the area indicated by the ROD and one previously unidentified area. EPA identified a RCRA listed waste – K087.

84. The EPA RCRA guidance lists K087 as "Decanter Tank Tar Sludge from Coking Operations"[53] under the section on "Hazardous Wastes from Specific Sources." This listing in the section covering the coking of coal and not in the section covering petroleum refining. The "EPA Section Notebook- Petroleum Refining"[54] does not mention K087, Decanter Tank Tar Sludge, in the section covering Petroleum Coking. On the other hand, Decanter Tank Tar Sludge (K087) is very specific to the coking of coal where coal tar is a by-product of the coking of coal to produce metallurgical coke.[55] The coal or coke tar for this metallurgical coke process is decanted in a tank producing a sludge known as decanter tank tar sludge (K087). In the petroleum delayed coking process used at the Hudson refinery, and indeed throughout the refining industry, coke tar is not produced, nor is it decanted to produce sludge (K087). These are completely different processes for different industries. The petroleum delayed coker produces petroleum coke used as fuel for anodes in the aluminum manufacturing. Metallurgical

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[53] CFR-2014, Vol 26, Sec 261.32, Hazardous wastes from specific sources

[54] EPA Office of Compliance Section Notebook Project, Profile of the Petroleum Refining Industry, September 1995

[55] RCRA/Superfund Hotline Monthly Summary, February 89

coke is used in the steel making industry. All of the hydrocarbons produced in the coking process are converted into petroleum products. There was never any coal or coal coke produced or used on the Site. This was a mistake made by EPA in interpreting and applying its own regulations.

85. Hudson's application for the Land Treatment Unit ("LTU") permit, filed in February, 1981, lists coke fines as one of the listed wastes to be applied to the land farm. Hudson also, like the EPA, misidentified coke fines as Decanter Tank Tar Sludge (K087). The application of coke fines to the LTU was estimated to take place once or twice per year at an amount likely to be less than 2,000 pounds per year since most of the coke fines dredged from the coke pond were sold as fuel. Hudson clearly made an error in the LTU permit application since petroleum coke fines are not a classified hazardous waste and are not Decanter Tank Tar Sludge (K087). This error was perpetuated when the Hudson Bankruptcy Trustee refiled the Hazardous Waste Permit Application in 1985.

86. The tar like material at the Site that the EPA classified as "coke tar" is <u>NOT</u> K087. It is weather crude, topped crude, No. 6 Fuel Oil, or residuum used as coker and FCC feed stock. Samples of the "coke tar" confirmed that it was a petroleum product, consistent with weathered crude or heavy oils (Boehm 2015). All of these are crude oil or petroleum products and not RCRA listed waste, K087. All were subject instead to the CERCLA petroleum exclusion.

Opinion 11. The mischaracterized "coke tar" and "visual contamination" that the EPA RPM directed Land O' Lakes to excavate and remove from the "Coke Tar Area" are attributable to leaks or spills of crude oil and petroleum products during the years that the refinery occupied the Site. All this material is subject to the CERCLA petroleum exclusion.

87. An area of approximately 24,000 square feet was excavated from the "Coke Tar Area" (Figure 39) to a depth of 6 inches because the EPA RPM observed "visual contamination" in the EPA defined "Coke Tar Area" in general and specifically in pothole samples #2 and #4. As discussed in Opinion 10, the EPA mischaracterized the residuum material found at or near the surface in this area as coal coke tar tank decanter sludge (K087). The tar like substance in this area was a petroleum product (residuum, topped crude and No. 6 fuel oil) and not a listed RCRA waste. The tar like material found in this area is attributable to spills or leaks of topped crude from Tank 36, leaking buried pipes transporting the residuum from the coker vacuum tower to the FCC in the North Refinery, or from various tanks used for blending into No. 6 fuel oil. Chemical analysis[56] confirms that the so called "coke tar" is a petroleum product (Boehm 2015). The two photographs (Figures 40 & 41) were taken in the "Coke Tar Area" show "visual contamination" associated with leaking buried pipes. All this material is subject to the CERCLA petroleum exclusion.

Opinion 12. Material identified by the EPA RPM as "Coke Tar" and visual contamination north of Tank 97 and next to State Highway 33 (an area designated as "AA-1") was crude oil which is attributable to leaks from the pipelines which transferred crude to Tanks 96 and 97. All this material was subject to the CERCLA petroleum exclusion.

88. An area of approximately 3,500 square feet was excavated to a depth of up to eight feet near the northeast corner of the South Refinery (Figure 42). EPA declared the "visual contamination" identified in the area as "coke tar". (EPA, Statement of Work for Remedial Action Sampling, March 7, 2013.) Several pipes supplying crude to Tanks 96 and 97 were

[56] Boehm Affidavit

uncovered. Leaks of crude from these pipes caused the staining in and around AA-1. The material was weathered crude and not “coke tar” since “coke tar” was not produced at the refinery, as discussed earlier. The crude pipes were under pressure until the refinery was shut down in 1982. There was no indication of crude leakage in this area during the relocation of State Highway 33 in 1991. In the three decades after the shut-down, galvanic corrosion likely created holes in these pipes and they leaked the crude oil into the surrounding soil. These leaks occurred well after Midland had sold the refinery.

Opinion 13. When leaded gasoline is spilled or leaked, the gasoline quickly evaporates leaving behind TEL. It is not unusual at an old refinery site, like the Site, to find elevated lead levels in the soil in the areas where leaded gasoline has spilled or leaked. In the absence of evidence of elevated levels of lead in the area of the TEL storage facilities (there being no other sources of lead at the Site), it is my opinion that the all but one of the elevated soil lead levels in the South Refinery processing and tankage areas were the result of leaded gasoline spills or leaks. All such materials are subject to the CERCLA petroleum exclusion.

89. Five of the elevated soil lead levels identified prior to the Remedial Action, which led to soil excavation in the South Refinery, are reasonably attributable to leaks or spills of leaded gasoline. All but one of the remaining elevated soil lead levels were under the railroad right-of-way and were unrelated to refinery operations.

90. A combined area of greater than 52,000 square feet was excavated to a depth of 6 to 24 inches in six areas (Figure 43) in the South Refinery due to the presence of lead above the ROD cleanup level of 1,000 mg/kg. All of this material was subject to the CERCLA petroleum exclusion. Beginning in the period from the mid-1920s to the mid-1930s, the refinery operating

at the Site[57] produced and stored gasoline containing TEL. This practice continued until the refinery shut down at the end of 1982. The TEL that was blended into the gasoline was stored in two horizontal vessels at the locations shown on Figure 1. Elevated lead levels were not discovered during the Remedial Investigation ("RI") or earlier soil investigations in either the surface or subsurface samples collected near the TEL storage facility in either the South Refinery or North Refinery. The two TEL tanks were emptied and cleaned during the EPA ERA in 1998. At that time the lead level in the soil around the tanks tested below the ROD cleanup level. During the EPA NTCRA in 2002 and 2003, the TEL tanks were removed.

91. From the mid-1920s to the mid-1930s gasoline was produced at the Site by simply blending crude naphtha (straight run gasoline) with butane and TEL. TEL was "slipstreamed" into the product in the pipeline conveying product to blending/storage tankage. By the 1960s, more sophisticated processing facilities added to the refinery resulted in finished gasoline being a batch blend of five components with TEL in a tank to meet the specifications for each specific volume and grade of gasoline. The five components included: crude naphtha (straight run gasoline), fluid catalytic cracking ("FCC") naphtha (cat gasoline), alkylate, platformate, and butane. These five components were blended to a specific recipe to meet the required specifications. TEL was added to boost the octane number of the finished gasoline. Mixers in the gasoline tanks assured the blend was homogeneous. After mixing, the blend was tested to ensure it met the required specifications and then pumped to the offsite east tank field

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[57] Special timeline: Leaded gasoline, http://66.147.244.135/~enviror4/about/ethyl-leaded-gasoline/lead-history-timeline/

for delivery to a pipeline. A small portion was diverted to the truck loading rack (warehouse) for local delivery.

92. A single elevated lead level discovered in Remedial Investigation ("RI") surface soil sample NSFT-05-506a (Figure 44) that the EPA directed Land O' Lakes to excavate and remove from the ROD SAOC-5 cannot be attributed to spills or leaks from either TEL storage or leaded gasoline, since there is no evidence of either being stored or transported through this area. A possible source could be from leaks of leaded gasoline or TEL from the adjacent railroad right-of-way.

93. The elevated lead levels in subsurface soil sample SAOC-2/HSBH-17 (15-24 in) and post excavation samples ("PX") SAOC-2/PX-27A (0-0.5 ft), SAOC-2/PX-19SW (1.0 ft), SAOC-2/PX-14SW (1.0 ft) and SAOC-2/PX-15SW (1.0 ft) are attributable to spills and leakage from both buried and surface piping used to transport leaded gasoline from area tanks to the loading racks and pipeline customers over the years of the refinery's operation. Leaks and spills from the same tanks could also have contributed to the elevated lead levels.

94. In two adjacent areas, a total of over 5,000 square feet soil was excavated to a depth of 2 feet because a supplemental field investigation ("SFI") boring (SAOC-2/HSBH-17) indicated lead contamination above the ROD cleanup level. The excavated areas (yellow areas) are shown layered over maps of tanks that existed at the refinery in 1924 and 1938 (Figure 45 and 46). The SFI boring sample was from under former Tank 22, which likely contained leaded gasoline and was constructed prior to 1924, but was dismantled prior to 1931. By 1938, Tank 85 was built on this site and Tank 31 replaced Tank 44 as shown in Figure 45, and they both contained leaded gasoline. Buried and surface pipes that connected Tanks 22, 31, and 85 to

offsite loading racks and pipeline customers were located near the PX soil samples which contained elevated lead levels. The elevated lead levels discovered in this excavation are attributable to spills and leakage from these pipes that were used to transport leaded gasoline from Tanks 22, 31, and 85 to the loading racks and pipeline customers. Leaks and spills from Tanks 22, 31, and 85 likely also contributed to the elevated lead levels**.** The soil around Tank 85 had been bioremediated to less than 5% oil and grease during the FCD.[58] All of these materials required to be removed are subject to the CERCLA petroleum exclusion.

95. Testing of post excavation sample SAOC-2/PX-48SW (1.0 ft) indicated a lead level of 35,000 mg/kg. Dr. Boehm concluded that this level was nearly five times the lead level that would be expected from weathering of leaded gasoline. This sample is inconsistent with other lead samples in the area and is not near any TEL storage areas. Based on no other explanation for the very high lead level in this sample, Boehm concludes that it was an outlier (Boehm 2015). I do not believe it is attributable to the refining operations.

96. Elevated levels of lead discovered in subsurface soil samples SAOC-3/HSBH-05 (6-15 in), SAOC-3/HSBH-07 (6-15 in), SAOC-3/HSBH-09 (6-15 in) and post-excavation samples SAOC-3/PX-7A (0-0.5 ft), SAOC-3/PX-06SW (0.5 ft), SAOC-3/PX-07SW (0.5 ft), SAOC-3/PX-23SW (1.0 ft), SAOC-3/PX-26SW (1.0 ft) and SAOC-3/PX-27SW (1.0 ft) are reasonably attributable to spills and leakage from both buried piping and the associated pump house used to transport leaded gasoline from tanks to the loading racks and pipeline customers

[58] Report Review Compliance Status Assessment, A.T. Kearney, Inc., CABK01181-211

over the years of the refinery's operation. Leaks and spills from the same tanks also could also have contributed to the elevated lead levels. All these materials are subject to the CERCLA petroleum exclusion.

97. The area east of the South Refinery processing area, known as the rundown tank area, contained numerous tanks starting with the earliest days of the refinery operations. These tanks stored components and finished products. Prior to 1917, thirteen tanks occupied this area. They contained gasoline, benzene, kerosene, distillate and fuel oil. By 1924 the number of tanks in the area had grown to 29 tanks storing the same types of products. By 1931 a number of tanks were dismantled and only 19 remained. By 1938 essentially all of the original tanks had been replaced (Figure 46). Over the remaining years of the refinery operation, the 1938 tanks remained in place. However several tanks changed service between 1939 and the 1970s.

98. The large excavation under the rundown tank area (yellow area in Figures 47) was prompted by SFI soil borings (SAOC-3/HSBH05, SAOC-3/HSBH07 & SAOC-3/HSBH09) which showed lead levels above the ROD cleanup level. Post-excavation samples (SAOC-3/PX-07A (0-0.5 ft), SAOC-3/PX-06SW (0.5 ft), SAOC-3/PX-07SW (1.0 ft), SAOC-3/PX-23SW (1.0 ft), SAOC-3/PX-26SW (1.0 ft), SAOC-3/PX24SW (1.0 ft) and SAOC-3/PX-27SW (1.0 ft)) collected in this area also detected lead levels above the ROD cleanup level. An excavation covering approximately 17,000 square feet, which covered most of the rundown tank area, was dug to a depth of 2 feet. The SFI soil borings showing the elevated lead levels (from a depth of 6-12 inches below grade) were under or near a pump house serving the rundown tank area and within 75 feet of Tank 79 and 80, which stored premium and regular gasoline. Both gasoline grades would have contained TEL. This area contained numerous buried pipes used to transport products to and from the rundown tanks. The post-excavation soil samples showing elevated

lead levels (also from 6-12 inches below grade) were from an area near Tank 79 and in an area with buried piping. The source of the lead discovered at this excavation is attributable to leaks and/or spills of leaded gasoline from the tank pump house and leaks from buried piping used to pump the leaded gasoline from Tank 79 and 80 to the loading racks and pipeline customers. Leaks and spills from Tanks 79 and 80 could also have contributed to the elevated lead levels in this area. An additional source of lead contamination might include the spreading of the contents of partially dismantled tanks over this area as occurred during the ERA. The materials in this area are subject to the CERCLA petroleum exclusion.

99. Elevated levels of lead discovered in the subsurface soil sample SAOC-2 BHO8 (6-15 in)and post-excavation samples SAOC-2/PX45SW (0.5 ft) and SAOC-2/PX08SW (0.25 ft), taken south of Tank 93 resulted from spills and leaks of leaded gasoline from both buried and surface piping used to transport the gasoline from Tank 93 to the loading racks and pipeline customers over the years of the refinery's operation. Leaks and spills from Tank 93 could also have contributed to the elevated lead levels. The materials in the area are subject to the CERCLA petroleum exclusion.

100. An area of over 10,000 square feet was excavated to a depth of 15 inches just east of the railroad main line in SAOC-2 (Figure 48) based on the discovery of elevated lead levels in the SFI soil boring (SAOC-2-BH-08). Post excavation samples south of the SFI boring also showed elevated levels of lead. The area is within the containment dike surrounding and under Tank 93 which contained leaded gasoline. The tank was constructed prior to 1945 and converted

to a floating roof tank in 1971.[59] A 6 inch diameter pipe (SPR011) containing gasoline was unearthed during the Land O'Lakes' required activities under the UAO at this location. Buried and surface pipes from Tank 93 travel to a pump house and then south to the truck loading rack and pipe line customers. The elevated lead levels in PX surface samples from this excavation are reasonably attributable to spills and leaks of leaded gasoline from these pipes. Leaks and spills from Tank 93 also likely contributed to the elevated lead levels in the tank containment areas. An area adjacent to the elevated lead levels was used to mix the contents of area tanks with soil as part of the ERA. The spreading of tank contents in the area may also have contributed to the lead contamination. The materials in this area are also subject to the CERCLA petroleum exclusion.

101. An elevated lead level discovered in the surface soil sample SAOC-1/HSBH-01 (0-6 in) taken in a depressed area at the southwest junction of the two main railways is attributable to spills of leaded gasoline from two former tanks south of the sample site or piping transporting the gasoline from these tanks to the loading racks and pipeline customers over the years of the refinery's operation. The materials in this area are subject to the CERCLA petroleum exclusion.

102. An area of approximately 4,600 square feet was excavated to a depth of 6 inches in a depressed area in the southwest junction of the two main railways that crossed the refinery (Figure 49) because of the elevated lead level in the SFI surface sample SAOC-1/HSBS-01 (0-6 in). This depressed area accumulated runoff from both the railways and the tankage in the area.

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[59] Equipment List, EPAFOIA0021305

Other elevated surface soil lead levels were present in post-excavation samples taken on the railway which indicated that spills of leaded gasoline from railcars had occurred on the railway. Rain water would have washed these spills into the depression and resulted in the elevated lead level measured in sample SAOC-1/HSBS-01 (0-6 in). Tanks 25 and 26 stored leaded gasoline from 1924 until they were dismantled prior to 1961. Prior to at least 1955 there were no containment dikes around these two tanks,[60] therefore spills from these tanks would also have drained into the depressed area and caused the elevated soil lead levels recorded in sample SAOC-1/HSBS-01 (0-6 in). Piping transporting the gasoline from these tanks to the loading racks and pipeline customers could have also contributed to the elevated lead levels in this depression. In either case the elevated lead level is attributable to lead gasoline, a petroleum product. The materials in this area are subject to the CERCLA petroleum exclusion.

103. Elevated levels of lead discovered in post-excavation surface soil sample SAOC-1 PX-08A (0-0.5 ft) and SAOC-1 PX09A (0-0.5 ft) from under the railroad right-of-way are unrelated to refinery operations and are reasonably attributable to spills from railcars.

104. The railroad rights-of-way are elevated above the surrounding refinery tanks and pipelines. The elevated lead level on the railroad right-of-way was measured in soil samples taken from the right-of-way surface. It would not have been possible for leaks or spill from the refinery to have caused these elevated soil lead levels.

Opinion 14. The Lockheed Report incorrectly identified various pools of water shown in aerial photographs taken of the refinery as pools of “hazardous substances”

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[60] Oil Insurance Association Inspection, 1955, EPAFOIA007909-910

from leaking tanks. The EPA's decision to use Lockheed's incorrect analysis as part of the basis for the ROD and UAO issued to Land O' Lakes was arbitrary and capricious.

105. The EPA's UAO concluded that the Lockheed Report[61] showed that pools of water were pools of "hazardous substances" (oil) and reflected leaks from the associated tanks. The EPA made their conclusions in spite of the fact that Dr. Bill Coons' provided a detailed analysis[62] for Land O'Lakes which concluded that the Lockheed Report was speculative at best and based only on black and white aerial photographs and inconsistent with Midland records and a former employee's testimony.[63] During the nearly 70 years of the refinery's operations at the Site, spills of oil may have occurred in these areas. But, normal refinery practices would have promptly removed any spilled oil with a vacuum truck (Williams, 2015; Wright, 2015). I have reviewed numerous invoices[64] issued to Midland for contractors' vacuum trucks during the 1970s and none of them were for skimming oil from these locations. In my opinion, there were not standing pools of oil allowed to accumulate in the Midland refinery as claimed by the EPA.

106. Based on my experience, it is probable that spills and leaks occurred at the Hudson refinery during its nearly 70 years of operation. But the practice at this refinery, as at most other refineries, was to immediately stop the spill or leak and vacuum up the oil. The 1963 Midland General Safety Rules Manual[65] emphasized this point in stating: "*Oil, acid or caustic*

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[61] Aerial Photographic Analysis, June 1999, EPAFOIA0006345-85

[62] Analysis and Interpretation of Aerial Photographs of Hudson Refinery Superfund Site, February 6, 2006

[63] Forrest Fuqua Interview, July 11, 2007, LOL0099318-368

[64] Vacuum Truck Invoices, 1969-1975 , EPAFAOIA0078756-99, 0078887-982, 0079076-106

[65] General Safety Rules Manual, EPAFIOA0012714-719

spills are to be cleaned up immediately." Insurance inspections of refineries are quick to point out incidences of oil pooling in locations around a refinery because of their concern for the fire hazard posed by these pools of oil. I reviewed numerous insurance inspection reports[66] of the Midland refinery and none noted pools of oil in the refinery except the 1966 report,[67] which noted: "*the dikes around tanks 96 and 97 contain a considerable amount of water and oil.*" The report recommended that all tank dikes be drained on a regular basis. Drainage of storm water from these two tanks' containment area continued to be a problem, and staff meeting minutes[68] indicate a steam pump was installed to lift the storm water out of the dikes and into the nearby separator. Over the past 50 years, I have had the responsibility for the operation of a major refinery and I have provided consulting services to many other refineries. I have found that in none of these refineries, both large and small, was it acceptable to allow pools of oil to lie around the refinery as the EPA has claimed existed at the Site based on Lockheed's review of the black and white aerial photographs. Spills do occur but the refining industry practice is to quickly vacuum up the spill to prevent fires. Operators at the Hudson refinery confirmed this was its practice as well.

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[66] Various Insurance Inspection Reports, EPAFOIA0077879-922

[67]Oil Insurance Association, 1966, EPAFOIA0077895-897

[68] Staff Meeting Minutes, EPAFPIA002377

Based on my information and belief, I declare under penalty of perjury that the foregoing is true and correct.

Dated this _____ day of August, 2015.

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D. Keith Baugher