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The Constitutionality of Remote Sensing Satellite Surveillance in Warrantless Environmental Inspections

Karen Geer*

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NOTES

THE CONSTITUTIONALITY OF REMOTE SENSING SATELLITE SURVEILLANCE IN WARRANTLESS ENVIRONMENTAL INSPECTIONS

INTRODUCTION

THE last few decades have seen an incredible expansion in environmental legislation.¹ In order to enforce environmental regulations effectively, Congress has included a "right of entry" in statutes which allows governmental investigators access to private facilities.² Although the Supreme Court has held that aerial photography is included in an inspector's investigatory power, the Court questioned the legality of satellite surveillance.³ In evaluating the constitutionality of aerial photography, the Court analyzed five factors: the type of the place under surveillance;⁴ the obtrusiveness of the physical surveillance;⁵ the degree of enhancement provided by the sensor;⁶ the availability of the equip-

1. See Joseph C. Sweeney, *Protection of the Environment in the United States*, 1 FORDHAM ENVTL. L. REP. 1 (1989).

2. See Clean Water Act of 1977 § 308, 33 U.S.C. § 1318(a)(B) (1988); Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) § 104(e), 42 U.S.C. § 9604(e) (1988); Resource Conservation and Recovery Act of 1976 (RCRA) § 3007, 42 U.S.C. § 6927(a) (1988); Hazardous Liquid Pipeline Safety Act of 1979 § 211(c), 49 U.S.C. § 1808(c) (1988); Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) § 9, 7 U.S.C. § 136g(a) (1988); Toxic Substances Control Act (TSCA) § 11, 15 U.S.C. § 2610 (1988). Cases involving administrative searches/investigations conducted under environmental statutes include: *EPA v. Alyeska Pipeline Service Co.*, 836 F.2d 443 (9th Cir. 1988); *United States v. Western Processing Co.*, 734 F. Supp. 930 (W.D. Wash. 1990); *Outboard Marine Corp. v. EPA*, 773 F.2d 883 (7th Cir. 1985), *vacated*, 479 U.S. 1002 (1986). See generally Steven T. Wax, *Symposium on Waste Management Law and Policy: Related Issue: the Fourth Amendment, Administrative Searches and the Loss of Liberty*, 18 ENVTL. L. 911, 915 n.29 (1988).

3. *Dow Chemical Co. v. United States*, 476 U.S. 227, 238 (1986).

In the instant case, two additional Fourth Amendment claims are presented: whether the common-law "curtilage" doctrine encompasses a large industrial complex such as Dow's, and whether photography employing an aerial mapping camera is permissible in this context. Dow argues that an industrial plant, even one occupying 2,000 acres, does not fall within the "open fields" doctrine of *Oliver v. United States*, but rather is an "industrial curtilage" having constitutional protection equivalent to that of the curtilage of a private home. Dow further contends that any aerial photography of this "industrial curtilage" intrudes upon its reasonable expectations of privacy.

4. *Id.* at 235. (citations omitted).

5. Here, the EPA was not employing some unique sensory device that, for example, could penetrate the walls of buildings and record conversations in Dow's plants, offices or laboratories, but rather a conventional, albeit precise, commercial camera commonly used in mapmaking. The government asserts it has not yet enlarged the photographs to any significant degree

Id. at 238.

6. It may well be, as the Government concedes, that surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally

ment;⁷ and the existing legal protections against invasion of a business' privacy to uncover trade secrets.⁸ When these factors are applied to remote sensing satellite sensors, there is no reason to create a legal distinction between aerial photography and remote sensing satellite surveillance.

This Note examines the constitutionality of satellite surveillance in warrantless environmental inspections. Part I describes the constitutional framework for warrantless governmental inspections. Part II examines *Dow Chemical Co. v. United States*⁹ and argues that satellite surveillance is not likely to intrude on activities protected by the Fourth Amendment. Part III concludes that Remote Sensing Satellite Surveillance is a proper investigatory tool under the "right of entry" provisions in environmental legislation.

I. CONSTITUTIONAL FRAMEWORK FOR WARRANTLESS ENVIRONMENTAL INSPECTIONS

The Fourth Amendment of the Constitution protects the rights of an individual to be free from "unreasonable searches and seizures."¹⁰ The traditional view of this amendment is limited to a person's individual home, his personal papers and effects, and the government's physical entry into the home.¹¹ The Supreme Court has interpreted the Fourth Amendment's reach to protect people in areas outside of the home such

proscribed absent a warrant. But the photographs here are not so revealing of intimate details as to raise the constitutional concerns. Although they undoubtedly give the EPA more detailed information than naked-eye views, they remain limited to an outline of the facility's buildings and equipment. The mere fact that human vision is enhanced somewhat, at least to the degree here, does not give rise to constitutional problems.

Id. at 238.

7. An electronic device to penetrate walls or windows so as to hear and record confidential discussions of chemical formulae or other trade secrets would raise very different and far more serious questions; other protections such as trade secret laws are available to protect commercial activities from private surveillance by competitors.

Id. at 239.

8. "No trade secret law cited to us by Dow proscribes the use of aerial photography of Dow's facilities for law enforcement purposes, let alone photography for private purposes, unrelated to competition such as mapmaking or simple amateur snapshots." *Id.* at 239 n.6.

9. 476 U.S. 227 (1986).

10. U.S. Const. amend. IV. The Fourth Amendment in its entirety states: "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no [w]arrants shall issue, but upon probable cause, supported by [o]ath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized." *Id.*

11. See *United States v. Karo*, 468 U.S. 705, 714 (1984); *Payton v. New York*, 445 U.S. 573, 589 (1980); *United States v. United States Dist. Court*, 407 U.S. 297, 312 (1972); *Coolidge v. New Hampshire*, 403 U.S. 443, 474-75 (1971), *overruled by Washington v. Chrisman*, 455 U.S. 1 (1982); *Silverman v. United States*, 365 U.S. 505, 511 (1961); *Goldman v. United States*, 316 U.S. 129, 137 (1942) (Murphy, J., dissenting), *overruled by Katz v. United States*, 389 U.S. 347 (1967).

as the curtilage of the home¹² or place of business.¹³ The scope of freedom afforded at the home, however, is differentiated from commercial property and searches are not necessarily infringed by warrantless administrative inspections.¹⁴ With the advent of modern technology, the Court has had to refine the scope of protections afforded by the Fourth Amendment.¹⁵

In 1967, the Supreme Court addressed the issue of the constitutionality of warrantless administrative searches. In *Camara v. Municipal Court of San Francisco*,¹⁶ the Court overruled *Frank v. Maryland*¹⁷ to the extent that it permitted warrantless administrative searches without some exceptions to the warrant requirement. The Court rejected the notion that searches under the regulatory scheme were reasonable and that a warrant was not required.¹⁸ The Court held that inspectors need not show probable cause that a violation exists, but rather they must show a reasonable government interest to justify a warrant requirement.¹⁹

The Supreme Court drastically restricted the availability of warrantless administrative searches in *See v. City of Seattle*.²⁰ By applying the holding in *Camara*, the Court held that administrative entry upon portions of commercial premises which are not open to the public may be conducted only with a warrant.²¹ In both *Camara* and *See*, the Court held that in order to obtain an administrative warrant, the official need not show probable cause that a violation of the applicable regulation has occurred; he need only present evidence relating to the purpose of the regulatory statute.²²

12. *Oliver v. United States*, 466 U.S. 170, 180 (1984).

13. *See v. City of Seattle*, 387 U.S. 541, 543 (1967).

14. *Dow Chemical Co. v. United States*, 476 U.S. 227, 237-38 (1986), *Donovan v. Dewey*, 452 U.S. 594, 598-99 (1981).

15. *See, e.g.*, *United States v. Dunn*, 480 U.S. 294 (1987) (electronic device); *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986) (image-magnifying aerial photography); *California v. Ciraolo*, 476 U.S. 207 (1986); *United States v. Karo*, 468 U.S. 705 (1984) (electronic tracking device); *Texas v. Brown*, 460 U.S. 730 (1983) (artificial illumination); *United States v. Knotts*, 460 U.S. 276 (1983) (electronic device).

16. 387 U.S. 523 (1967).

17. 359 U.S. 360 (1959). This was the first Supreme Court case to consider the validity of warrantless regulatory inspections. In *Frank*, a health inspector was investigating complaints of rodent infestation in Frank's neighborhood. At the rear of the house the inspector found strong evidence of rat infestation. When the inspector tried to enter the house, Frank refused. The inspector returned with two policemen. After reinspecting the exterior of the house, he then swore out a warrant for Frank's arrest. Frank appealed his conviction, claiming that the search violated his Fourth Amendment rights. In affirming Frank's conviction, the Court held that Fourth Amendment protection does not extend to administrative searches. *Frank v. Maryland* was subsequently overruled by *Camara v. Municipal Court of San Francisco*, 387 U.S. 523 (1967).

18. *Camara*, 387 U.S. at 530-32.

19. *Id.* at 539.

20. 387 U.S. 541, 545 (1967).

21. *See*, 387 U.S. at 543. "[I]f a valid public interest justifies the intrusion contemplated, then there is probable cause to issue a suitably restricted search warrant."

22. *See*, 387 U.S. at 543-545.

A. *Exceptions to the Warrant Requirement for Administrative Investigations*

There are exceptions to the administrative warrant requirement for governmental investigations.²³ For purposes of Remote Sensing Satellite Surveillance in warrantless environmental inspections, the pertinent exceptions are the open fields and plain view doctrines.²⁴

The open fields and plain view exceptions to the warrant requirement are similarly applicable to administrative searches as they are to the main body of Fourth Amendment law.²⁵ Both exceptions are pertinent to the discussion of remote sensing in environmental inspections. In order to understand these exceptions, it is necessary to discuss the seminal case which defined "constitutionally protected area"²⁶ under the Fourth Amendment.

In *Katz v. United States*,²⁷ Justice Stewart, writing for the majority stated that the Fourth Amendment protects people and not places (or areas).²⁸ The Court held that the electronic eavesdropping was an unconstitutional search because the agents had not obtained a search warrant.²⁹ Justice Harlan's concurrence has become a two-part test upon which lower courts rely,³⁰ and the Supreme Court ultimately

23. An exception to the administrative warrant requirement was approved by the Supreme Court in *Colonnade Catering Corp. v. United States*, 397 U.S. 72 (1970) and *Biswell v. United States*, 406 U.S. 311 (1972). This exception is justified based on the owner's implicit waiver of Fourth Amendment rights by choosing to own a business that is "pervasively regulated". In *Marshall v. Barlow's Inc.*, 436 U.S. 307 (1978), the rule was limited because the Court emphasized that the pervasive regulation exception was not a general rule. See also *New York v. Burger*, 482 U.S. 691 (1987), (automobile industry); *Balelo v. Baldrige*, 724 F.2d 753 (9th Cir. 1984), cert. denied, 467 U.S. 1252 (1984); *United States v. Blue Diamond Coal Co.*, 667 F.2d 510 (6th Cir. 1981), cert. denied, 456 U.S. 1007 (1982) (mining); *Bionic Auto Parts & Sales, Inc. v. Fahner*, 721 F.2d 1072 (7th Cir. 1983) aff'd sub nom, *Rush v. Obledo*, 756 F.2d 713 (9th Cir. 1985) (family day care); *United States v. Jamieson-McKames Pharmaceuticals, Inc.*, 651 F.2d 532 (8th Cir. 1981), cert. denied, 455 U.S. 1016 (1982) (drug manufacturers); *United States v. Tsuda Maru*, 470 F. Supp. 1223 (D. Alaska 1979) (fishing).

24. See, e.g., *Dow Chemical Co. v. United States*, 476 U.S. 227, 238 (1986) (open fields exception); *Oliver v. United States*, 466 U.S. 170 (1984); *Coolidge v. New Hampshire*, 403 U.S. 443 (1971) (plain view exception).

25. See generally Theodore Fishman, *Technologically Enhanced Visual Surveillance and the Fourth Amendment: Sophistication, Availability and the Expectation of Privacy*, 26 AM. CRIM. L. REV. 315 (1988).

26. This doctrine defined a constitutionally protected area as being an area that would require a physical invasion or trespass in order to pass constitutional muster. See *infra* note 32 and accompanying text.

27. 389 U.S. 347 (1967). Katz was convicted in federal court on a charge of wagering information by telephone from Los Angeles to Miami and Boston. Evidence was produced at trial by FBI agents, who had attached an eavesdropping device to the exterior of the public phone booth.

28. *Id.* at 351.

29. *Id.* at 347.

30. *United States v. Freie*, 545 F.2d 1217 (9th Cir. 1976); *Government of Virgin Islands v. Berne*, 412 F.2d 1055 (3d Cir. 1969).

adopted.³¹ Harlan states:

My understanding of the rule that has emerged from prior decisions is that there is a two-fold requirement, first that a person have exhibited an actual (subjective) expectation of privacy, and second, that the expectation be one that society is prepared to recognize as "reasonable." Thus a man's home is for most purposes, a place where he expects privacy, but objects, activities, or statements that he exposes to the "plain view" would not be protected against being overheard, for the expectation of privacy under the circumstances would be unreasonable.³²

The plain view doctrine states that an officer (or administrative agent) may seize evidence which is in his/her immediate visual sight.³³ As technology has become more sophisticated, what constitutes "plain view" has been scrutinized.³⁴ In deciding whether technologically-enhanced visual surveillance is a search, the Court has considered many factors including the extent to which the equipment enhanced officers' natural senses, and the availability of such equipment to the general public.

The Supreme Court first considered the Fourth Amendment implication of enhanced visual surveillance in the 1927 decision of *United States v. Lee*.³⁵ The Court held that the use of a search light to enable officials to see contraband did not infringe upon the defendant's Fourth Amendment rights, since the search light illuminated what was already in "plain sight" of the officer.³⁶ The same rationale was expanded in *State v. Denton*,³⁷ where a police officer used a night scope (infra-red spectrum band) which was located on a public navigable waterway. The Court held that since the night scope magnifies what the viewer could see with the naked eye, it was not an unconstitutional search.³⁸

In *Goldman v. United States*,³⁹ the Court had held that the use of an electronic listening device did not constitute a search if the surveillance was not accompanied by physical trespass or physical intrusion. But in

31. *California v. Ciraolo*, 476 U.S. 207 (1986); *Smith v. Maryland*, 442 U.S. 735 (1979).

32. *Katz*, 389 U.S. at 361.

33. *Coolidge v. New Hampshire*, 403 U.S. 443 (1971).

34. See *Smith v. Maryland*, 442 U.S. 735 (1979); *Dalia v. United States*, 441 U.S. 238 (1979); *United States v. Caceres*, 440 U.S. 741 (1979); *Scott v. United States*, 436 U.S. 128 (1978); *United States v. New York Tel. Co.*, 434 U.S. 159 (1977); *United States v. Donovan*, 429 U.S. 4132 (1977); *United States v. Chavez*, 416 U.S. 562 (1974); *United States v. Giordano*, 416 U.S. 505 (1974); *United States v. Kahn*, 415 U.S. 143 (1974); *Gelbard v. United States*, 408 U.S. 41 (1972); *United States v. United States Dist. Court*, 407 U.S. 297 (1972); *United States v. White*, 401 U.S. 745 (1971); *Alderman v. United States*, 394 U.S. 165 (1969); *Lee v. Florida*, 392 U.S. 378 (1968); *Berger v. New York*, 388 U.S. 41 (1967); *Clinton v. Virginia*, 377 U.S. 158 (1964).

35. 274 U.S. 559 (1927).

36. *Id.*

37. 387 So. 2d 578 (La. 1980).

38. *Id.* at 579.

39. 316 U.S. 129 (1942).

Katz,⁴⁰ the Court held that the use of eaves-dropping equipment in a public telephone booth was a search; the Court expressly disapproved of the *Goldman* rule.⁴¹

In *Air Pollution Variance Board v. Western Alfalfa Corp.*,⁴² the plain view exception was adapted to administrative inspections. In *Western Alfalfa*, a state official entered on company's land to view the smoke from company's chimneys and to make an opacity test to measure air pollution. The Court implicitly approved of the plain view exception in administrative searches.⁴³

The most current case to use the plain view doctrine in analyzing aerial photography is *Dow Chemical Co. v. United States*.⁴⁴ In *Dow*, a very sophisticated camera was used to establish environmental violations. The Court held that the use of the camera was not violative of the Fourth Amendment because the pictures were taken in plain view of an open area of the plant.⁴⁵

The early search and seizure decisions focused on the "constitutionally protected areas" approach. The "open fields" doctrine can be viewed as an application of this approach. In *Hester v. United States*,⁴⁶ the Court denied Fourth Amendment protections to areas designated as open fields. In *Katz*, the majority rejected the constitutionally protected areas approach, but in Harlan's concurring opinion, the open fields doctrine approach was preserved.⁴⁷ These two tests, "constitutionally protected areas" and "reasonable expectations of privacy" were modified in *Oliver v. United States*⁴⁸ using the reasonable expectation of privacy analysis developed in *Katz*. The Court held that the expectation of privacy in open fields is not an expectation that "society recognizes as reasonable."⁴⁹ The Court considered the open fields doctrine of *Hester* to be consistent with *Katz*.⁵⁰

The Supreme Court addressed aerial surveillance and the open fields doctrine in *California v. Ciraolo*⁵¹ and *Dow Chemical Co. v. United States*.⁵² In *Ciraolo*, the Court held that a warrantless overflight from an

40. 389 U.S. 347 (1967).

41. *Id.* at 358-59.

42. 416 U.S. 861 (1974). The lower court held that *Camara*, 387 U.S. 523 (1967), and *See*, 387 U.S. 541 (1967), required a warrant, but the Court found those cases inapplicable because the inspector was not in the plant inspecting the premises, equipment, people or files. *Air Pollution Variance Board*, 416 U.S. at 864-65.

43. *Id.*

44. 476 U.S. 227 (1986).

45. *See supra* note 41 and accompanying text.

46. 265 U.S. 57 (1924). In *Hester*, a revenue agent spotted the defendant with bootleg whiskey. The defendant threw the jug into a nearby field. The agent found the broken jug in the field and found that it did contain whiskey.

47. *See supra* note 23 and accompanying text.

48. 466 U.S. 170 (1984).

49. *Id.* at 171.

50. *Id.* at 173.

51. 476 U.S. 207 (1986).

52. 476 U.S. 227 (1986).

altitude of 1000 feet, which enabled the investigator to identify marijuana by naked eye observation, was a constitutional search. Also, the Court clarified the open fields doctrine to include any aerial observation which the police were capable of surveying as long as the public could see the same activities.⁵³

In *Dow*, the Court held that viewing the open areas of an industrial complex with the use of aerial surveillance and precision aerial mapping was equivalent to an open field in which an individual may not legitimately demand privacy.⁵⁴ In its discussion of the commercial mapping camera used to take the photographs, the Court stated "that surveillance equipment not generally available to the public such as satellite technology might be constitutionally proscribed absent a warrant."⁵⁵

II. *DOW CHEMICAL CO. v. UNITED STATES*

In *Dow Chemical Co. v. United States*,⁵⁶ aerial photography was held not to be a search in violation of the Fourth Amendment. If the factors used to evaluate the use of aerial photography in warrantless environmental inspections are applied to satellite technology for that use, no legal distinction exists between these technologies.

A. *Facts*

The United States Environmental Protection Agency hired a private firm to take aerial photographs of the Dow Chemical plant in Midland, Michigan. A camera worth \$22,000 was used to take color photographs from altitudes of 12,000, 3,000, and 1,200 feet. The photographs could detail equipment, pipes, and power lines as small as one half inch in diameter. The Court held that even though Dow had an expectation of privacy, the taking of aerial photographs of an industrial plant complex from navigable airspace was simply not a search prohibited by the Fourth Amendment.⁵⁷ The factors used by the Court to evaluate aerial photography were the open fields doctrine, the intrusiveness of the sensor, the degree of sensory enhancement, and the existing legal protections for trade secrets.⁵⁸ Each of these factors will be discussed, then applied to remote sensing satellite surveillance.

B. *The Open Fields and Satellite Surveillance*

In the Court's view, Dow's industrial facility was more like an open field than a home. Dow was not protected by the Fourth Amendment

53. *Ciraolo*, 476 U.S. at 207.

54. *Dow*, 476 U.S. at 228.

55. *Id.* at 238.

56. 476 U.S. 227.

57. *Id.* at 229.

58. Jim Talbett, *Satellite Surveillance and the Fourth Amendment*, American Society for Photogrammetry and Remote Sensing, 209-16 (1987).

for warrantless inspections⁵⁹ since airflights are a common occurrence and Dow did not take any steps to protect observation from the air. Both satellite surveillance and aerial photography operate by recording reflected energy from the surface.⁶⁰ One difference between them, however, is the altitude of the remote sensor in the satellite which is higher than that of aerial photography. In open field recording situations where the sensor can delineate the outline of private buildings, there should be no Fourth Amendment restrictions.⁶¹ Although satellite sensors undoubtedly give the EPA more detailed information than naked-eye views, they remain limited to an outline of the facility's buildings and equipment similar to aerial photography. The mere fact that human vision is enhanced somewhat, at least to the degree here, does not give rise to constitutional problems. Thus, it is not reasonable to distinguish between aerial photography or remote sensing devices that record the activities in open fields.

C. Intrusiveness of the Remote Sensor

The Court noted that the aerial photography used in *Dow* could not penetrate walls and record confidential information.⁶² Sensors using infrared could detect certain materials behind walls or underground.⁶³ In *Katz*, the Court recognized that due to the rapidly advancing surveillance technology, a search could violate the Fourth Amendment without a physical trespass.⁶⁴

Satellite surveillance does not involve a physical invasion of the property and is relatively unobtrusive;⁶⁵ unlike the eavesdropping device used in *Katz*. The Court in *Ciraolo* also noted the unobtrusiveness of the airplane flight in navigable airspace as being one of the deciding factors in permitting the flight without violation of the Fourth Amendment.⁶⁶ Since *Dow*, it will have to be shown that satellite remote sensing is more like eavesdropping than aerial photography in order for it to be violative of the Fourth Amendment.

59. We conclude that the open areas of an industrial plant complex with numerous plant structures spread over an area of 2,000 acres are not analogous to the "curtilage" of a dwelling for purposes of aerial surveillance; [footnote omitted] such an industrial complex is more comparable to an open field and as such it is open to the view and observation of persons in aircraft lawfully in the public airspace immediately above or sufficiently near the area for the reach of cameras.

Dow, 476 U.S. at 227.

60. See *infra* notes 71-92 and accompanying text.

61. *Dow*, 476 U.S. at 238.

62. *Id.* at 238.

63. See *infra* notes 88-92 and accompanying text.

64. *Katz v. United States*, 389 U.S. 347 (1967).

65. See *infra* notes 88-92 and accompanying text.

66. *California v. Ciraolo*, 476 U.S. 207, 213 (1986).

D. Sensory Enhancement

The Court in *Dow* considered the degree of enhancement the sensor provides. The Court in *Dow* found photographs that showed very intricate details of pipes to be permissible.⁶⁷ The amplification size available from the American LANDSAT System (30 M) and the French (SPOT) system (10 M) would not be able to produce images as revealing as the ones the *Dow* Court found permissible.⁶⁸

Also pertinent is the constitutional problem of electronically gathered data that cannot be perceived by the human senses. "The difference between the human eye and the satellite sensing system is that humans see all visible bands simultaneously, whereas satellites view the earth in separate spectral bands."⁶⁹ It should be noted that enhanced surveillance may be permissible only in analyzing the exterior of buildings and not within private areas. Thus, like aerial photography, enhanced satellite surveillance which does not penetrate the curtilage of the building would be constitutionally permissible.

E. Availability of Satellite Surveillance Equipment

The Court in *Dow* noted that the camera used for aerial photography was a camera that was commonly used for mapmaking purposes.⁷⁰ The Court, however, did distinguish between the availability of aerial photography to the public and satellite surveillance.⁷¹ The Court reasoned that because the public does not have access to the satellites, the expectation of privacy from satellite observation was greater than that of aerial observation.

This distinction is not valid because images produced by satellites such as LANDSAT and SPOT are available to anyone.⁷² Furthermore, in 1984 Congress passed the Land Remote Sensing Commercialization Act of 1984 which privatized the satellite business.⁷³ Thus, it is possible to order specific images of any area in the world, a person's expectation to be free from surveillance is diminished.⁷⁴

67. *Dow Chemical Co. v. United States*, 476 U.S. at 238 (1986).

68. *See supra* note 56 and accompanying text.

69. NASA, LANDSAT BULLETIN 25 (1988).

70. *Dow*, 476 U.S. at 235.

71. *Id.* at 235.

72. *See infra* notes 88-92 and accompanying text.

73. Landsat Commercialization Act of 1984, 15 U.S.C. §§ 4201 - 4292 (1988). Section 4203 provides that "it shall be the policy of the United States that civilian unenhanced remote sensing data be made available to all potential users on a 'nondiscriminatory' basis." *Id.* § 4203. The legislative history defines "nondiscriminatory" as "without preference, bias, or any arrangement that favors any purchaser or class of purchasers." H.R. REP. NO. 98, 92nd Cong., 1st Sess. 4, *reprinted in* 1971 U.S.C.C.A.N. 1017.

74. France successfully launched the first commercial remote sensing satellite SPOT, in February, 1986. The Spot-Image Corporation has concluded numerous agreements for the sale of its data, and even the United States Pentagon makes use of its services. SPOTS tariffs for a single MSS frame are about \$155 for a black and white print and \$410

F. Trade Secrets

The final factor emphasized in *Dow* was the invasion of a business' privacy to uncover trade secrets. The Court in *Dow* held that trade secret laws do not proscribe legitimate aerial photograph's applications.⁷⁵ In *Dow*, the government's objective was not to engage in industrial espionage, but rather to enforce environmental regulations.⁷⁶ Also, federal laws, protect commercial surveillance in terms of unfair competition.⁷⁷ The legitimate use of remote sensing for research purposes generates great benefits for society's right to know, and society's interest in enforcing environmental laws. In making the determination of what is reasonable, the Court must balance the public interest against the level of intrusion into individual privacy.⁷⁸

When these factors are applied to remote sensing satellite surveillance it is unlikely that this surveillance technique would intrude upon the activity protected by the Fourth Amendment. Since remote sensing satellite information would be cost-effective and an excellent investigatory tool for environmental protection, its use should be constitutional for warrantless environmental inspections.⁷⁹

III. REMOTE SENSING AND WARRANTLESS ENVIRONMENTAL INSPECTIONS UNDER THE ENVIRONMENTAL PROTECTION AGENCY'S RIGHT OF ENTRY

Recent environmental legislation has granted governmental investigatory units a "right of entry" to facilities. Under this right of entry, inspectors have broad investigatory powers to conduct searches, take samples, inspect equipment or records without obtaining a search warrant.⁸⁰

Remote Sensing may be a powerful investigatory tool even in situations where its output does not conform to regulatory standards, thus preventing it from use as evidence. The legal question that arises, however, is whether remote sensing is available to the Environmental Protec-

for a color print. See generally EDWARD BINKOWSKI, SATELLITE INFORMATION SYSTEMS 64 (1988).

75. *Dow Chemical Co. v. United States*, 476 U.S. 227, 231-33 (1986).

76. *Id.*

77. *Id.* at 234 at n.2. Dow's fears that the EPA might disclose trade secrets revealed in these photographs appears adequately addressed by federal law prohibiting such disclosures. See generally Trade Secrets Act, 18 U.S.C. § 1905 (1988); Freedom of Information Act, 5 U.S.C. § 552(b)(4) (1988).

78. Talbett, *supra* note 58, at 209-16.

79. See generally *Remote Sensing and the Private Sector: Issues for Discussion — A Technical Memorandum* (Washington D.C.: U.S. Congress, Office of Technology Assessment, OTA-TM-ISC-20, March 1984).

80. See Clean Water Act of 1977 § 308, 33 U.S.C. § 1318(a)(B) (1988); CERCLA § 104(e), 42 U.S.C. § 9604(e) (1988); RCRA § 3007, 42 U.S.C. § 6927(a) (1988); Hazardous Liquid Pipeline Safety Act of 1979 § 211(c), 49 U.S.C. § 1808(c) (1988); FIFRA § 9, 7 U.S.C. § 136g(a) (1988); TSCA § 11, 15 U.S.C. § 2610 (1988).

tion Agency as an investigatory tool under this "right of entry" without violating the Fourth Amendment.

A. *Right of Entry under the Clean Air Act*⁸¹

The right of entry for site inspection in the Clean Air Act is authorized in Section 114(a) which states that the "Administrator or his authorized representative, upon presentation of his credentials shall have a right of entry to, or through any premises of such person or in which any records required to be maintained"⁸² The legislative history provides that this section authorizes entry of buildings, facilities and monitoring equipment for purposes of setting standards and enforcing them.⁸³ In analyzing section 114 of the Clean Air Act, the Supreme Court stated in *Dow* that

Congress vests [in the Environmental Protection Agency] with enforcement and investigatory authority, it is not necessary to identify explicitly each and every technique that may be used in the course of executing the statutory mission. . . . Regulatory or enforcement authority generally carries with it all modes of inquiry and investigation traditionally employed or useful to execute the authority granted. . . . Section 114(a), however, appears to expand, not restrict EPA's general powers to investigate.⁸⁴

The Court further stated that the "EPA, as a regulatory and enforcement agency, needs no explicit statutory provision to employ methods of observation commonly available to the public at large."⁸⁵ Since remote satellite information is available to the public, the EPA should be allowed to use remote sensing satellite technology as an enforcement tool.⁸⁶

B. *Remote Sensing Applications in Environmental Law Enforcement*

Remote Sensing, broadly defined, "refers to any technique of imaging

81. 42 U.S.C. §§ 7401-7626 (1988).

82. Clean Air Act, § 114, 42 U.S.C. § 7414 (1988).

83. See H.R. REP. NO. 1146, 91st Cong., 2d Sess. 25 (1970) *reprinted in* 1970 U.S.C.C.A.N. 5356, 5380.

84. 476 U.S. 227, 233-234 (1986).

85. *Id.* at 234.

86. It has been argued that it is questionable whether many of the federal environmental statutes containing a "right of entry" are constitutionally adequate. Broad inspection schemes are constitutionally suspect when applied to industries that are not pervasively regulated. See also *Wax*, *supra* note 2. Further constitutional restrictions were placed on warrantless inspections in *New York v. Burger* 482 U.S. 691 (1987). The Court held that the Mine Safety and Health Act, was constitutional and that a warrantless search of a closely regulated industry was reasonable. The Court held that three criteria must be met in order for a warrantless inspection to be deemed "reasonable". First, there must be a "substantial" government interest; second, the inspections must be necessary to further the regulatory scheme; and third, the inspection program must "in terms of the certainty and regularity of its application provide a constitutionally adequate substitute for a warrant." *Id.* at 692.

objects without the sensor being in direct contact with the object or scene itself."⁸⁷ Aerial photographs are one of the most commonly used products of remote sensing.⁸⁸ Camera stations on airplanes or satellites provide millispectral imagery for study which is beyond the range of human vision, hence the term "remote sensing" was coined.⁸⁹

There are three categories of remote sensing end products. "Photographic images" are produced by directly recording on photographic film data received by sensors. "Reconstructed images" requires computer processing or some other form of data manipulation. "Enhanced images" are presented in the form of statistical tables or computer-generated charts, and bear a resemblance to photographs, but in actuality are quite distinct.⁹⁰

Remote sensing satellites are designed specifically to collect data of the earth's environment.⁹¹ Landsats are equipped with three basic systems for gathering and transmitting data through remote sensing techniques: Three Re-trun Bean Vidicon (RBV); the MultiSpectral Scanner (MSS); and the Thematic Mapper (TM).⁹²

C. Remote Sensing Capabilities in Detection of Pollution

Because of a remote sensor's ability to obtain a synoptic view, ecological and industrial phenomena can be monitored frequently. The use of the spectral bands can prove quite valuable in detecting pollution. This involves the recording and analyzing of electromagnetic energy from visible light, infrared radiation, microwave radiation, and all other forms of

87. INTRODUCTION TO REMOTE SENSING OF THE ENVIRONMENT, 5 (Benjamin F. Richardson, Jr. 2d ed. 1985).

88. *Id.* at 6.

89. *Id.*

90. Howard A. Latin, *Remote Sensing Evidence and Environmental Law* 64 CAL. L. REV. 1300, 1317 (1976).

91. See NASA *Landsat Bulletin* (1988). The first remote sensing satellite was the Earth Resources Technology Satellite (ERTS 1), later named Landsat 1. There were three independent cameras that viewed a ground scene of approximately with a resolution of 80 meters. ERTS 1 malfunctioned after 130 satellite orbits. Landsat 2 was launched in 1975; this satellite was very similar to Landsat 1. In 1978, significant improvements were made in Landsat 3 including a resolution of 40 meters. Landsat 2 ceased operation in February 1982. The second generation of Landsat programs began with the launch of the Landsat 4. Landsat 4 had some problems in 1982, which led to the launch of Landsat 5 in 1985. Landsats 4 and 5 circle the Earth every 98.9 minutes in a nearly polar orbit, 438 miles high.

92. The RBV photographs the surface of the Earth in three different spectra: red, green and infrared. The MSS collects data by continually scanning the earth recording radiation in four different spectral bands. The TM images an area of 30 meters using seven spectral bands. Besides the RBV and the MSS/TM, another essential system was at work on the Landsat satellites. The Data Collection System (DCS) transmits data to central receiving stations for analysis. The Landsat system is now a privately owned joint venture called Eosat. The European Space Agency (ESA) has developed an expendable launch vehicle called ARIANE; its first remote sensing payload launched in 1986 offers images which have a resolution of 30 meters. *Id.*

wave-propagated energy.⁹³ Remote sensing in spectral bands other than the visible light ranges, offer the most significant benefits, but some information derived from historic photographs proved valuable in analyzing the physical environment of landfills, for example, in leachate contamination.⁹⁴

The infrared spectrum runs from the bottom of the visible spectrum. It is divided into two major regions: the visible infrared (near-infrared) and the thermal infrared (far-infrared). Near-infrared wavelengths are largely absorbed by water, but reflected by land.⁹⁵ This differentiation makes near-infrared sensing a valuable tool for the detection of unauthorized land fill operations.⁹⁶ The thermal infrared band which detects radiation may indicate the presence of unauthorized discharges: effluents containing radiation or thermal plumes.⁹⁷

The radio spectrum begins at the bottom of the infrared and extends all the way down to a few kilohertz. It can be divided further into VHF, UHF, and microwave frequencies.⁹⁸ Active sensors such as radar can image the Earth uninterrupted which is crucial to the observation of oil spills.⁹⁹ Landsat's ability to detect pollution was used to reveal a chemical discharge from a paper mill into Lake Champlain, dumping of industrial wastes from barges into New York Bight, municipal waste disposal in the ocean by New York City, and strip-mining damage in Southeastern Ohio.¹⁰⁰

There have been increased demands placed on environmental agencies. The type of information needed by these agencies can be efficiently and appropriately obtained by using Remote Sensing techniques.¹⁰¹ The EPA has devoted considerable effort to increase compliance with regulatory standards and remote sensing is an integral part of its investigative

93. JON ERICKSON, *EXPLORING EARTH FROM SPACE*, 53 (1981).

94. See Donald Erb, *Analysis of Landfills with Historic Airphotos*, 47 *PHOTOGRAMMETRIC ENGINEERING AND REMOTE SENSING* 1363-69 (1981).

95. See *id.*

96. See generally John Garfalo, *Solid Waste and Remote Sensing*, *PHOTOGRAMMETRIC ENGINEERING AND REMOTE SENSING* 45-59 (1974); Jon Stöhr, *Remote Sensing Investigations at a Hazardous Waste Landfill*, 53 *PHOTOGRAMMETRIC ENGINEERING AND REMOTE SENSING*, 1555-63 (1987).

97. See generally Izi Veziroglu, *Remote Sensing Applied to Thermal Pollution*, *REMOTE SENSING ENERGY-RELATED STUDIES* 303-34 (1975).

98. ERICKSON, *supra* note 93, at 58 (1981).

99. Sensing in a number of spectral bands has proved useful in the detection of oil spills, and in fact, that application is among the best recognized of present remote sensing capabilities. Howard A. Latin, *Remote Sensing Evidence and Environmental Law*, 64 *CAL. L. REV.* 1301, 1342 n.127 (1976).

100. NASA, *Landsat Bulletin*, 23 (1988).

101. See generally *Remote Sensing and the Private Sector: Issues for Discussion — A Technical Memorandum* (Washington, D.C.: U.S. Congress, Office of Technology Assessment, OTA-TM-ISC-20, March 1984); (Table 15 examines existing legislation which requires monitoring including the Clean Air Act, Pub. L. No. 95-95, 91 Stat. 685 (1977) (codified as amended at 42 U.S.C. §§ 7401-7626 (1988)); Clean Water Act of 1977, 33 U.S.C. §§ 1251-1376 (1988); Hazardous Waste Management Act, 15 U.S.C. §§ 2601-29 (1988); National Environmental Policy Act, 42 U.S.C. §§ 7401-7642 (1988)).

arsenal.¹⁰² The Landsat Commercialization Act provides that other federal agencies are authorized and encouraged to conduct research and development of the use of remote sensing in fulfillment of their authorized missions, using funds appropriated for such purposes.¹⁰³ Investigatory applications include detection of concealed effluent outlets, the identification of air pollution sources either directly, through sensing emission plumes, or by imaging the resulting deterioration of nearby vegetation, detection of irrigation violations, and the monitoring of ocean dumping.¹⁰⁴

CONCLUSION

Environmental protection has become one of the most pertinent issues of our time. Congress has expressed the desire to address pollution in the United States by enacting powerful legislation to force businesses to take responsibility for industrial pollutants. In this new legislation the EPA was granted a "right of entry" to inspect businesses for environmental violations.

In *Dow Chemical v. EPA*, the constitutionality of satellite surveillance was questioned by the Supreme Court. In reviewing the history of the Fourth Amendment protections in administrative searches, and the technological advances in surveillance equipment the Court has adopted a two-fold test regarding Fourth Amendment protections. Since it is no longer reasonable to assume that remote sensing satellite surveillance does not occur, and the data from the satellites are generally available to the public, businesses can no longer rely on the Fourth Amendment to shield them from standards imposed by environmental regulations. Also, the Supreme Court analysis of aerial photography as presented in *Dow* when applied to remote sensing satellite surveillance presents no legal difficulties. Therefore, the use of remote sensing satellite surveillance as a means of investigating environmental law violations should not violate the Fourth Amendment.

Karen Geer

102. See generally Rough Terrain Diffusion Model 40 C.F.R. Parts 51-52 (1988). EPA does not intend to preclude the use of remote sensing devices to directly measure wind speed and direction of prime transport height.

103. Landsat Commercialization Act of 1984, 15 U.S.C. § 4261 (1984).

104. EDWARD LYONS, SATELLITE DETECTION OF AIR POLLUTANTS, REMOTE SENSING ENERGY-RELATED STUDIES, 267-89 (1975); JOHN SETZER, THE STUDY OF AIR POLLUTION PLUMES WITH IMAGING TECHNIQUES (1982).