UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF OKLAHOMA

SIERRA CLUB,	)	
	)	Civil Case No._____
Plaintiff,	)	
	)	COMPLAINT FOR
v.	)	DECLARATORY
	)	AND INJUNCTIVE RELIEF
CHESAPEAKE OPERATING LLC;	)	UNDER 42 U.S.C.
DEVON ENERGY PRODUCTION CO. LP;	)	§ 6972(a)(1)(B)
and NEW DOMINION, LLC,	)	
	)	
Defendants.	)	
	)	
	)	

COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF

Plaintiff Sierra Club, through the undersigned counsel, for its complaint against Defendants Chesapeake Operating LLC, Devon Energy Production Co. LP, and New Dominion, LLC (collectively, "Defendants"), alleges as follows:

INTRODUCTION

1. This is a civil action for declaratory and injunctive relief, and costs and fees, under the citizen suit provision of the Solid Waste Disposal Act, amended as the Resource Conservation and Recovery Act, 42 U.S.C. § 6901, *et seq*. ("RCRA"), specifically section 7002(a)(1)(B) of RCRA, 42 U.S.C. § 6972(a)(1)(B). This action is brought to enforce significant and ongoing violations of RCRA, Section 7002(a)(1)(B), that are placing people and the environment in Oklahoma and Kansas at significant and immediate risk from major man-made earthquakes induced by Defendants' waste disposal practices.

2. As detailed below, Defendants generate, handle, transport, and dispose of large volumes of liquid wastes from oil and gas extraction activities ("Production Wastes"). They

dispose of these wastes by injecting them into wells drilled deep into the ground. Defendants have contributed and continue to contribute to the increased seismicity triggered by the waste handling, transport, and disposal activities at the injection wells owned or operated by the Defendants throughout the State of Oklahoma and southern Kansas. The earthquakes induced by these waste management activities may, and in fact, do, present an imminent and substantial endangerment to health and the environment in violation of RCRA Section 7002(a)(1)(B), 42 U.S.C. § 6972(a)(1)(B).

3. As shown on Figure 1 attached to this complaint, the number of earthquakes in Oklahoma has increased more than 300 fold, from a maximum of 167 before 2009 to 5,838 in 2015. As the number of earthquakes has increased, so has their severity. For example, the number of magnitude 3.5 earthquakes has increased one hundred fold from 4 in 2009 to 220 in 2015. *See* Figure 2. These waste-induced earthquakes have toppled historic towers, caused parts of houses to fall and injure people, cracked basements, and shattered nerves, as people fear there could be worse to come.

4. A large number of earthquakes is an indication that more severe earthquakes are likely. According to the Gutenberg-Richter Relation, a series of small earthquakes suggests that a larger one may take place in the same area. As a result of the large number of earthquakes in the area, seismologists have stated that a magnitude 7 quake is possible along the Nemaha fault. *See* Figure 6. Such a quake could cause devastating harm. Further illustrating this risk, a 5.1 earthquake shook northwest Oklahoma on February 13, 2106, two days ago. *E.g.* http://www.cbsnews.com/news/5-1-magnitude-earthquake-among-several-to-shake-oklahoma/

5. To reduce this substantial risk of harm from waste-induced earthquakes, Plaintiff seeks an Order requiring Defendants to reduce immediately and substantially the amounts of Production Wastes they are injecting into the ground to levels that seismologists believe will not cause or contribute to increased earthquake frequency and severity. At a minimum, the current rates of injection, particularly into the Arbuckle Formation, a layer of rock just above the basement rock in which the earthquakes originate, must be substantially reduced in order to abate the currently unacceptable earthquake risks.

6. Because a reduction in injection volumes would take some time to result in a reduction in earthquakes, Plaintiff also seeks an Order requiring Defendants to reinforce vulnerable structures that current forecasts indicate could be impacted by large magnitude earthquakes during the interim period.

7. Because no government body is currently taking a holistic or proactive view of waste injection and its potential to induce earthquakes, Plaintiff further seeks an Order requiring the establishment of an independent earthquake monitoring and prediction center to determine the amount of Production Wastes which may be injected into a specific well or formation before induced seismicity occurs. Additionally, the center would be responsible for tracking the degree to which the ongoing earthquakes conform to researchers' predictions, which would necessitate further investigation and characterization of the underlying rock formations, including the Arbuckle.

8. Finally, Plaintiff requests that the Court award Plaintiff reasonable attorneys' fees, expert witness fees, and costs incurred in bringing this action, and any further relief it deems appropriate.

JURISDICTION

9. This Court has jurisdiction over the claims set forth in this complaint under Section 7002(a) of RCRA, 42 U.S.C. § 6972(a), under 28 U.S.C. § 1331, the federal question statute, and the Declaratory Judgment Act, 28 U.S.C. § 2201 *et seq.*

10. This Court has jurisdiction over each of the Defendants in that each of them have purposely availed themselves of Oklahoma laws by, among other things, seeking permits for injection wells and drilling and operating such wells within the district of this court. Defendants Chesapeake Operating, LLC, and Devon Energy Production Co., LP have corporate headquarters and principal places of business located in Oklahoma City. Defendant New Dominion, LLC has significant drilling and operating activities and maintains offices and employees in this district. All of the Defendants operate wastewater injection wells within the district of this Court which have caused and contributed to, and continue to cause and contribute to, the damages suffered by Plaintiff.

11. Section 7002(a)(1)(B) of RCRA, 42 U.S.C. § 6972(a)(1)(B), allows citizens to bring suit in order to stop an "imminent and substantial endangerment to health or the environment." It provides that any person may commence an action against "any person [. . .] including any past or present generator, past or present transporter, or past or present owner or operator of a treatment, storage, or disposal facility, who has contributed or is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment[.]"

12. On October 29, 2015, Plaintiff gave notice of the violations and its intent to file suit to the Defendants, the Defendants' registered agents, United States Attorney General, United States Environmental Protection Agency ("EPA"), EPA Region VI, Oklahoma

Department of Environmental Quality, and the Oklahoma Corporation Commission, as required by Section 7002(a) of RCRA, 42 U.S.C. § 6972(a). The registered mail receipts show the notice letter was received by Defendants and other entities to whom the letter was sent on or before November 5, 2015. Plaintiff's notice letter is attached as Exhibit A and is incorporated by reference herein.

13. More than ninety days have passed since Plaintiff provided its notice of intent to file suit to Defendants and others.

14. The endangerment complained of in the notice is continuing at this time or is reasonably likely to continue, because Defendants have failed to take corrective actions sufficient to abate the endangerment conditions.

15. Neither the EPA nor the State of Oklahoma have commenced or are diligently prosecuting a civil or criminal action in a state or federal court to abate the imminent and substantial endangerment to health and the environment alleged in Plaintiff's notice of intent letter. Nor is the EPA, under the Comprehensive Environmental Response, Compensation and Liability Act, engaged in any of the actions described in 42 U.S.C. 6972(b)(2)(B) with respect to the conditions described herein.

VENUE

16. Venue is properly vested in this Court under Section 7002(a) of RCRA, 42 U.S.C. § 6972(a), because the Defendants own or operate within this district injection wells and related facilities for the handling, storage, treatment, transportation, or disposal of waste fluids from oil extraction and hydraulic fracturing ("fracking") activities industries and the alleged endangerment occurred and continues to occur within this district.

PLAINTIFF

17. Plaintiff Sierra Club is a California non-profit organization and has its principal place of business at 85 Second Street, 2nd Floor, San Francisco, California 94105.

18. The Sierra Club has a chapter within the State of Oklahoma, the Oklahoma Sierra Club, with its principal place of business at 600 NW 23rd Street, Suite 204, Oklahoma City, Oklahoma 73103.

19. In addition, the Sierra Club has a chapter within the State of Kansas, the Kansas Chapter of the Sierra Club, with its principal place of business at 9844 Georgia Avenue, Kansas City, Kansas 66109, which includes the Southwind Group, covering southern Kansas, based in Wichita, Kansas.

20. The Sierra Club is America's oldest and largest grassroots environmental organization. Sierra Club has more than 2 million members and supporters, with over 3,000 members within the State of Oklahoma and over 4,000 members within the State of Kansas. Founded in 1892, the Sierra Club has been working for well over a century to protect communities, wild places, and the planet itself. The Sierra Club is dedicated to exploring, enjoying, and protecting the wild places of the Earth; to practicing and promoting the responsible use of the Earth's resources and ecosystems; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Sierra Club's concerns encompass the exploration, enjoyment, and protection of the lands and waters of Oklahoma.

21. At least 10 of Sierra Club’s members that are affected by the endangerment are prepared to be standing witnesses. These members have already experienced concrete harms from the earthquakes, such as cracking of the walls of their homes. In addition, the waste induced earthquakes detract from their enjoyment of their homes and the surrounding

environment. Furthermore, they have a reasonable fear that if effective action is not taken to stem the earthquake swarm, their homes and their environment could suffer far more damage that could be catastrophic.

22. Plaintiff was and is a "person" within the meaning of Section 1004(15) of RCRA, 42 U.S.C. § 6903(15). Plaintiff has standing because its members are being harmed by Defendants' waste management activities, the relief requested would redress these harms, and the interests Plaintiff seeks to protect are germane to the organization's purpose.

23. Neither the claims asserted in this Complaint, nor the relief requested, require the participation of the individual members of the organizations in this lawsuit.

DEFENDANTS

24. Defendant Chesapeake Operating, LLC ("Chesapeake") is a corporation existing and operating under the laws of the State of Oklahoma that does business within the State of Oklahoma and has its principal place of business at 6100 N. Western Avenue, Oklahoma City, Oklahoma 73118-1044.

25. Defendant New Dominion, LLC ("New Dominion") is a corporation existing and operating under the laws of the State of Oklahoma that has substantial activity within the State, including drilling and operating wells and maintaining offices and employees.

26. Defendant Devon Energy Production Co., LP ("Devon") is a corporation existing and operating under the laws of the State of Oklahoma that does business in the State of Oklahoma and has its principal place of business at 20 North Broadway, Suite 1500, Oklahoma City, Oklahoma 73102-8202.

27. Defendants were and are "persons" within the meaning of Section 1004(15) of RCRA, 42 U.S.C. § 6903(15).

28. All of the Defendants are oil and gas companies that transport, handle, and dispose of waste fluids from oil and gas production activities by taking them from the point of production to waste injection wells, where the wastes are disposed by injecting them deep into the ground.

29. All of the defendants have purposely availed themselves of Oklahoma laws by, among other things, seeking permits for injection wells and drilling and operating such wells within the district of this Court. Defendants Chesapeake Operating, LLC, and Devon Energy Production Co., LP have corporate headquarters and principal places of business located in Oklahoma City. Defendant New Dominion, LLC has significant drilling and wastewater injection activities and maintains offices and employees in this district. All of the Defendants operate wastewater injection wells within the district of this Court which have caused and contributed to, and continue to cause and contribute to, the damages suffered by Plaintiff.

FACTS

I. Earthquakes Induced By Defendants' Waste Injection are Causing Endangerment in Central Oklahoma and Southern Kansas

30. In recent years, it has been established that the injection of Production Wastes into the ground through high rate disposal wells causes earthquakes. After much local controversy, the Oklahoma Geological Survey ("OGS") determined in the spring of 2015 that "the majority of recent earthquakes in central and north-central Oklahoma are very likely triggered by the injection of produced water in disposal wells" and that "seismologists have documented the relationship between wastewater disposal and triggered seismic activity." http://earthquakes.ok.gov/what-we-know/ (visited on October 9, 2015).

31. The United States Geological Survey ("USGS") fully supports this conclusion. For example a *New Yorker* article recently quoted USGS geologist William Ellsworth in reporting that "[d]isposal wells trigger earthquakes when they are dug too deep, near or into basement rock, or when the wells impinge on a fault line. Ellsworth said, 'Scientifically, it's really quite clear.'" http://www.newyorker.com/magazine/2015/04/13/weather-underground.

32. Similar conclusions were reached by the authors of one of the first peer-reviewed papers on this issue, published in July 2014, titled "Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection." Keranan et al., Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection, 448-451, 451 (July 3, 2014).

33. Thephenomenon that adding fluids into the earth can cause earthquakes is not newly discovered. Well-known examples of water injection into wells causing earthquakes have occurred in Colorado, Texas, India, and China. Most recently, in a year-end review, EPA noted that many experts have concluded that a connection likely exists between disposal well location, injection volume and rates, and seismic activity. EPA was concerned with the continued upward trend in earthquakes and recommended a reduction in the volumes of waste injected into the Arbuckle formation, which is the most critical stratum in regards to induced seismicity. EPA further recommended additional assessment and mapping of the Arbuckle formation and its connection to basement rock.

34. Based on publicly available data, the conclusion that wastewater injection and the recent spate of earthquakes in Oklahoma and southern Kansas are related is inescapable. Before 2009, the maximum number of earthquakes measured in a given year in Oklahoma was 195 in 1995. By 2014, the number of measured earthquakes soared to over 5,000, and in 2015

the number of earthquakes reached over 5,800. The number of earthquakes that residents can feel has shown an even greater rate of increase. In 2014, Oklahoma had 585 earthquakes of magnitude-3 or greater compared to 109 magnitude-3 quakes in 2013. Since late 2009, the rate of magnitude-3 or larger earthquakes in north-central Oklahoma has been nearly 300 times higher than in previous decades. Of course, earthquakes do not respect state boundaries. The earthquake swarm in central and northern Oklahoma also extends into southern Kansas. McNamara et al, Earthquake hypocenters …., Geophysical Research Letters (Jan 27, 2015) ("Future Hazards") at Figure 2.

35. As discussed in a recent study, "this seismicity appears to be associated with increases in saltwater disposal that originates as 'flow-back' water after multistage hydraulic fracturing operations." F. Rall Walsh III and Mark D. Zoback, Oklahoma's recent earthquakes and saltwater disposal, Science Advances, 18 Jun 2015 available at http://advances.sciencemag.org/content/1/5/e1500195.full ("Disposal Study").

36. Since 2009, Defendants have injected huge amounts of Production Wastes via disposal wells. The total cumulative volume of Production Wastes injected in Oklahoma has increased from 2 billion ("bn") barrels in 2009 to over 12 bn barrels in 2014. Figure 3. Focusing on the Arbuckle formation alone, which is the geologic stratum in which large volume disposal wells discharge and which lies directly above the basement rock where most of the earthquakes originate, Defendants account for over 30% of the total volume of Production Wastes injected in 2014. Figure 4. In specific regions, individual Defendants have much larger shares of the local amount of injection. New Dominion has been injecting large volumes since 2011, but since then, Devon has almost matched New Dominion's volumes, while Chesapeake has surpassed them. Figure 5.

37. Overlaying the locations of Defendants' wells onto the places where earthquakes above magnitude 3.5 have occurred shows that earthquakes are occurring in the vicinity of Defendants' wells and along faults that are close to the wells. Figure 6. As the frequency and volume of wastewater injection has increased in the central and northern areas of Oklahoma, earthquake occurrences in those regions have correspondingly increased. *Compare* Figure 7 with Figure 6.

38. While not all wells cause earthquakes, studies have found that most high volume disposal wells are linked to earthquakes: "Even though quake-associated wells were only 10 percent of those studied, more than 60 percent of the high-rate wells — 12 million gallons or more — were linked to nearby earthquakes" and "of the 45 wells that pump the most saltwater [waste] at the fastest rate, 34 of them — more than three out of four — were linked to nearby quakes." http://www.nytimes.com/aponline/2015/06/18/science/ap-us-sci-manmade-quakes.html?smprod=nytcore-ipad&smid=nytcore-ipad-share&_r=0.

39. For example, just four wells owned by New Dominion have caused 20% of all the seismic activity in the central U.S. from 2008 to 2013. Keranan et al., Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection, Science Vol. 345, 448-451, 448 (July 3, 2014) ("Sharp Increase"). In addition, Wells have been shown to induce earthquakes over 20 miles away.

40. The Disposal Study confirms that "the significant increases in SWD [Salt Water or Production Waste disposal] increase pore pressure in the Arbuckle Group, which spreads out away from the injection wells with time, eventually triggering slip on critically stressed faults in the basement." It also confirms that "[i]njection of large volumes of

saltwater into the Arbuckle group appears to be triggering the release of already stored strain energy in crystalline basement." Disposal Study.

41. It has therefore been scientifically established that injection of Production Wastes induces earthquakes. Moreover, as previously stated, Defendants are injecting much of the Production Wastes that are causing the earthquakes about which Plaintiff complains.

42. Importantly, as mentioned above, the risk is not only that there are more frequent earthquakes, it is also that those earthquakes have been and will continue to increase in severity. USGS scientists are warning that the smaller earthquakes induced by the injection of Production Wastes are reawakening long-dormant, 300-million-year-old fault lines across Oklahoma. The faults could trigger much higher-magnitude, and consequently more destructive, earthquakes than the smaller ones that have plagued the state in recent years. According to USGS scientists, these reawakened faults in central Oklahoma could produce earthquakes as powerful as magnitude-5 and 6. One USGS geologist stated, "Many faults are reactivating, with as many as 17 magnitude-4 earthquakes in 2014." http://www.usatoday.com/story/news/nation/2015/03/10/oklahoma-earthquakes-fault-lines/24702741/. In 2011, one even reached magnitude-5.4 in strength near Prague, Oklahoma and just three days ago a 5.1 earthquake occurred in northwest Oklahoma.

43. Recently, two earthquakes of greater-than-magnitude-4 occurred in Oklahoma on the same day-, which is further evidence of the increased frequency of more serious earthquakes in the areas of concern. A magnitude 4.4 quake hit northern Oklahoma on October 10, 2015, which one USGS researcher said "had all the hallmarks of an induced quake" and "seem[ed] to be part of an ongoing swarm of induced quakes in the area." *Guardian*, October 10, 2015, Oklahoma Earthquake likely caused by wastewater injection,

seismologist says, available at http://www.theguardian.com/us-news/2015/oct/10/oklahoma-earthquake-fracking-us-geological-survey.

44. On the same day, a magnitude 4.5 earthquake hit about 100 miles southeast, near the major oil storage area of Cushing, Oklahoma. Cushing is the location of the world's largest and most important crude oil storage hub. The emergency manager reported that "the whole house shook." The oil tanks did not suffer significant damage, but it "shattered nerves." *New York Times*, October 14, 2015 New Concern Over Quakes in Oklahoma Near a Hub of U.S. Oil, *available at* http://www.nytimes.com/2015/10/15/us/new-concern-over-quakes-in-oklahoma-near-a-hub-of-us-oil.html. Scientists reported in a paper published online in September that a large earthquake near the storage hub "could seriously damage storage tanks and pipelines." Dr. McNamara, the lead author of that study, stated that the recent earthquake continued a worrisome pattern of moderate quakes, suggesting that a large earthquake is more than a passing concern. "When we see these fault systems producing multiple magnitude 4s, we start to get concerned that it could knock into higher magnitudes," he said. "Given the number of magnitude 4s here, it's a high concern." *Id.*

45. The Cushing oil hub stores oil piped from across North America until it is dispatched to refineries. As of last week, it held 53 million barrels of crude oil. The earth beneath the tanks was comparatively stable until last October, when magnitude 4 and 4.3 earthquakes struck nearby in quick succession, revealing long-dormant faults beneath the complex. Three more earthquakes with magnitudes 4 and over occurred within a few miles of the tanks within a month. The Department of Homeland Security has gauged potential earthquake dangers to the hub and concluded that a quake equivalent to the record magnitude 5.7 could significantly damage the tanks. Dr. McNamara's study concludes that recent

earthquakes have increased stresses along two stretches of fault that could lead to earthquakes of that size. Despite these risks, some oil companies have challenged the right of the State of Oklahoma to reduce injection volumes.

46. Further south, the Nemaha fault runs north-northwest between Oklahoma City and southern Kansas. Figure 6 attached. In a peer-reviewed paper in Science magazine published in July 2014, seismologists found that a magnitude 7 earthquake is possible along that fault. Furthermore, they stated that "the increasing proximity of the earthquake swarm to the Nemaha fault presents a potential hazard to the Oklahoma City metropolitan area." Keranan et al., Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection, Science Vol. 345, 448-451, 451 (July 3, 2014) ("Sharp Increase"). USGS scientists have also said that a magnitude 7 quake cannot be ruled out.

47. The Future Hazards study confirms that more severe earthquakes are likely as a result of ongoing injection of Production Wastes into the ground through high-rate disposal wells. It states that earthquake clusters associated with long fault structures could give rise to magnitude 5 to 6 earthquakes. Examples include earthquakes associated with the Nemaha fault near Jones, in the Medford and Stillwater regions, and between Langston and Guthrie. Another example is the area around Cushing. Future Hazards at Figure 2. The paper concludes that the increased seismicity poses an elevated hazard to infrastructure and the regional population.

48. According to a recent paper referenced below, the Cushing area earthquakes are associated with reactivated faults that cut into the Arbuckle formation and a subsidiary fault called the Wilzetta-Whitehall. That paper noted that most of the earthquakes do not lie along known fault structures but there may be other fault structures that are being reawakened by the

injections that are associated with these earthquakes. The paper notes that earthquake activity in this area has been above forecast and that "[i]nclusion of all recent Oklahoma earthquakes in the NSHM [hazard model] significantly increases ground shaking estimates and earthquake hazard . . ., which would result in serious implications for infrastructure design standards." McNamara et al., Reactivated faulting near Cushing, Oklahoma: Increased potential for a triggered earthquake in an area of United States strategic infrastructure, Geophysical Research Letters (October 23. 2015) available at http://onlinelibrary.wiley.com/doi/10.1002/2015GL064669/pdf.

49. These earthquakes have already caused considerable physical damage and mental disquiet. The scale to classify earthquakes is logarithmic, meaning that a magnitude 4 earthquake is 10 times more powerful than a magnitude 3, and a magnitude 5 earthquake is 100 times more powerful than a magnitude 3. Earthquakes of magnitude 6 to 7 cause widespread damage and considerable loss of life. A series of shocks over magnitude 5 in 2011, the largest of which was magnitude 5.6 in the Prague area of Oklahoma, destroyed at least 16 houses and collapsed an historic spire at Benedictine Hall at St. Gregory's University. Repairing the spire cost about $5 million dollars. In addition to the property damage, in nearby Prague the quakes have not only caused property damage but have also caused harm to people. For example, Sandra Ladra was at home watching television in her home in Prague, Oklahoma in November of 2011 when an earthquake caused the rock facing on her fireplace to fall. The rocks struck Ms. Ladra causing her significant injury.

50. If earthquakes of over 6 in magnitude struck Oklahoma or Kansas, there is a very real danger that large numbers of people could be harmed or even killed. In addition, storage tanks for oil and other products could be ruptured, pipes carrying oil, gas, or other

chemicals could be ruptured, and other damage to infrastructure could occur. This would cause widespread environmental damage, in addition to property damage and personal injuries. In particular, if a large earthquake struck the massive oil storage area in Cushing, huge amounts of oil could be released, causing massive environmental damage.

51. The earthquakes are continuing in 2016. Oklahoma City residents were awakened on January 1, 2016 with a 4.1 magnitude earthquake. Six days later, 4.3 and 4.8 magnitude earthquakes occurred back-to-back. Oklahoma has had 131 earthquakes from January 1 through 16, 2016 ranging from 2.01 to 4.8.

52. On February 13, 2016 at 11:07 a.m. a 5.1 magnitude earthquake struck 17 miles northwest of Fairview, Oklahoma. It was quickly followed by aftershocks of magnitude 3.9, 3.7, 3.6, 3.5, 3.1 and 3.0. According to the Oklahoma Geological Survey, this was the third largest earthquake recorded in Oklahoma history and was felt from Kansas City, Missouri to Dallas, Texas. Of particular concern is the fact that the epicenter was approximately 75 miles west of Cushing and its vulnerable oil storage tanks and pipelines.

53. Thus, the injection of large volumes of Production Wastes into the ground in Oklahoma has caused and is causing large numbers of moderate strength earthquakes in Oklahoma and southern Kansas. The constant increase in the number of these size earthquakes, standing alone, causes an imminent and substantial endangerment to health and the environment. That endangerment is exacerbated by the increasing likelihood of a devastating earthquake that could injure or kill large numbers of people and cause massive environmental devastation.

54. Plaintiff and its members seek relief from this Court, as set forth in this Complaint, to protect themselves and their environment by requiring the Defendants to reduce

substantially the volumes of Production Wastes that they are injecting and take the other measures outlined in this Complaint to abate the present endangerment.

II. Defendants Have Violated and Are Violating RCRA by Causing Earthquakes and/or Contributing to Their Cause

55. Having provided the required notice, Plaintiff is now entitled to bring suit against "any person . . . who has contributed or who is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment." A potential endangerment exists when there is some reasonable cause for concern that someone or something may be exposed to a risk of harm.

56. As discussed above, and shown in even more detail below, Defendants have contributed and are contributing to past and present handling, storage, transport, and disposal of Production Wastes which is causing earthquakes that may present an imminent and substantial endangerment to health or the environment. They are therefore jointly and severally liable for the abatement of this endangerment.

III. New Dominion Has Disposed of Production Wastes that Caused Earthquakes and/or Contributed To Their Occurrence and is Continuing to Do So

57. The Sharp Increase study describes the mechanism for how high volume waste disposal wells cause earthquakes. The rate of wastewater injection increased rapidly from 2004 onwards, doubling between 2004 and 2008. The need for Production Waste disposal increased as non-conventional "dewatering" oil production increased. Dewatering production wells produce as much as 200 times the Production Wastes as conventional oil wells. This led to a rapid increase in disposal via injection. At the same time, the rate of earthquakes went up, establishing a direct correlation between injection and earthquake frequency. The Sharp

Increase study went beyond that and showed that the high rate of injection was causing the swarm of earthquakes around Jones, which lies close to Oklahoma City to the northeast.

58. New Dominion started operating the first high rate injection well just south of Oklahoma City in 2004. This well and the other three in the same area that followed built up to an injection rate of 3 million barrels per month. This high rate of injection caused pressure to build up in the ground. Sharp Impact at Figure 3. The Jones earthquake swarm started concurrently with the reporting of positive pressure at the wells. The scientists who wrote Sharp Increase showed that the wells were contributing to an expanding zone of high pressure moving northeast. *Id.* at Figure 4. As the high-pressure zone moved northeast so did the earthquakes. The four high -volume New Dominion wells were responsible for 85% of the increase in pressure in this area. Analysis of the ground conditions showed that higher pressures than were present in 2014 would be needed to cause an earthquake directly along the Nemaha fault. However, the Sharp Increase scientists warned that if pressure built up further it could cause an earthquake of magnitude 7.

59. The Figures attached to this Complaint, based on publicly available information and showing the spatial and temporal correlation, confirm the Sharp Increase findings. From 2011 to 2014 New Dominion has been injecting large volumes of Production Wastes. Figure 5. In 2011, New Dominion disposed of higher volumes of waste than the other Defendants combined. *Id.* New Dominion's disposal mainly occurred through four wells close to Oklahoma City on the Nemaha fault and a number near the Wilzetta fault to the east. Figure 6. In 2014, and probably other years, the bulk of this injection was into the Arbuckle Formation. Figure 8. Between 2009 and 2011, 53 of the 54 greater than 3.5 magnitude earthquakes in Oklahoma occurred close to New Dominion's wells. Figure 7. Since then, the

earthquake swarm in the Jones area has continued and extended into the Guthrie area. Figure 6.

60. New Dominion's disposal of Production Wastes is causing or contributing to the earthquake risks in these areas. In addition, it is likely that New Dominion is contributing to the earthquake risk in the Cushing area.

61. Thus, New Dominion has contributed and is contributing to the past and present handling, storage, and disposal of Production Wastes which is causing earthquakes in Oklahoma and southern Kansas that present an imminent and substantial endangerment to health or the environment.

IV. Chesapeake Has Disposed of Production Wastes that Caused Earthquakes or Contributed To Their Occurrence and is Continuing to Do So

62. Chesapeake has been disposing of high volumes of Production Wastes into the ground since before 2011. Figure 5. In 2011, it had a few major wells in the north central part of Oklahoma, but no earthquakes occurred near them between 2009 and 2011. Figure 7. It doubled its disposal volume in 2012, tripled it in 2013 and then reduced it slightly from 2013 levels in 2014. Figure 5. Furthermore, most of these wells are in the north central part of Oklahoma close to the Kansas border. Figure 6. In 2014, and probably other years, the bulk of this injection was into the Arbuckle Formation. Figure 8. Since late 2013, a swarm of greater than magnitude 3 earthquakes developed in this area. Figure 6. This swarm extends into southern Kansas. These earthquakes are continuing in 2016 and, as detailed above, are becoming increasingly severe.

63. Therefore, Chesapeake's handling and disposal of the Production Wastes has contributed and is contributing to the northern swarm of earthquakes. In addition, it is probable that Chesapeake is contributing to the earthquake risk in the Cushing area.

64. Thus, Chesapeake has contributed and is contributing to the past and present handling, storage, and disposal of Production Wastes which is causing earthquakes in Oklahoma and southern Kansas that present an imminent and substantial endangerment to health and/or the environment.

V. Devon Has Disposed of Production Wastes that Caused Earthquakes or Contributed To Their Occurrence and is Continuing to Do So

65. Devon started to dispose of high volumes of Production Wastes into the ground in 2012, but then ramped up its volume rapidly. Figure 5. All but two of its wells are between the Sandridge and Chesapeake wells in the north and the New Dominion wells in the south. Figure 6. In 2014, and probably other years, the bulk of this injection was into the Arbuckle Formation. Figure 8. Since 2013 a swarm of greater than magnitude 3.5 earthquakes developed in this area. Figure 6. This swarm extends into at least the Cushing area. These earthquakes are continuing in 2015 and, as detailed above, are becoming more severe.

66. Therefore, Chesapeake is contributing to the earthquake risk in the Cushing area and it may also be contributing to the other earthquake swarms.

67. Thus, Devon has contributed and is contributing to the past and present handling, storage, and disposal of Production Wastes which is causing earthquakes in Oklahoma and southern Kansas that present an imminent and substantial endangerment to health and/or the environment.

CLAIM FOR RELIEF

RCRA – Imminent and Substantial Endangerment

68. Plaintiff incorporates by reference the allegations of the preceding paragraphs of this Complaint and the attachments to this Complaint.

69. Pursuant to RCRA Section 7002(a)(1)(B), having given the required notice, Citizens may commence a citizen suit against "any person," "including any past or present generator, past or present transporter, or past or present owner or operator of a treatment, storage, or disposal facility who has contributed or who is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment." RCRA § 7002(a)(1)(B), 42 U.S.C. § 6972(a)(1)(B).

70. Pursuant to 42 U.S.C. § 6903(15), all Defendants are "persons" subject to the citizen suit provisions of RCRA, 42 U.S.C. § 6972.

71. The Production Wastes are "solid waste" under RCRA section 1004 because they are "discarded material," which includes liquid or semisolid material resulting from industrial or commercial operations. 42 U.S.C. § 6903(27).

72. As set forth above, all Defendants have engaged in the operations of handling, storage, treatment, transportation, or disposal of Production Wastes. Thus, all Defendants have contributed and are contributing to the past and present handling, storage, treatment, transportation, or disposal of a solid waste under RCRA.

73. Defendants have contributed and continue to contribute to the increased seismicity triggered by the treating, storing, transporting and disposal of Production Wastes at injection wells owned or operated by the Defendants throughout the State of Oklahoma.

74. Consequently, as set forth above, Defendants' treatment, handling, storage, transportation, and disposal of the Production Wastes may present an imminent and substantial endangerment to public health and the environment as those terms are used in Section 7002(a)(1)(B) of RCRA, 42 U.S.C. § 6972(a)(1)(B).

75. In accordance with this provision, Defendants are subject to injunctive relief requiring them to take necessary actions to abate this endangerment.

RELIEF REQUESTED

WHEREFORE, Plaintiff respectfully requests that the Court enter a judgment:

1. Declaring that Defendants' past and/or present treatment, handling, storage, transportation, and disposal of Production Wastes presents, or may present, an imminent and substantial endangerment to public health and/or to the environment in violation of RCRA.

2. Preliminarily and permanently enjoining Defendants by ordering them to reduce immediately and substantially the amounts of Production Wastes they are injecting into the ground to levels that seismologists believe will not cause or contribute to increased earthquake frequency and severity, including, at a minimum, requiring a substantial reduction in the current unacceptable rates of injection of Production Wastes into the Arbuckle Formation.

3. Preliminarily and permanently enjoining Defendants by ordering them to reinforce vulnerable structures that current forecasts show could be impacted by large magnitude earthquakes during the interim period.

4. Ordering the establishment of an independent earthquake monitoring and prediction center to analyze and forecast the volume of Production Wastes which can be injected into a particular well or formation in a given area before seismicity is induced; and monitor how closely ongoing earthquakes conform to researchers' predictions. This prediction effort will likely involve further investigation and characterization of the underlying rock formations, including the Arbuckle.

5. Ordering an award of Plaintiff's reasonable attorneys' fees, expert witness fees, and costs incurred in bringing this action, as authorized by 42 U.S.C § 6972(e).

6. Such other and further relief as the Court deems just and proper.

RESPECTFULLY SUBMITTED this 16th day of February, 2016.

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* To Be Admitted *Pro Hac Vice*